A TRACKING SYSTEM FOR FILE MANAGEMENT USING RADIO FREQUENCY IDENTIFICATION

BY

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Declaration

"This thesis is the original work and has not been presented for a degree or any other academic award in any university or institution of learning"

Name and Signature of candidate

Date

Approval

"I affirm that the work presented in this thesis was carried out by the candidate under my supervision"

_____

Name and signature of supervisor

_____

Date

Acknowledgement

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List of Acronym

AES	Advanced Encryption Standard
AIDC	Automatic Identification and Data Capture
ASP	Active Server Pages
AMIEDOT	Annotation model for Interchange Exchange and Document Service.
AML	Anti Money Laundering
CPU	Central Processing Unit
DSRC	Dedicated Short Range Communication
EFA	Exploratory Factor Analysis
EFTS	Electronic File Tracking System
EUROSTAT	European Statistical Office
GPIO	General Purpose Input/output
GPS	Global Positioning System
GSM	Global System for Mobile
GUI	Graphic User Interface
HATS	Hardware Attached on Top
HTML	Hypertext Markup Language
ID'S	Identification
IDEAS	Information and data exchange advance system
IFF	Identification Friend or Foe
KMO	Kaiser- Meyer- Olkin
MIM	Man in-the Middle
MYSQL	Microsoft Structured Query Language
NAFDAC	National Agency for Food and Drug Administration and Control
NFC	Near the Field Communication
NIC	National Informatics Center
PHP	Hypertext Pre-processor
RFID	Radio Frequency Identification
SPSS	Statistical Package for Social Science
SQL	Structured Query Language

TagFS	Tag based File System
UHF	Ultra High Frequency
UID	Unique Identifier
UML	Unified Modeling Language
USB	Universal Serial Bus
WI-FI	Wireless Fidelity

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Abstract

Locating files is one of the greatest problems in universities nowadays and large volumes of data are usually generated in most institutions of learning. Time is wasted in searching files, energy is misused in looking for misplaced files, deadlines are missed and sometimes files are lost. This study proposed the use of Radio Frequency Identification (RFID) technology as a method of tracking and managing movement of files from one location to another within an organization, special emphasis is on files of all members of staff of Yobe State University. The RFID Tracking System will track the location of file within the Registry Department and Near the Field Communication (NFC) tags are placed in the file of staff which has unique identification number, the Universal Serial Bus (USB) NFC reader will send response to each tag that are within the reading range of the USB NFC reader. The control units are responsible for receiving the information (UID) from the RFID unit and tracking staffs and tagging from where necessary. The system consists of terminal units which include Raspberry pi, monitor, Universal Serial Bus (USB) Near the Field Communication (NFC) Reader, NFC Tags for each staff and wireless keyboard.

The Radio Frequency Tracking System provides the functionalities of the overall system such as displaying unique identifier of the staff, registering Unique Identifier of the staff, deleting Unique Identifier of the staff, generating location history of the staff files and other minor related matters. The RFID tracking System was validated using Information System Success Model (ISSM) to measure the effectiveness of the system developed using the survey questionnaire. This research work has discussed the application and implementation of Radio Frequency File Tracking System for file management. The file tracking system using raspberry pi and NFC reader is automated and monitored without any wastage of time. RFID will aid tagging, tracking and management of individual file of all member of staff of Yobe State University.

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CHAPTER ONE
INTRODUCTION

1.1 Background of the study

Much of today's data processing is done using manual approaches. Letters are hand written, or are typed manually in most businesses because they are small. For example, an operator of a stationery service who buys and supplies equipment to three or four vendors believes that there is no need for automated accounting system and thereby care less about keeping vital information. It is such system that do not involve the use of machine, almost all the work to be done is done manually (Fagbolu, 2008).

When it comes to an effective and smooth running of an office, there are certain elements that must be implemented, despite the industry you find yourself. First and foremost, your files are the key to your operation and learning how to properly maintain a sufficient paper trail can make a world of difference when it comes to your daily operations (Anne, 2012). One peculiar characteristics of the information age is that companies and organizations have completely depended upon their computer maintained files for information storage, organization and retrieval. Existing manual system are often replaced with electronic filing system as a result of social changes that have created large, complex political and economic structure (Fagbolu, 2008).

The need to keep track of files has become significantly important particularly in institutions of higher learning. However, little is being discussed about this in literature (Omoregbe et al., 2014). In most cases, files are transferred physically from one desk to another within a department or between departments (Omoregbe et al., 2014). File Tracking Systems offers clear visibility of the file movement throughout the file processing channel DMD (2010). Sometimes there is need for a file to go through several personnel before it can be rendered acceptable. There are however drawbacks in transferring these files from one desk to another such as getting these files missing or forgetting to document the transfer.

There is thus the need for a system that can provide solutions that will address such problems while saving time and energy of administrative workers. File tracking systems offer a viable solution in this regard. The effectiveness and efficiency of any organization depends on its ability to efficiently manage its files and documents. Therefore, retrieval, searching and locating of a file or document should be carried out with little or no stress (Omoregbe et al., 2014).

Based on this premise, this study intends to use Radio Frequency Identification (RFID) technology as a method of tracking and managing movement of files from one location to another within an organization and special emphasis is on files of all member of staff of Yobe State University which comprises: Senior academic staff, Junior academic staff, Senior non-academic staff and Junior non-academic staff. The movement of files is done for promotions, leaves, disciplinary cases, appointments and many other cases as the need arises but numerous instance of missing file during the movement are the drawback.

1.1.1 Historical Perspective

The history of recognition via radio waves technology goes back to Faraday's discovery that light and radio waves are both forms of energy in 1864. In 1946, Leon Theremin invented a tool for the government of the Soviet Union that was able to transfer the radio waves caused by any event in the form of sound to the desired location. These sound waves would translate reflection of radio waves into an understandable language by mobilizing the diaphragm that was connected to a vibrator device. This tool is considered as the first RFID-based device, but some of the sources believe that RFID technology started in 1920 and became prevalent around 1960s (Khast, 2017).

Another technology that was very similar to RFID is Identification Friend or Foe (IFF). IFF was invented in Great Britain in 1939 and was used as an efficient tool in World War II in order to make it easier to identify German aircrafts as enemy aircrafts. This was postulated by Harry Stockman, an American researcher and later invented (Garfinke and Holtzman, 2005). In recent years, development of this technology sparked a revolution in identification systems, Radio Frequency Identification systems have gained popularity and notoriety which has led to use of technologies such as tracking devices, smart labels embedded with transmitting sensors and intelligent readers to convey information about the key areas where consumers live and work to data processing system (Soon and Guitierrez, 2008).

The smooth development of many organizations has been attributed to file management systems and policy put in place because files are walking sticks for daily operations. Universities for example use physical procedures for deciding, reporting or requesting and this call for proper quality control measures for file management to reduce time wastage and energy in searching for them (Krasniqi, 2013). Radio Frequency Identification (RFID) is one of the new generation of auto identification and data collection technology which help to automate business processes and allows large number of tagged objects using radio waves (Dhanalakshmi and Mamatha, 2013).

Smiley (2015), presented the popularity of RFID File Management as increasing among companies because of inherent advantages of RFID to accurately and efficiently track documents. By placing RFID labels on files and documents, setting up the proper RFID infrastructure, then you can successfully locate these documents and files within the minimal time and invariably save time and money, reduce stress and increase professionalism.

RFID File Tracking System is one of the most powerful record management software tools which is best suited for businesses with substantial amount of transactions and where critical security restrictions are indispensable. RFID is a technology that uses radio waves to transmit information. This kind of system usually consists of tag, readers and data processing system. Such a system allows computer to acquire information about identities of physical objects. It is more than a substitute technology of bar code systems. An RFID tag can hold much more information than a barcode, to the extent that is possible to identify individual tagged items in supply chain. RFID is superior to barcode as it does not require line of sight for automatic data capturing, which is a definite advantage in numerous application (Chowdhury et al., 2007).

1.1.2 Conceptual Perspective

According to Rouse (2017), RFID (Radio Frequency Identification) is a form of wireless communication that incorporates the use of electromagnetic or electrostatic coupling in the radio frequency portion of the electromagnetic spectrum to uniquely identify an object, animal or person. This technology comprises of three major components: Scanning antenna, Transceiver (often combined into one reader, also known as an interrogator) and Transponder (the RFID tag). An RFID tag consists of a microchip, memory and antenna.

RFID reader is a network-connected device that can be permanently attached or portable. It uses radio frequency waves to transmit signals that activate the tag. Once activated, the tag sends a wave back to the antenna, where it is translated into data. The data that is transmitted is then interpreted, tracked from the rest of the file and immediate action required is taken by the management.

The RFID system consists of tags with antenna, Reader with antenna, middleware and backend or stored database. The tag includes a chip which stores a special series identifier that is utilized to identify the things individually. The tag can be indicating the object from multi meters distance and in front of the RFID reader. RFID tags have three kinds which are active, passive and semi-passive tag. The active tag is that which does not require external source, it has battery source built in it, the passive tag is that

which is initiated by the reader, it does not have battery source built in it, and the semi passive tags have the properties of both of them (Abdulsada, 2017)

File Tracking System is a web application that manages all the files movement at any time that is from one desk to another one and help in managing the flow of files efficiently. Any desk can receive and send request and decisions at any time. The system follows a procedure of file unique numbering and enables file management, file status monitoring, file movement tracking, etc. It also has a very powerful search form to locate a file and analyze the history of movement of that file (Krasniqi, 2013).

1.1.3 The Contextual Perspective

Yobe State University is located in Damaturu, Yobe State, Nigeria and was established in 2006, the institution has grown steadily and currently offers programmes under several faculties: Faculty of Arts, Social and Management Science, Faculty of Science, Faculty of Law and Faculty of Medicine.

The University has been using the manual system of keeping and tracking files since its inception. Therefore, locating file when the need arises becomes difficult which is one of the major challenges facing the University file management system. In addition, energy is wasted in locating file and unable to meet up with deadlines among others. Therefore, it is pertinent to develop a file tracking application that can be used to overcome the aforementioned problems in order to promote effective and efficient file management activities in the university (Krasniqi, 2013).

1.2 The Problem Statement

In Nigeria, most established organizations with a considerable large number of staff still manage their files and documents using the manual method, such method lack effective and efficient ways of recording, tracking, retrieving and managing files and documents that are moved from one place to another within an organization. In the process of moving such files and documents, they can be intentionally/unintentionally misplaced or lost which makes missing files and documents difficult to track in the manual file management method.

Also, the susceptibility for misplaced, missing or stolen files is high when an organization uses the manual file and document management system (Omoregbe et al., 2014). However, in the case of misplaced files, locating them is usually more difficult and cumbersome. Hence, the need to keep track of files is the source of motivation for this research work. The research aims at providing an electronic

solution to most of the aforementioned weaknesses of the manual file and document management system. Effective and efficient files and documents management is at the heart of any established organization which enhances the organization's productivity and performance (Moran and Morner, 2017).

1.3 Objectives of the Study

1.3.1The main objective of the study

The main objective of this research work is to apply tracking system of Radio Frequency Identification for File Management.

1.3.2 Specific objectives of the study

To analyze the existing File Tracking System used in Yobe State University of Nigeria.

To apply the Radio Frequency Identification System for Yobe State University of Nigeria.

To implement the Radio Frequency Identification system in Yobe State University.

To validate the Radio Frequency Identification System in Yobe State University.

1.4 Research Questions of the study

How can we analyze the existing File Tracking System in Yobe State University?

How can Radio Frequency Identification System be applied for file management?

How can the Radio Frequency Identification System be implemented?

How can the Radio Frequency Identification System be validated?

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1.5 Scope of the study

1.5.1 Geographical scope

This study was conducted at Yobe State University, Damaturu, Yobe State, Nigeria.

1.5.2 Content Scope

This study is aimed at applying the use of Radio Frequency Identification System for tracking staff files that are created within the Registry Department of Yobe State University.

1.5.3 Time scope

This study was carried out for a period of five months that is from January, 2018 to May, 2018. January and February were for proposal writing and the rest of the three remaining months were for developing the system.

1.6 Significance of Study

Proper tracking and retrieval of file and document will eliminate missing file cases and invariably reduce any corrupt practices, nepotism and favoritism found in almost government parastatals including higher education. All stakeholders will be the beneficiaries of this study such as Government, Governing Council Members, Management staff, and Academic and Non-academic staff of the university as well as future researchers.

1.7 Organization of the Dissertation

This thesis is divided into six chapters. The rest of the chapters are organized as follows

Chapter 2: Discusses the reviewed of the related literature pertaining Radio Frequency Identification, File Management as well as finding and contributions from various researchers.

Chapter 3: Discusses the methodologies of the study which include the research design, research population, sample size.

Chapter 4: Presents the analysis and interpretation of the findings of the study which include; the demographic data of respondents, analysis of existing File Tracking System used in Yobe State University as well as validating of the Radio Frequency Identification System designed for Yobe State University.

Chapter 5: Describes the Design and Implementation of Radio Frequency Identification Tracking System.

Chapter 6: The study is concluded here, presents the Discussion of findings, Recommendation, Contribution to Knowledge and Conclusion were also presented here as part of this chapter.

CHAPTER TWO
LITERATURE REVIEW

2.0 Introduction

This chapter reviewed related literature pertaining to Radio Frequency Identification, file management as well as findings and contributions of various researchers on this topic.

2.1 Radio Frequency Identification Concept

Mahyidin (2008), reviewed that Radio Frequency Identification as a new technology that incorporates the use of electromagnetic or electrostatic coupling in the radio frequency (RF) portion of the electromagnetic spectrum. The device uniquely identify an object, animal, or person. RFID tags are not an "improved bar code" as the proponents of the technology would like you to believe. An RFID system consists of three components; an antenna, transceiver (often combined into one reader) and a transponder (the tag). The antenna use radio frequency waves to transmit a signal that activates the transponder. When activated, the tag transmits data back to the antenna. RFID technology differs from bar codes. RFID can read the tag using RF, meaning that the RFID reader can be read from a distance, right through your clothes, wallet, backpack or purse. Besides, the RFID tag consists of a unique ID for each tag. The technology used in RFID has been around since the early 1920s (Mahyidin, 2008).

Similarly, Chiagozie and Nwaji (2012), describes Radio Frequency Identification (RFID) as a technology that uses radio waves to transfer data from an electronic tag called RFID tag or label attached to an object, through a reader for the purpose of identifying and tracking the object. Radio Frequency Identification (RFID) technology, incorporates the use of electromagnetic or electrostatic coupling in the radio frequency portion of the electromagnetic spectrum to uniquely identify an object, animal, or person. RFID chips contain radio transmitter that emits coded identification number when queried by a reader device. Some RFID tags can be read from several meters away and beyond the line of sight of the reader. The application of bulk reading enables an almost-parallel reading of tags. This small type is incorporated in consumer products and can be implanted in pets, for identification. The tag's information is stored electronically. The RFID tag includes a small RF transmitter which transmits an encoded radio signal to interrogate the tag, and receiver which receives the message and responds with its identification information. Some RFID tags do not use a battery. Instead, they use the radio energy transmitted by the reader as its energy source. The RFID system design includes a method of

discriminating several tags that might be within the range of the RFID reader (Chiagozie and Nwaji, 2012).

2.1.1 RFID DEFINITION

Comment [B2]: It is expected to have definition b4 application

RFID is a data collection technique which collects information by using data of radio frequency that communicates between a mobile tag and the reader in order to recognize, classify and track them. There are many different applications for RFID systems like tracking of product through industrialization and assembly, controlling of inventory, parking lot access and control, searching of equipment in hospitals and searching of containers. (Abdulsada, 2017).

Wamba (2013) defined Radio Frequency Identification (RFID) as a wireless Automatic Identification and Data Capture (AIDC) technology which allows end-to-end supply chain item level tracking and tracing. The technology is also considered by scholars and practitioners as at the core of the so-called "Internet of Things" which refers to the possibility of discovering information about a tagged object by browsing an Internet address or database entry that corresponds to a particular RFID (Calia, 2010).

In addition, Sharma et al., (2014), defined RFID as a wireless automatic identification that is gaining attention and is considered by some to emerge as one of the pervasive computing technologies in history. As the technology grows very rapidly, RFID has received considerable worldwide attention and widely used in monitoring and tracking ranging from human identification to product identification. Previous researches has successfully indicated that RFID has been increasingly expanded in various fields such as retail supply chain, asset tracking, postal and courier services, education, construction industry, medical etc. Also, according to Kransniqi (2013), File Tracking System is a web application that manages the movement of file from one desk or room to another and helps in managing the flow of files effectively and efficiently. All the files such as reports, decisions, requests, reminders, and others can be processed and tracked by the system at any time. Radio Frequency Identification can be described as an automatic identification method which relies on storing and remotely retrieving data using devices called RFID tags or transponders. An RFID tag is an object that can be attached to a product, animal, or person for the purpose of identification using radio waves. Chip-based RFID tags contain silicon chips and antennae. Passive tags require no internal power source, whereas active tags require a power source (Akinyemi, 2014).

2.1.2 RFID APPLICATION

RFID is a wireless automatic identification that is gaining more attention and is considered by some to emerge as one of the passive technologies in history. RFID is used in monitoring and tracking ranging from human identification to object identification (Sharma et al., 2014). According to Li (2006) and Wyld (2006), RFID technology has been widely implemented all over the world and its impact on our daily life is very diverse and massive. The diverse areas of RFID application include logistic tracking, monitoring, maintenance of products and payment process. Governments in both developed and developing countries are applying it in various areas such as tracking manufactured goods, currencies, school attendance etc.

The use of this technology grows faster especially during the Second World War and many enterprises adopted it because of the benefits. In the United State for example, Wal-Mart took the lead followed by Tesco and Metro among others that have adopted it worldwide, with increased percentage of the usage witnessed in industries such as Logistics, Medical treatment, Finance, Supply chain, Retail Company, Military, Manufacturing and Agriculture. In all these areas, tracking of records is the major objective with the help of the internet.

Application of RFID technology is increasing in various industries as price continuously decreases. According to the data from Eurostat, the statistical office of the European Union (Eurostat, 2010), the most common application of RFID technology in enterprises in the European Union in January 2009 was in the area of person identification or access control which has 56%, followed by supply chain management and inventory tracking with 29%, followed by payment with 25%, product identification with 24%, monitoring individual production with 21% and lastly, service and maintenance information management with 15%. In addition, Croatian enterprise uses the technology for person identification, access control and for payment application such as toll collection. According to Renko & Ficko (2010), Croatian retailers do not use new logistics technologies sufficiently; particularly enterprises from studied sample do not use RFID for products labelling. Authors explained that fact with high costs of RFID employment per unit with compare to low costs of labour that retailers employ for product labelling.

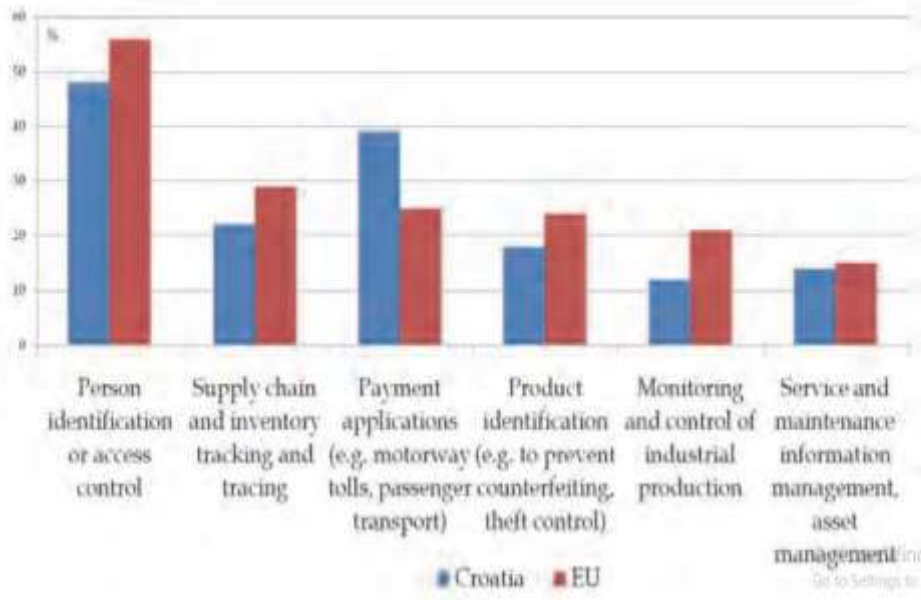


Figure 1.2.1: Applications of RFID Usage in Enterprises by Purpose, First Quarter 2009 (Eurostat, 2010)

Source: Maticevic et al., (2011)

Furthermore, based on the highest share of enterprises which used RFID in January 2009, enterprises from Netherlands has the highest RFID usage with 9%, followed by the enterprises in Finland with 8% of usage while enterprises in Spain, Austria and Slovakia have 4% usage each. The lowest share enterprises that used RFID were from Greece, Cyprus and Romania with 1% respectively. Also, it is worth noting that Croatian enterprises had 4% RFID usage which is one percent higher than the average usage in the EU27 which has only 3% (Maticevic1 et al, 2011).

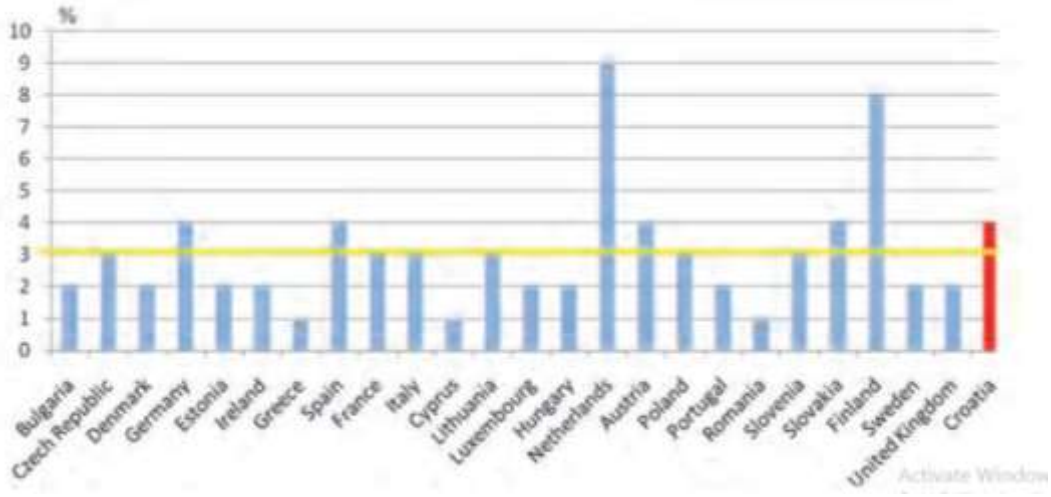


Figure 2.2.2: Enterprises that used RFID in January 2009 (% of all enterprises) (Eurostat, 2010)

Source: Maticevic1 *et al.*, (2011)

In addition, Chiagozie and Nwaji (2012), reviewed that in 2010, there were three key factors that drove a significant increase in RFID usage which include; decreased cost of equipment and tags, increased performance to reliability of 99.9% as well as stable international standard around Ultra High Frequency passive tag. RFID is becoming increasingly prevalent as the price of the technology decreases (Mahyidin ,2008). The current application of RFID includes:

Electronic Vehicle Registration

With security of cars being a major concern in many countries, RFID technology is being leveraged by government for vehicle registration. This helps in detecting stolen cars and their retrieval.

Transportation Payments

Governments use RFID applications for traffic management while automobile companies use various RFID tracking solutions for product management.

Car-Sharing

The Zipcar car-sharing service uses RFID cards for locking and unlocking cars and for owner identification.

T*oll Roads*

The tags which are usually the active type are read remotely as vehicles pass through the booths and tag information is used to debit the toll amount from a prepaid account. The system helps to speed traffic through toll plazas as it records the date, time, and billing data for the RFID vehicle tag. This has been introduced in some places in Nigeria.

Schools and Universities

School authorities in the Japanese city of Osaka are now chipping children's clothing, back packs, and student IDs in primary schools. Similarly, Whitcliffe Mount School in Cleckheaton England uses RFID to track pupils and staff in and out of the building via a specially designed card. In the Philippines, some schools already use RFID in IDs for borrowing books and also gates in those particular schools have RFID ID scanners for buying items at a school shop and canteen, library and also to sign in and sign out for student and teacher's attendance.

Also, the RFID technology has been suggested to be applied in various sectors in Nigeria so as to reduce corruption. These sectors include; the monitoring of crude oil loading, tracking the movement of money, drug agencies and monitoring containers entering the country (Chiagozie and Nwaji ,2012)

RFID technology companies in Nigeria started providing Anti-Money Laundering (AML) solutions to banks. The RFID technology used to keep tracks of the movement of money and alerts the Nigerian Financial Intelligence Unit of any suspicious activities. Furthermore, the company used to provide service to five major Nigerian commercial banks. This technology has been used by National Agency for Food and Drug Administration and Control to reduce the importation and distribution of counterfeit drugs 2008 (Chiagozie and Nwaji, 2012).

Furthermore, according Heyde (2017), Radio Frequency Identification is a technology which include both the wireless data capture and transaction processing. Short range and long range are the two major areas where RFID technology is used. Track and Trace applications can be long range applications distance. The technology also provides additional functionality and benefits for product authentication. The access control applications are a short range type of applications. Heyde (2017), further stated that the following are the main applications areas of RFID technology:

Asset Tracking: this can be static or in-motion asset tracking or location which are used in health care facility, wheelchairs or IV PUMPS IN, laptops in a corporation as well as servers in a data center, which was an easy task. User can suddenly determine the location of tagged assets anywhere within the facility with the help of RFID technology. Control point detection zones at strategic locations throughout the facility allow the user to define logical zones and monitor high traffic areas. Tagged assets moving through these control points provide instant location data.

People tracking: people tracking system are used as an asset tracking system. These are commonly used in hospitals and jail. In hospitals, RFID tags are used for tracking special patients especially those with psychiatric problems. The RFID tag is also used for locating and tracking all the activities of the newly born baby. The best use of people tracking system is in jails. It helps the jail to easily track their inmates. Many jails now in the United States have adopted the RFID tracking system which help them to keep a close eye on their inmates.

Document Tracking: This is most common problem nowadays in our universities and other institutions that deal with large amount of data and documents which bring a lot of problem in the document – tracking systems. The RFID document-tracking system save time and money by reducing the time spent searching for lost document and also the financial and legal implications associated with losing documents.

Government Library: Many government libraries use barcode and electromagnetic strips to track various assets. RFID technology uses for reading these barcodes unlike the self-barcode reader RFID

powered barcode reader can read multiple items simultaneously. This reduces queues and increase the number of customers using self-check.

Healthcare: Patient safety is a big challenge in the health sector. Reducing medication errors, meeting new standards, as well as reducing cost are the plus points of use of RFID solution. RFID wristbands containing patient records and medication history address several of these concerns. Singh and Mahajan (2014), reviewed that there are over 500,000 RFID technology installed in warehouses and retail establishments worldwide. The first application of RFID technology in library environment was in Singapore public library in 1998. The use of RFID by libraries since then has grown dramatically. The adoption of RFID system by the libraries, promises a solution that could make it possible to inventory hundreds of thousands items in their collections in a day instead of a month. In addition, the RFID technology allows patrons to check out and return library collection automatically at any time of the day. Besides, it also speedup checkouts, keeping collection in a better order alleviating repetitive strain injuries among libraries. It also provides a better control on theft, non-return as well as misfiling of library assets.

In a similar vein, Senadeera and Dogan (2016) reviewed that Radio Frequency Identification is an emerging technology which has wide range of applications. The Radio Frequency Identification users seek diverse characteristic of tags depending on their application especially cheaper tags than the existing ones and interoperability between the systems. In addition, Radio Frequency Identification manufacturers tend to create products that would meet the demand of customers. Identification systems for medical aviation, railway and shipping industry, animal identification, timing of sport events, control of highway toll collection, electronic shelf management in libraries, control of production lines as well as food safety are some of the new developments that use Radio Frequency Identification Technology today.

2.1.3 Benefit of using RFID

Though RFID is not likely to entirely replace commonly used barcodes in the near future, (Kaur, 2011), reviewed that the following advantages give added value for identification : Tag detection not requiring human intervention reduces employment costs and eliminates human errors from data collection, as no

line-of-sight is required tag placement is less constrained, RFID tags have a longer read range than barcodes, tags can have read or write memory capability, while barcodes do not have the read or write capability, RFID tag can store large amounts of data additionally to a unique identifier, Unique item identification is easier to implement with RFID than with barcodes, Its ability to identify items individually rather than generically, tags are less sensitive to adverse conditions (dust, chemicals, physical damage etc.), many tags can be read simultaneously, RFID tags can be combined with sensors, automatic reading at several places reduces time lags and inaccuracies in an inventory, tags can locally store additional information; such distributed data storage may increase fault tolerance of the entire system, reduces inventory control and provisioning costs and reduces warranty claim processing cost
According to Roberti (2011), the following give added advantage to the use of RFID which make it better and more efficient than our barcode reader: RFID is the only truly automatic-identification technology, Bar codes are great, but they usually require a person to scan them. RFID systems on the other hand, can collect information without the need for human intervention. That means using RFID is usually cheaper than scanning bar codes or performing other manual processes. The under listed points are the advantages:

RFID usually requires no line of slight: If you were to receive a box containing 60 pairs of jeans, you would either need to open the box and count the garments manually or scan each bar code to confirm that there were actually 60 items and that they were the correct products. With RFID, you could read the contents in only a few seconds.

RFID is an enabling technology: RFID allows users to build a wide variety of applications that go well beyond data collection. For instance, museums have enhanced the visitor's experience by having a tag read whenever a visitor approaches an item, triggering visual or audio information. And retailers have deployed mirrors with built-in RFID readers and a touch screen. When a customer tries on an item in front of the mirror, the tag is read and information is displayed. The customer can then touch the screen to view other colors and styles, as well as accessories, thereby enabling retailers to cross-sell without requiring a salesperson.

RFID is accurate: Bar codes require people to scan them and people often forget to do so or scan the wrong bar code. As a result, IT systems frequently have bad information in them. When RFID solutions are properly deployed, they are often highly accurate, which means the data stored in an inventory-management, warehouse-management or other system is accurate and can be trusted. This leads to better a business decision. Similarly, according to Wyld (2006) RFID has more advantages than the barcode which include: RFID can read without line of sight, multiple tags can read simultaneously which is not possible using the barcode, RFID can cope with hash or dirty environment, RFID can identify a specific item whereas barcode can only identify the type of item, RFID can overwrite new information (update) while the barcode cannot be update and can automatically tracked removing human error.

In addition, Senadeera and Dogan (2016), note that there are many advantages in RFID compared to bar code technology. One of the advantages is that the reader can read or write tags data without the line of sight. In addition, the information of a tag can be rewritten, but it is unchangeable in the bar code system. Also, the RFID reader has the ability to read multiple RFID tags simultaneously. Compared to barcodes, RFID tags are applicable in insensitive environments, such as outdoors, higher temperatures and around chemicals.

2.1.4 Challenges of RFID

Before RFID can be utilized to its maximum potential as opposed to the fraction in which it is currently employed, certain issues need to be understood by the users and corrected if possible. The three core obstacles include the concerns of security, the problems surrounding the privacy of the data captured and the characteristics associated with the nature of RFID (Darcy *et al.*, 2011).

Additionally, we will further examine the specific problems associated with anomalies present within the captured observational records which are regarded as characteristics of RFID. When all of these issues are rectified to provide maximum security, privacy and integrity, RFID will be able to realize its full potential in massive wide-scale adoptions (Darcy *et al.*, 2011).

According to Mitrokotsa *et al.,* (2010), Thamilarasu & Sridhar (2008), the issues associated with RFID Security also known as Intrusion Detection refers to the discovery of foreign attacks upon the system usually utilizing the tags that hinder the overall integrity of the data. The under listed five issues are some of the most dominant with regards to RFID security: Eavesdropping: The act of setting up an additional reader to record tag data, Unauthorized Tag Cloning: Copying tag data onto an additional tag to gain the same privileges, Man-in-the-Middle (MIM) Attack: When an external object pretends to be either a tag or reader between actual tags and readers, Unauthorized Tag Disabling: When an external reader disables a tag not allowing it to be utilized again, Unauthorized Tag Manipulation: Manipulating the tag data using an external reader.

Privacy within the context of an RFID-enabled facility refers to either unknowingly releasing critical information (deriving specific knowledge or tracking meaningless data) (Langheinrich, 2009), or compiling a list of all items currently found on a person (Juels, 2006).

Furthermore, Langheinrich (2009) stated that there have been several methodologies proposed in the past to ensure maximum privacy of an individual including the general approaches of Encrypting/Rewriting and Hiding/Blocking Tags. In addition to these general solutions, there have been more specific and advanced approaches suggested such as killing/sleeping the Tags, carrying around a privacy-enforcing RFID device, releasing certain information based solely on distance from the reader and introducing Government Legislations (Juels, 2006).

There are certain characteristics associated with the nature of RFID technology (Cocci *et al.*, 2008 and Derakhshan *et al.*, 2007). These challenges are low level data, error-prone data, high data volumes and its spatial and temporal aspects. Low level data refers to the raw observational readings being taken by the RFID Reader; Error-Prone Data is the problem which RFID has with capturing the data; High Data Volumes refers to the ongoing obstacle with managing exponential RFID data streams and Spatial and Temporal Aspects alludes to the aspects of RFID's freedom in being capable of being used in all situations.

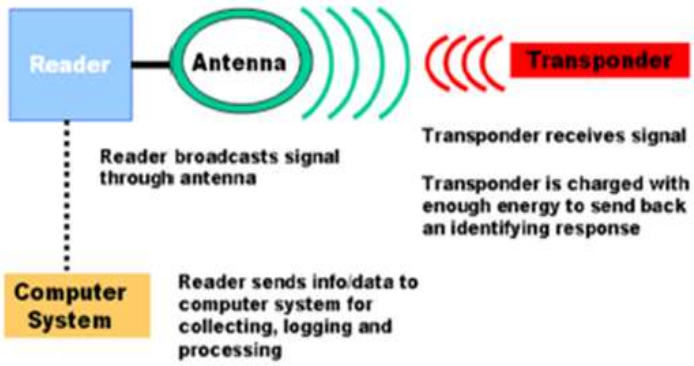
However, according to Pandey and Mahajan (2010), the following are the disadvantages of RFID in the library; high cost, frequency block, changes of removed of exposed tags exit gate sensor problem, reader collision and lastly Interoperability.

Darcy *et al.,* (2011), reviewed that there are three issues concerning the integration RFID technology. Firstly, the security when using the technology as tags is susceptible to both physical and virtual attacks upon the system. Secondly, the need for privacy surrounding the data collected as the observation recorded can be used for breaches in privacy. The third is that the data collected among systems, in particular where passive tags are utilized, produces data characteristics that make the system harder to use.

2.1.5 HOW RADIO FREQUENCY IDENTIFICATION (RFID) WORKS

Sharma *et al.,* (2014), stated that RFID system combines inexpensive, programmable tags with a computerized radio detector. When the tag comes to within a few feet of the detector, the detector reads data carried in the tag via radio waves. A detector can work in a system with any number of tags, from a few to millions. RFID equipment has many uses which include: inventory tracking, secure building access and retail-theft control. RFID methods utilize radio waves to accomplish this. At a simple level, RFID systems consist of three components: an RFID tag, an RFID reader, and antenna. The RFID tags contain an integrated circuit while the antenna, are used to transmit data to the RFID reader (also called an interrogator). The reader then converts the radio waves to a more usable form of data. Information collected from the tags is then transferred through a communications interface to a host computer system, where the data can be stored in a database and analyzed later. A RFID reader is a network connected device (fixed or mobile) with an antenna that sends power as well as data and commands to the tags. The RFID reader acts like an access point for RFID tagged items so that the tags' data can be made available to several applications.

Figure 3.2.3 shows the basic principle of an RFID system.



Source: (sharma *et al.*, 2014)

2.3: Working Principle of an RFID System

Similarly, Abhishek et al., (2017), described the working of RFID reader in monitoring of school bus using Raspberry PI. The RFID is connected to the Raspberry PI board and the RFID tag is scanned with the reader. When a child boards the school bus, his card has to be scanned and each tag has a unique identification code. The scanned code is sent to the Raspberry which has to match with the corresponding information code stored in the database of the corresponding child.

A message will be sent from the Raspberry PI to the child's parents informing them that their child has boarded the bus at this time and date. Also, the same happen when the child is dropped at the dropping point from the school as a message will be sent to the child's parents that their child has been dropped at the dropping point in school at a particular time and date. Figure 2.4 below shows how the RFID works in monitoring a school bus using Raspberry (Abhishek et al., 2017).

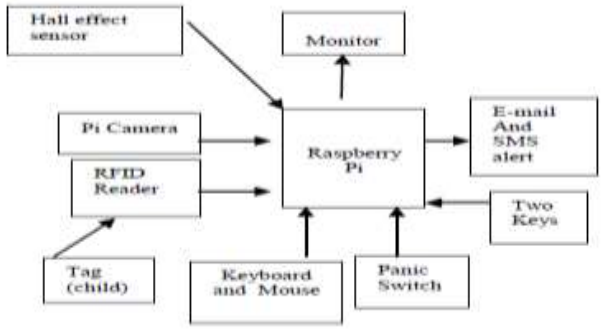


Figure 4.2.4 : Working of RFID

SOURCE : Abhishek *et al.,* (2017)

2.1.6 Review of related Literature

According Musa and Dabo (2016), the idea of RFID is akin to that of barcode which is used to identify, track, and detect library properties at the circulation desk and the daily stock maintenance. Thus, the following review describes how the RFID technology is being applied in tracking, monitoring and management of resources.

Telepen (2013) launched a file and document tracking software which is user friendly barcode-based tracking system. The major shortcoming of this system is that, the barcode needs to be in clear line-of-sight with the reader in order to be effective. In a similar vein, Information and Data Exchange Advanced System (IDEAS) was developed by the National Informatics Centre (NIC) in Kerala, India, as a file tracking system using Free and Open Source Software (Omoregbe *et al.,* 2014). It was developed as a web based application in order to keep track of files coming into a government office (that is, citizens' petitions). Due to its intuitive web interface, government officers were able to easily record or query information about the petitions or files received within their respective offices through the medium of the internet (Chaladan, 2010). Also, users which include both citizens and officers alike can track the movement of files making the system a transparent one. The drawback of this particular system is that, it is built to serve files in government offices and not necessarily Universities or other institutions of higher learning (Bakshi, 2011).

Another similar system was developed by National Information Center in 2013. The system was developed as a web application for the government of New Delhi. It is used to create, send and track government files (receipts). Similar to IDEAS, the system allows users to track the movement of important files in the process of decision-making. The drawbacks of this system include; security - in any possible hacking situation, all the files can be easily manipulated; also no activity log is implemented for tracking files; the system is platform dependent –runs on a Windows-based server (IIS) and requires proprietary databases as backend. The implementation language is Active Server Pages (ASP) (Dopt, 2013). Furthermore, Centralized File Movement and Tracking Information System is another file tracking system based on Web as well as Client Server Architecture. It was developed to track the movement of files in medium and large government offices National Information (2013). The goal of the system is to replace the manual record keeping system for files/letters with a more efficient paperless automated system. The system is platform independent, fully menu driven and user friendly, the data entry is done once only and it ensures extensive built in data validation checks, it has extremely powerful search capabilities, it ensures acknowledgment to the sender about physical receipt of file, it notifies a receiver about incoming files, it also provides a facility to recall the file if wrongly marked. It is highly secure providing, centralized database, super user administrative control, better availability, reliability, and multi layered security. Aside the aforementioned systems, some file tracking systems employ Radio Frequency Identifier (RFID) technology which allows you to track files like you would use bar-coding (Nares *et al.*, 2011).

In addition, Infotronic Systems for instance, developed a file tracking system that employs RFID technologies. The rationale behind the development of the application was at ensuring that existing files are secured. Each file in file storage (room) receives all RFID file tag label depending on the file type. The tag contains the name and other related information including a unique file number. At the file storage door, an RFID security gate (sensor) is implemented so that whenever someone takes a file from the file room and tries to go out without proper clearance, an alarm is triggered and such a person is accosted by security guards on duty. The system is very powerful especially for securing files but the same cannot be said for it being used for arranging or searching files. This RFID-based tracking system can also be expensive to implement particularly by a tertiary institution. The costs include those of buying sensors, label tags, and other essential accessories. This can be a draw back in some respect.

Putting it all in perspective, we identify that several tracking systems exist that are being used outside the context of learning institutions like Universities.

Omoregbe *et al.,* (2014), proposed the Electronic File Tracking System (EFTS) that uses RFID technology and open source software to manage the large volumes of data that are generated in tertiary educational institutions. Their aim was to improve the productivity of administrative staff in such a way that files can be tracked and processed in real-time using the EFTS. Even though, the EFTS has improved file management and staff productivity, the RFID technology used relied on off-the-shelf technology which lacks local-content technology and are more likely to consume much power.

The challenges faced by libraries in developing countries with respect to managing their routine library operations led Olaniyi *et al.,* (2016) to propose a secure library circulation management system. The system uses RFID technology and an Advanced Encryption Standard (AES) private key encryption technique. Their system addressed the insecurity of library resources and it also reduced human involvement in library operations that usually lead to errors in the execution of routine tasks. Such a system has greatly improved the security and management of library resources. However, the system is designed for the library and the RFID technology prototype used for this study has limited capabilities (such as WIFI, Global Positioning System and Global System for Mobile communications)) and it requires a lot of power (12 volts). Additionally, the library circulation management system uses a full scale computer that acts as a server.

According probhat and Mahajan (2010), a clear description of the application of RFID technology in libraries, its components, benefits and the role of librarians was presented. The work shows the power of RFID technology in enhancing check- in and check- out and likewise anti- thief detection. The drawback of this system is that the work lack design consideration for user and data confidentiality.

Furthermore, Akinyemi *et al.,* (2014), described RFID technology as a complete system that can address the security of book in library. If properly practiced, the RFID technology will not be a threat to a library as it would help staff to do more user service task and also help the institution to save money and gives a return on investment. The staff and the library user need to be educated about the library technology

before implementing the program. However, there is high cost of RFID system tools and devices, so this system can only be implemented to secure important books in the library. A general implementation in the library can be done when the cost of the RFID devices drops down in the future.

Similarly, Bandaya *et al.,* (2015), developed and implemented a file tracking system for the university of Kashimir. The system helps to improve efficiency and effectiveness of the existing system, consistency of file records, resource management, and quality of administration and also help to reduce turnaround time and processing delay of files. Also Krasniqi (2013), developed a file tracking system which is web based where report, request and decision that are done manually using paper would now be done through the web. The web application will save time and reduce the cost of paper that are being purchased for that work. Deviselvam and Dirya (2013), designed a Raspberry PI for RFID and GPS. The system is used to record the attendance details of the employee and also Global Positioning System which is used to set up a clock for raspberry PI without an internet connection.

Abhishek *et al.,* (2017), developed a school bus monitoring system using raspberry PI. The system focus on monitoring and tracking of the school bus thereby minimizing the hazards that may occur such as negligence by drivers, children missing cases and many others. The monitoring of the school bus would be helpful to their owners, parents, as well children's safety. An SMS alert is sent to the parents whenever their child boards the school bus and also when the child is dropped from school at the dropping point. Whenever there is school bus accident, the system provides the condition of students by an E-mail and SMS alert. The E-mail alert is provided along with the images of the internal environment in the school bus and the location of emergency. An alert message is sent to the school authority if the school bus driver is reckless at any point of time.

2.1.7 Research gap from the related RFID work

In file and document tracking software developed by Telepen (2013), the researcher failed to address the issue of line of sight, for the system to work, the barcode has to be in clear line of sight with the reader for it to be effective. Also from the research of Omoregbe *et al.,* (2014), who developed a system that was called Information and Data Exchange Advanced System (IDEAS) using free and open source software. The weakness of the system was revealed from the literature; the system is used to serve files

in the government offices and cannot be used by the universities or other higher institution. The system is only suitable in tracking electronic file only Omoregbe *et al.,* (2014).

Furthermore, another system was developed by the National Information Centre with the name Centralized File Movement and Tracking Information System by National Information (2013). The drawbacks of this system include: security - in any possible hacking situation, all the files can be easily manipulated; also no activity log is implemented for tracking files; the system is platform dependent – runs on a Windows-based server (IIS) and requires proprietary databases as backend. The implementation language is Active Server Pages (ASP) Omoregbe *et al.,* (2014). In addition, Infotronic Systems File Tracking System was developed based on RFID, the researcher failed to address the cost of implementing the RFID which is very expensive such as the cost of buying sensor, label, tags and other essential accessories.

Omoregbe *et al.,* (2014), proposed the Electronic File Tracking System which was based on RFID technology as well as also open source software. The system relied on off-the-shelf technology which lacks local-content technology and is likely to consume much power. Similarly, Olaniyi *et al.,* (2016), designed a secure library system Library Circulation Management System. The system can only be used in the library and also the RFID technology used for this study has limited capabilities, coupled with the fact that the system uses full scale computer which serve as a server.

Also according to Probat and Mahajan (2010), who developed an RFID system which is used in the library, however the work lacked design consideration for user data confidentiality. In addition, Akinyemi (2014), developed a Radio Frequency Identification based security system, the researcher fails to address the high cost of RFID system tools which make the system to only secure important books in the library. So, general implementation in the library can be done when the price come down.

Similarly, Bandaya *et al.,* (2015), developed a file tracking system used in University of Kashmir. The researcher failed to address the issue of paperless e-government whereby digital files would be used instead of traditional paper based files. The issue of email and SMS notification was not addressed which would notify the user about the status and progress of their files. Also, the issue of security and

encryption of file has not been addressed completely. Deviselvam and Dirya (2013), designed a Raspberry PI for RFID and GPS. The system failed to address the issues of biometric identification like finger prints and face detection instead of using the Radio Frequency Identification Card.

Abhishek *et al.*, (2017), developed a school bus monitoring system using raspberry PI, the researcher need to enhance the security so that additional security capabilities should be incorporated into the system to ensure the information is not sent to the wrong person.

2.2 File Management

File management refers to the method of accessing, managing, and maintaining files. In the digital world, according Saluja and Taylor (2003), file management system is a system that an operating system uses to keep track of different files. Unlike the Central Processing Unit and memory, management aspects of the operating system which aim mainly towards an optimum use of the CPU, the main goal of file management is to provide a convenient programming environment for the users of the system. Furthermore, file management system can also be defined as any electronic system that organizes records in a logical and easily retrieval format. File managements used to consist of drawers and cabinets full of paper, but today most systems are managed on computers using specialized software (Elshobaki, 2017).

Earlier, file management was used to maintain a system of paper files which are in logical order often in a file cabinet. Today, file management refers to a software program that organizes electronic files in a similar fashion, but on a computer instead of a file cabinet. In fact, file management is often used by the users as a measure of how good the operating system is. In digital environments, the most widely used file management system is the Hierarchical Folder System integrated within the computer operating system. The hierarchical folder system allows users to organize files into tree structures. Although computer itself and the operating system have gone through fundamental changes in the past few decades, the hierarchical folder structure stays almost unchanged (Marsden and Cairns, 2003). A well-constructed hierarchical structure can keep things organized. A parent folder often has several subfolders while a subfolder can contain several files. Normally files are stored into folders and subfolders. Each file can be found by following a particular path that goes through different levels of folders and

subfolders. Folders can be moved, renamed, copied and deleted to serve the needs of the changing working environment (Ma, 2010).

However, hierarchical folder structure is not a perfect solution for file management. Earlier researchers have discovered that there were problems with it, such as users frequently have to turn to desktop search even if they thought they have saved their files in a memorable folder. New methods and designs have been introduced to help people maintain better control over digital documents. One category of research efforts come from the area of information retrieval. New desktop search systems have been developed to help users re-find files through new searching techniques (Ma, 2010).

Tagging is claimed to be able to afford efficient information access and overcome the deficiencies of hierarchical file system (Bloehdorn *et al.*, 2006). Tagging requires less cognitive load than categorizing as suggested by Sinha's cognitive analysis of tagging (2005). It is easy to complete and provide immediate self and social feedback (Sinha, 2005; Tonkin, 2006). Meanwhile, tagging system has the flexibility that hierarchical system does not have. For instance, multiple tags can be applied to one information item and one tag can be applied to multiple information items. However, problems could also occur to one's personal tagging system. Tagging system gives users freedom to index information with self-created terms. It also creates a large vocabulary that might cause problems when people try to re-find files with tags. Large number of self-created tags can grow to an extent that individuals forget and get lost in one's own self-created tags. Also, it happens frequently that people use different words to describe the same information item. Tagging inconsistency, that makes tags hard to manage (Ma, 2010)

We expect that a hybrid system with both hierarchical folders and tags might solve the deficiencies of each structure when used alone. Files are organized with both folders and tags. File systems with tagging functions have already been proposed and developed previously. However, most of such efforts are still in preliminary stage (Hsieh *et al.*, 2008). There is limited empirical research investigating this problem. Whether or not tagging can complement the hierarchical folder system for file management is still a myth. We are not only interested in comparing hierarchical folders and tags for file management, but also in whether tagging can complement folders for file management.

2.2.1 Management with Hierarchical Folders

Hierarchical file system is a method whereby items are organized in folders and sub folders which is familiar and widely used by people. Using hierarchical file system, similar items are stored together and also sub folders can function as a task list. The hierarchical file system is a good in representing the structure of information (Malinowski, 2017).

According Malinowski (2017), states that the following are some of the drawback of using hierarchical file structure which include; challenging to get the right balance between breadth and depth, items can only go in one place and also time consuming to reorganize if the hierarchy becomes out of date.

Hierarchical folder structure has been used extensively for managing information in the digital environment ever since the first computer was invented. According Johnson (2014), file management a method which is used to organize and keep track of files and folders, it helps in organizing information t so that it can be easily located. A folder is a container for storing program and files, which look similar to our folder in a file cabinet. As with a file cabinet, working with out of sorts file cabinet, working with out of sorts files is like looking for a needle in a haystack which is frustrating and time-consuming to search through irrelevant and out-of-date file to file the one you want.

Windows allow us to organize our folders and file in a file hierarchy. Copying the same way, you store paper documents in real folders. Just like file cabinet which contains several folders, each containing related documents with dividers grouping related folders together, the windows file hierarchy allow you to organize your files in folder and then place folders in other folders. The file management tools used to save files in folders with appropriate names for quick identification and easily create new folders so that you can regroup information, delete files as well as folder that you no longer need (Johnson, 2014).

Discussion in the preceding section will focus on research and practices in using hierarchical folders for file management. The concepts of file, folder and file management will also be considered. In the digital world, a file refers to a collection of data or programs stored under a single identifying name (Stevenson, 2007). A file can be presented in different formats; a bit of text, a graphic image, an audio record, or anything else. The size of a file can vary from a few bytes to multiple gigabytes. A folder or a directory

refers to a container that contains a list of files and subfolders. Usually folder name describes what kind of files and subfolders that the parent folder contains. A folder can either be empty or contain thousands of files. At the lower level, files are streams of bytes and folders/directories contain file names that link to the content of the files. Different file system may have different mechanisms in storing files and directories to hard disks. However, at the higher level, we see files as individual objects and folders as containers where files reside, just as what we see physical files and physical folders (Ma, 2010). Meanwhile, file management refers to the process of accessing, managing, and maintaining files. In the digital environment, the most widely used file management system is the hierarchical folder structure integrated within computer operating system. The hierarchical file system allows users to organize files into a tree structure. A well-constructed hierarchical structure can help us keep things organized (Ma, 2010).

2.2.2 Organizing Files with Hierarchical Folders

According Ma (2010), people have been using hierarchical folder for file management for a long period of time, even before the digital era. Library collections are organized with a hierarchical classification system based on their subject. In the digital environment, operating system has gone through many generations of transformation, but hierarchical folder system stays barely unchanged.

A well-constructed hierarchical structure can keep things organized. A parent folder can have several subfolders and one subfolder can only belong to one parent folder. Files are stored into folders. Each file can be found through a particular path that goes through different levels of folders and subfolders. Folders can be moved, renamed, copied and deleted to serve the needs of the changing working environment. Usually, users would categorize files and create folders based on the content of the file. Henderson (2005) looked at the types of folders people create and how they organized them into hierarchies. She found that most folder names represent the type, task, topic or time dimension of the documents that the folder contains. The context in which a file was acquired, created or used would largely affect how it was classified, stored, and later retrieved (Barreau, 1995). Kwasnik (1989) and Barreau (1995), found that contextual information such as situational attributes, document attributes, disposition, order or scheme, time, value, and cognitive state were used as key factors in the organization of materials.

Furthermore, Mcneill and Bailey (2014), reviewed that hierarchical file are organized in folder and sub-folders, it is the most familiar and widely used file management system. Hierarchical file system is used to represent the structure of information where similar items are stored together and sub- folders can function as a task. it is hard to get the right balance between breadth, depth and also time consuming to reorganize if the hierarchy is out of date.

Beck (2016), asserts that folder structure can help in file management, just like using the drawer to keep our clothes organized. Folder structure is a method in which folders are organized in our computer. As we add more folders over time, we can either keep them in the same level like folder 1, 2 and 3 or nest them within each other like folder 1B and 1B-1. The nested folder helps us to easier find a specific file.

2.2.3 File management using tagging

According MCNeill and Bailey (2014), tagging is a method whereby each item is assigned one or more tags. The items can go in more than one category that is multiple categories can be used. many people find tagging quicker and easier than hierarchical filing. Furthermore, Frost (2016), described tags as keywords used to assign to a files. Think of them like characteristics for a person; Just like you would describe someone as "tall," "funny," "brunette," and so on, you would tag a file "important," "tax info," "just for fun," or "work.

We believe that there are potential advantages of using tags for file organization. First, tagging is believed to be cognitively easier than categorizing (Sinha, 2005). Classifying and categorizing information requires cognitive effort. Real life information is ambiguous to be classified into absolutely neat hierarchical structures. Tags are believed to require less cognitive load than categorization because tags could be any text that is associated with the information. They do not have to be a high level generalization or categorization. Second, hierarchical systems require users to follow the exact saving path to get access to the desired file. With tagging, the target file can be accessed with any associated tag. Third, users can give contextual tags to files, such as “important”, which can serve as reminders later in the process of re-finding. Fourth, multiple tags can be assigned to a file. Since there is no parental and sibling relationship between tags, files can be easily regrouped from different perspectives. Research was done to explore the possibility of using tags for file management. For example, a software

tool called “Tag” was designed to help users manage personal files with tag. Tag allows users to attach tags and descriptions to files.

Although, there are potential problems with social tagging, problems could also occur to one’s personal tagging system. First, large number of self-created tags can grow to an extent that individuals forget and get lost in one’s self-created tags. Secondly, people may use different words to describe the same information which would make it hard to find files only with tags. Thirdly, the way tags are presented is a problem. Currently, tag cloud is used widely in social tagging systems. Basically, tags cloud is a set of alphabetically presented tags, with the most frequently used tags emphasized in a larger font size. Whether tag cloud is a useful mechanism for a personal tagging system is not clear. Similarly, McNeil & Bailey (2014), states that the following are some of the drawback of using tagging file system; if the material is not tagged properly when required it can be hard to find later and there is a risk of inconsistent tagging.

As discussed previously, both hierarchical folder systems and tagging systems have their own strengths and drawbacks. We expect that a hybrid system with both hierarchical folders and tags will partially solve the deficiencies of each structure when used alone. There has been research work aiming at integrating tagging into the hierarchical file systems. Bloehdorn *et al.,* (2006), proposed TagFS. In TagFS, files are annotated with RDF metadata so that “file system operations are mapped to manipulations of tags on information objects”. Civan *et al.,* (2008), saw the advantages and disadvantages of using either hierarchical folders or tags for managing information. They conducted an exploratory study into how people use folders and tags differently for managing emails.

2.3 Theoretical framework

This study was underpinned by the Annotation Model for Document Tracking and Recommendation Service developed by Abiodun (2007). The author proposes AMIEDOT (annotation model for information exchange and document tracking) which can assist in document tracking and recommendation services. The model is based on the three parameters namely; document, time parameters as well as the parameters of the creator of annotation into annotation process. The model further explained that, there are three constraints to be used which include; who used the document,

when was the document used and for what the document was used. The basic objective of annotation conception is to provide additional set of information that was not specified by the initial author of the document. This information is saved to the original document and referenced by a link.

According to Bringay *et al.*, (2004), annotation helps in the legibility of information. Annotation may at one time make the document legible but may also hinder the legibility of the same document at another time. It does necessary aid in making the information clear but gives a specific interpretation to the information contained therein. Abiodun (2007) further explained that annotation model consists of four entities as the core for the model; the user who is the annotator, the document in question, annotation transaction and the process of annotation creation. The figure below shows how the annotation model works.

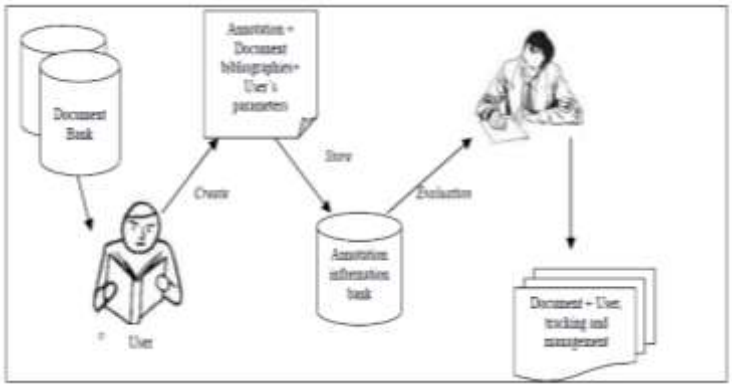
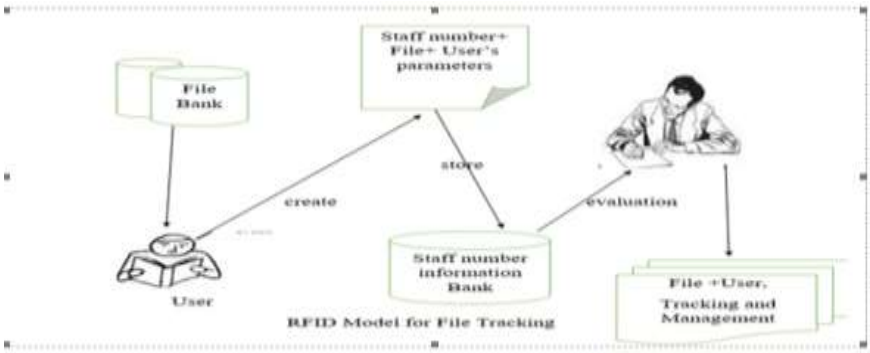


Figure 5.2.5: Application of AMIEDoT model for document and user tracking

Source: Abiodun (2007)

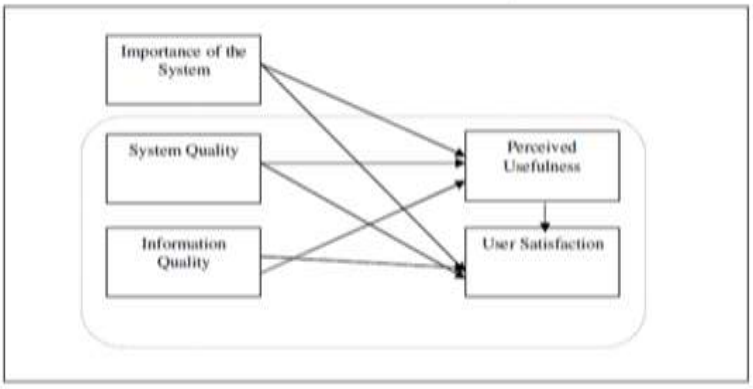
This model is considered relevant to this study because it emphasized on how document can be tracked efficiently by considering three parameters; document, time and user. This study tends to come up with the design of radio frequency identification which would be used in file management where files are stored in the file bank which consists of the open and secret file. The user would use the open file to create user parameter i.e. promotion letter, leave, appointment etc. which are then stored in staff number information bank which are then evaluated by deputy registrar to check whether that staff is due for leave, promotion, appointment etc. Below is the figure that shows how the modified version of AMIEDOT would work.



This study was also further underpinned by the Information System Success Model (ISSM) proposed by Delone and MCleane (2003). This was used to guide the validation of the RFID System developed.

According to Belkhamza and Wafa (2012), information system success model was introduced in the early 1990s which was considered as one of the most exciting contributions to IS success. Since its early introduction, quite a few topical domains have been investigated using Delone and Mclean model of IS, which include knowledge management, decision support system, tracking system, web- based system as well as enterprise systems.

Hellsten and Markova (2006), reviewed that the original information system model of Delone and Mclean has six interrelated dimensions of success; System Quality, Information Quality, Use, User Satisfaction, Individual Impact as well as Organizational Impact. DeLone and McLean emphasized that the six factors did not operate independently but interacted to influence success. Seddon and Kiew (1996), took the next step when they proposed a path model showing the nature of the interactions among the six factors. At the same time, they made several key alterations to DeLone and McLean's list of core variables and changed the way in which they were measured. The first key change involved the substitution of Usefulness for Use. Their justification for this change was that the level of use may not be determined by the usefulness of the system but by time constraints on potential users. Additionally, use of a CBIS may be compulsory and imposed by the task or organization, and the number of hours of usage may convey little or no information about its usefulness or success. A further change involved the inclusion of the constructs 'Importance of the System' and 'Task Importance' to balance the possibility that systems performing more important tasks may be regarded as more useful irrespective of actual system quality (Armstrong, 2005).



SEM of IS Success (Seddon & Kiew, 1996, p. 102)

Source: Armstrong *et al.,* (2005)

System quality: These are the desirable characteristics of an information system such as ease of use, system flexibility, response time as well as system reliability (Armstrong *et al.,* 2005).

System Quality*:* This is said to measure the desirable characteristics of an information system. For example, ease of use, system flexibility, system reliability and ease of learning (Delone and McLean, 2016).

Information Quality: This described the desirable characteristics of the system outputs i.e. management reports. For example, accuracy, timelines, completeness as well usability (Armstrong *et al.,* 2005).

Information Quality: This are desirable characteristic of the system output; i.e. Management reports and Web pages. For examples, relevance, accuracy, completeness, timeliness and usability (Delone & McLean, 2016).

Information quality*:* This has to do with content issues and characteristics of the information systems output. It has been measured by examining the output of an information system in terms of timeliness, accuracy, reliability, and trustworthiness (Ojo, 2017).

Importance of the system: This is the quality of the support that the system users receive from the information systems organization. For example, accuracy, reliability, technical competences as well empathy of the IT personnel staff (Armstrong *et al.,* 2005).

User Satisfaction: This construct describes the users' level of satisfaction with reports and support services (Armstrong *et al.*, 2005).

User Satisfaction: This is considered one of the most important measures of systems success, often measured by overall user satisfaction (Ojo, 2017).

Perceived Usefulness: According Jahangir and Begum (2008) reviewed that usefulness is the subjective probability that using the system would improve the way a user could complete a given task.

Perceived usefulness is "the degree to which a person believes that using a particular system would enhance his or her job performance" (Hussain, 2016).

CHAPTER THREE
METHODOLGY

3.0 Introduction

This chapter presents the methodology of the study, which includes: The Research design, Management of File using RFID File Tracking System, Mathematical Representation for RFIDTS, Sampling Technique, Research Instrument, Method of data collection, Method used in Analyzing File Tracking System, Method used in Designing Radio Frequency Identification Tracking System and Method used in Implementation Radio Frequency Identification File Tracking System.

3.1 Research Design

According to Kothari (2005), refers to the arrangement of conditions for the collection and analysis of data that aims to combine relevance to the research purpose with economy procedures. In this study the researcher used descriptive and cross sectional research design. Descriptive research is concerned with describing the characteristic of a particular individual or group (Kothari, 2005).

The descriptive research design was used in this study because the researcher wants to analyze the existing File Tracking System and determine the requirement needed as well as how important they are in the development of Radio Frequency Identification File Tracking System in Registry Department of Yobe State University.

Furthermore, the researcher used qualitative research, in this study. The qualitative research design was used to collect data needed to analyze the existing File Tracking System in Yobe State University, through face to face interview which was guided by well structure interview guide.

In addition, the Radio Frequency Identification Tracking System was configured using both the hardware and software. The designing of hardware unit consisting of a Raspberry Pi 3 interfaced with a designed database and Graphical User Interface (GUI) that will be responsible for tracking and storing the data received from the reader as shown in the Figure 3.1.

Figure 6.3.1 Physical Connection of Raspberry pi with Universal Serial Bus(USB) Near the Field Communication (NFC) Reader

The software development unit consist of Raspbian Operating System, hyper Text Markup Language (HTML), Apache, JavaScript and My Structured Query Language (MySQL) server. This is done by comparing the information received from the RFID reader to the information stored in the database.

The Hardware

The hardware architecture consists of the NFC RFID tag, the USB NFC RFID reader, the Raspberry Pi, the liquid crystal display Screen (LCD), Wireless keyboard, High-Definition Multimedia Interface to Video Graphics Array converter, the power supply unit.

The NFC reader in Figure 3.2 uses high frequency band, and practically, the reading distance between the tag and the reader is about 20 cm. the reader has frequency range of 13.56 MHZ. The output of this reader is transmitted serially, and has data rates of 424kbps. However, this reader has been chosen because NFC is designed to be a secure form of data exchange, and an NFC device is capable of being both an NFC reader and an NFC tag. This unique feature allows NFC devices to communicate peer-to-peer.

Figure 7.3.2 USB NFC reader

The Figure 3.3 shows the USB NFC RFID tags used in this research. These USB NFC tags are passive tags thus it has no internal power supply. These tags activated by radio frequency transmitted by the reader. There reading distance is about 7 cm. When the RFID reader receives the data from the tag, the data then will be compared with the data in the database to identify the holder of the tag.

Figure 8.3.3 NFC tag

The Raspberry Pi is a general purpose computing device that transforms an engineering concept to an actual interacting electronics module. It can be utilized for applications of embedded systems and for particular applications of Internet-attached embedded. Raspberry Pi is utilized in order to cater for programming and reprogramming concepts coupled with computing theories.

Figure 9.3.4 Raspberry pi

Raspberry Pi platform can run the Linux operating system which means that many libraries and applications of opened source software can be used directly with it. The availability of drivers of open source software makes the Raspberry Pi to be interfaced with devices such as keyboard with USB and adapter of Wi-Fi without having to source proprietary alternatives.

The functionality of recent Raspberry Pi models can be extended with daughter boards which is the Hardware Attached on Top (HATs), that are connected to the general- purpose input/output (GPIO) pins which are 40 pins (rows of dual pin connectors in the platform). The HATs can be designed and attached securely to the raspberry pi using this header

The Software

The software development unit consist of: HTML, JavaScript, MySQL, APACHE and Raspbian operating system.

Finally, the effectiveness of the system developed was validated using the survey Questionnaire.

3.2 Management of Files using RFID File Tracking System

The staff number was serving as a means of identification for the staff file kept in the database, so for easy location of records, indexing is necessary, each file will be identified with a unique staff number. The "key" field was used to arrange the files in an orderly manner for example staff number can be used as a key field in arranging staff files. This key aid in storage and retrieval of staff's record. A key such as staff number is called a primary key because it is unique and peculiar to each member of staff.

Immediate and quick retrieval of any particular file is provided by this electronic filing system. The search could be for only one staff or more than one staff. Updating filing system come in different way ranging from addition(insertion) of more relevant record to the file of the staff or deletion(removal) of old (existing) file that are no longer used in system. This feedback provided information like:

I. When was a file used?
II. Who used a particular file?
III. For what was a particular file used?

Among likelihood, we observed that:

Different file can be used differently by one or more users, two or more individuals would not make use of the same file the same way, the same user may not use the same file the same way at different times, a file can be used several times by a particular individual, it is presumed that one file cannot be used by two users at a time, one user may use file or document differently compared to another user and a particular user may use the same document differently given a time frame.

3.3 Mathematical Representation for Radio Frequency Identification Tracking System

In applying RFID into File Tracking, the study considered any file through their respective staff number with the following parameters - Users, Files and Time. Series of used files with their staff number over a specified period of time by one or more users can be evaluated to determine the use of file and its interest to any university official.

It can be represented as follow:

$$\mathbf{TS} = \iiint_1^n x\,dU\,dT\,dF$$

Where TS= Tracking system x= any information need in particular file.

dU= variance of user, dT=Variance of time, DF= variance of file

From the mathematical model, used file that are checked by a particular user over a specified time become a subject of interest in this research.

3.4 Research Population

The population of this study was 50 staff that are working in the Registry department of Yobe State University, these staff members were selected because of their significance to this research work.

3.5 Sample Size

Krejcie and Morgan sample table size were employed so as to determine the sample of this study. According to Krejcie and Morgan for a population of 50 the tabulated sample size is 44. Therefore, the sample size used for this study was 50 respondents.

3.6 Sampling Technique

Purposive sampling techniques were adapted because it is a type of nonprobability sample, the main objective of a purposive sample is to produce a sample that can be logically assumed to be representation of the population. This is often accomplished by applying expert knowledge of the population to select in a nonrandom manner a sample of elements that represents a cross-section of the population.

3.7 Research Instrument

The data collection instruments used for this study are qualitative and quantitative respectively. The interview guide contained open ended questions, which was used to collect data about the existing File Tracking System within the study domain. While questionnaire was used to validate the Radio Frequency Identification System that was used for the file management.

3.8 Validity and Reliability of Research Instrument

3.8.1 Validity of Research Instrument

According to Li (2016), validity is the degree to which an instrument accurately measures what it intends to measure. In order to ensure that the instrument for data collection is valid, two statistical measurements were used on the data collected for pilot study: Bartlett's test of Sphericity and Kaiser-

Meyer-Olkin (KOM) measure of sampling adequacy. Factor analysis was considered appropriate, since Barlett's Test was significant at ($p < 0.05$) and values of Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was between 0.6 and 1.0 which acceptable.

Statistical package for social science software 16.0 was used to perform the exploratory factor analysis (EFA). The test for validity was run on 20 respondents which are collected during pilot study. The result shows that the scale item used to measure each of the constructs for validation of radio frequency identification, satisfy validity condition, and therefore all items in the questionnaire were retained. The results of the Kaiser- Meyer-Olkin (KMO) are as follows:

1. Information Quality
   Kaiser-Meyer-Olkin Measure of Sampling Adequacy. (KMO) = 0.654
2. System usefulness
   Kaiser-Meyer-Olkin Measure of Sampling Adequacy. (KMO) = 0.556
3. System usage characteristic
   Kaiser-Meyer-Olkin Measure of Sampling Adequacy. (KMO) =0.657
4. Overall satisfaction
   Kaiser-Meyer-Olkin Measure of Sampling Adequacy. (KMO) = 0.500

3.8.2 Reliability of the research instrument

Reliability was used to measure the consistency of research instrument results over multiple trials. The data from pilot study was analyzed for reliability testing using statistical package for social science 6.0 (SPSS). The internal consistency of each scale was measured using Cronbach's Alpha and each of the scale in the survey questionnaire show adequate reliability with the Cronbach's Alpha being closed or above the recommended 0.70 level.

Table 1.3.1 Information Quality

Reliability Statistics	
Cronbach's Alpha	N of Items
.683	5

Cronbach's Alpha Value = 0.683

The result of reliability analysis on information quality shows that, the statements for information quality are reliable (Table 3.1).

Table 2.3.2: system usefulness

Reliability Statistics	
Cronbach's Alpha	N of Items
.714	3

Cronbach's Alpha Value = 0.714

The result of reliability analysis on system usefulness indicate that, the scale statements for system usefulness are reliable (Table 3.2). Pereira (2016) noted that, if items are less than 10, Cronbach's Alpha should be >0.5.

Table 3.3.3: system usage characteristics

Reliability Statistics	
Cronbach's Alpha	N of Items
.665	4

Cronbach's Alpha Value = 0.665

The result of reliability Analysis on system usage characteristic shows that, the scale statements for system characteristic are reliable (Table 3.3).

Table 4. 3.4: overall satisfaction

Cronbach's Alpha[a]	N of Items
.658	2

Cronbach's Alpha Value = 0.658

The results of running reliability analysis on overall satisfaction indicates that, the scale statements for overall satisfaction are reliable as shown in table 3.4.

3.9 Data analysis

Data collected from the field was compiled, edited, sorted and coded so as to have quality and accuracy. Thereafter the data was entered into computer using Statistical Package for Social Science (SPSS version 16.0).

Frequency and percentages were used by the researcher to analyze the demographic data of the respondents as well as the requirements for validation of radio frequency identification. In addition, mean and standard deviation were also used to analyze the validation, by deploying statistical package for social science 16.0 (SPSS) as tool.

Mean range was used to interpret the average mean that was obtained from individual constructs in the study. An item analysis was also used to identify the strengths and weaknesses of the respective indicators using mean as a measurement tool. Recommendations are derived from those strength and weaknesses, which were considered in the validation of radio frequency identification.

The following formula was used to calculate mean range:

$$\text{Range} = \frac{\text{Highest score} - \text{Lowest score}}{\text{Highest score}}$$

Source: Kibuka (2016)

The researcher used a 4- point Likert scale in the study as follows:

Highest score=4

Lowest score=1

This implies that,

$$\text{Range} = \frac{4-1}{4}$$

$$\text{Range} = \frac{3}{4}$$

Range= 0.75

Table 5.3.5 Interpretation Guide Table

Mean range	Response mode	Interpretation
3.26- 4	Strongly agree	Excellent
2.6-3.25	Agree	Very good
1.76-2.5	Disagree	Good
1.00-1.75	Strongly disagree	Fair

3.10 Method used in analyzing File Tracking System

The File Tracking System was analyzed using Thematic Analysis approach by interviewing the staff about the existing File Tracking System used in Yobe State University.

3.11 Method used in the Implementation of Radio Frequency Identification File Tracking System

The Radio Frequency Identification File Tracking System was implemented using both the hardware and software component. The hardware component includes raspberry pi, USB to VGA converter, Monitor, NFC reader, NFC tag. While the software was implemented using PHP, HTML, JavaScript, MySQL, Apache and Raspbian Operating System.

3.12 System Modeling

The following modeling approaches were used in modeling both the system data and information.

1. Flow chart diagram: It is a visual representation of sequence of step by step and decision needed to perform a process. The step is linked by connecting lines directional arrows. This help anyone to view the flow chart as well follow the process from beginning up to end.

2. Component diagram: This are special type of UML diagram which are used to model the physical aspect of a system. The physical aspects are the elements which include: executables, libraries, files as well document which reside in a node.

3.13 Limitation

In the conduct of this study not much limitation, that could affect its outcome was faced except of minor financial constraints an of scarcity of the equipment's needed for designing the system. However, measures were taken to avoid those constraints by securing some financial assistance from my government which make it possible to order the equipment from abroad. Besides, although the equipment's arrived lately that did not affect the conduct of the study.

3.14 Ethnical consideration and approval

The researcher ensured that the data collected from the respondents are treated with confidentiality and also the respondent seek permission from the Yobe State University before getting the field data. The college of higher Degree and Research of Kampala International University issued an introductory letter to the researcher, introducing the researcher to the field for data collection. Whereby Yobe State University approved the introductory latter from the researcher and give him permission to collect the necessary data about their staff file in the registry department of Yobe State University.

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CHAPTER FOUR

ANALYSIS AND INTERPRETATION OF FINDINGS

4.0 Introduction

This chapter presents the analysis and interpretation of findings of this study, which includes; the demographic data of respondents, analysis of the existing File Tracking System used in Yobe State University.

4.1 Demographic Characteristic of Respondent

Respondent were asked to provide their respective demographic data which include; designation, years of service in the university, level of education, gender and age.

Table 6.4.1.1 Respondents Gender

Respondents' gender		
Gender	Frequency	Percent
Male	30	68.2
Female	14	31.8
Total	44	100.0

Source: primary data (2018)

The findings from table 4.1.1 shows that most of the respondents were male which form 68.2% of the sample population while the female were 14 in number out of the total sample population with 31.8%. This shows that majority of the study participants were male.

Table 7.4.1.2: Respondents Age

Respondents' age		
	Frequency	Percent
Below 30	17	38.6
31 – 40	17	38.6
41 – 50	8	18.2
Above 50	2	4.5
Total	44	100.0

Source: primary data (2018)

The findings from table 4.1.2 shows that 38.6 of the respondents were within the age of 30 and below, while 38.6% of the respondents falls in the age group between 31-40. Also 18.2% of the respondents were within the age group of 41-50, while 4.5% of the respondents were within the age group of 50 and above. This implies that majority of the respondents in the study are within age groups of 30 and below, 31-50 and 41 – 50 respectively.

Table 8.4.1.3: Respondents Level of Education

Respondents' level of education		
	Frequency	Percent
Diploma	2	4.5
Bachelor Degree	18	40.9
Master's Degree	14	31.8
Ph.D.	10	22.7
Total	44	100.0

Source: primary data (2018)

The result from table 4.1.3 shows that, 4.5% of the respondents were diploma holders, while 40.9% of the respondents possessed bachelor degree. Also 31.8% of the respondents possessed master's degree and 22.7% of the respondents were PhD holders. Therefore, majority of the respondents that participated in the study are bachelor degree holders.

Table 9.4.1.4: Respondents Years of Service

Years of service in the university		
	Frequency	Percent
Less than 2 Years	8	18.2
2 - 5 Years	23	52.3
Above 5 Years	13	29.5
Total	44	100.0

Source: primary data (2018)

The result of the table 4.1.4 indicates that 18.2% of the respondents have been serving with the university for less than 2 years, while 52.3% of the respondents have been serving the university between 2 to 5 years. Also, the study shows that, respondents that have been serving the Registry department of the university above 5 years were 29.5% of the total sample size. This indicates that majority of the participants were respondents that have been serving the registry department of the university for 2- 5 years.

4.2 Responses on the Specific Objectives

4.2.1 Analyze the existing File Tracking System used in Yobe State University of Nigeria.

The findings of the key interview informants revealed that, the Registry department of the university used to keep two type of files; academic and nonacademic files. The files are used for maternity, employment as well as disciplinary cases of the university staff.

The type of files we handle include: academic and non-academic staff files. Both file is used to keep records of academic and non-academic staff of the University. The files are used to keep track of promotions, leaves, disciplinary cases, appointments and many other cases as the need arises of individual staff in the university (interview1).

The Registry department of the university is usually handles two categories of files which include: non-academic and academic staff files, which are used to keep track of necessary information about the university staff. The information includes: Appointment, leave, maternity etc. (interview2).

Based on my experience, we handle two type of file which include: Academic and non-academic staff file, the files are used to handle promotion, employment as well as disciplinary cases among others (interview3)

The finding also revealed that, the monitoring of file is done manually, by asking the Secretary about the status and location of file in the movement register. The method is inefficient and time consuming. Therefore, an improved method of file monitoring is needed in the University to ensure quick retrieval of files for processing.

The monitoring of movement of files from one office to another are usually did manually using a movement register to track the status and location of the file. This method tends to pose a lot of challenges in terms of efficiency due to bureaucratic bottleneck associated with the method (interview1).

We usually monitor movement of file in the registry by asking the Secretary the present and the last location of the file which can be derived from file movement register. This method is time consuming and inefficient (interview2).

Normally we monitor the movement of files from one office to another by checking the present and last location of file in the movement register (interview3)

The findings from the interview shows that, the current method used in the university is not efficient for quick decision making because huge volume of files is treated which result to difficulty in locating a file as well as monitoring its movement.

To the best of my knowledge the current method of file monitoring is inefficient due to difficulty in quick access to the status of file as well its location in the file movement register (interview1).

The current method of file monitoring is inefficient, considering huge volume of data that are usually tracked in the file movement register this may cause a lot of delay in monitoring respective files (interview2).

This method is ineffective, because there is delay in checking the location of the file in the movement register, considering the large number of file that are treated (interview3).

Based on the challenges encountered in the current file management, the finding shows that, the challenges encountered includes; duplication of record about file in the movement register, time consuming in updating and retrieving of record. The findings further identified additional challenges such as, nepotism and favoritism which are usually practiced by some administrative staff of the University.

The challenges we encountered with the current file monitoring method used in the university include; delay in retrieving and updating file movement information as well as duplication of record about respective files in the file movement register which may lead to difficulty in file handling process (interviewer1).

The current method of file used in the University is characterized with nepotism, favoritism as well as corrupt practices among staff which usually hinder the efficient and effective management of file in the university. In addition, there is also problem of improper documentation of file movement which usually results in difficulty of tracking file (interviewer2).

Normally the challenges we faced with the current method in the university include: Forgetting to document a file, Time consuming in updating a record as well as time consuming in retrieving of information (interview3).

Based on the need to improve the current file management method, the findings revealed that there is need to improve the current method which can be achieved through eliminating delay in file as well as location of file. The finding further identified additional improvement such as eliminating corrupt practices, improve the system so that it can be able to capture file details and notify the personnel about the status of the file.

Yes, there is a need to improve the current file tracking method in the university in order to ensure its efficiency and effectiveness so that the challenges associated with the method can be minimized (interviewer1).

Yes, it is important to improve the current method so that, it can enable us to track our files as fast as possible to eliminate delay and quick location of file so that appropriate decision can be taken. In addition, we want an improve system that is capable of capturing file details as well as notifying the personnel concern about the movement of the file (interviewer2).

Yes, there is need to improve the file tracking method that is used in university, so that we can have a quick location of file and also eliminate the corrupt practices among staff (interview3).

Finally, based on whether the file tracking system in the university is cost effective. The findings from the interview informants revealed that at present, all report, and decision are done manually using paper and pen which is not cost effective. In order to minimize cost, a computer based need to be employed.

The current method of file tracking in the university is not cost effective because it is usually carry out manually using paper and pen. It will be better if computer can be deployed to replace the current paper based method in order to minimize cost of file tracking in the university (interviewer1).

No, the current method is not cost affective in the sense that all the decision, report and request are done manually using paper. Therefore, in order to improve the method computer based can be deployed (interviewer2).

No, because all the report and decision are done using the paper work, which consumed a lot of time in retrieving and updating a file. So, if computer based can be deployed it can minimize the problem of manual method used in the university (interview3).

CHAPTER FIVE

SYSTEM DESIGN , IMPLEMENTATION AND VALIDATION

5.0 Introduction

This chapter presents the design, implantation and validation of Radio Frequency Identification File Tracking System.

5.1 System Design & Modeling

According Tremblay (2001), software design is the activity within the software development life cycle, where software requirements are analyzed in order to produce a description of the internal structure and organization of the system that will serve as the basis for its construction.

5.1.1 Block diagram of Radio Frequency Identification system

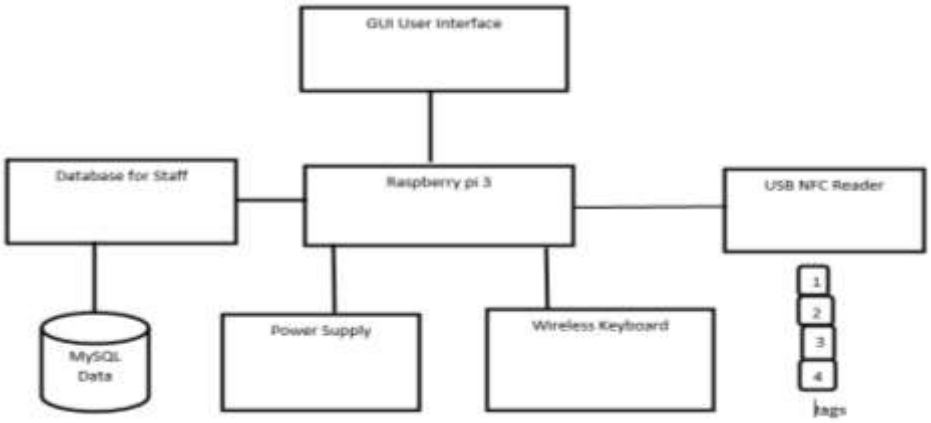

Table 10.5.1 The Proposed RFID File Tracking System Block Diagram

The system proposed in this research work is based on the use of Raspberry pi 3 models for hardware implementation of file tracking system using USB NFC reader. The proposed file tracking system is demonstrated in the figure 5.1 above. It consists of terminal units which consist RFID unit and control unit. The RFID unit consists of USB NFC reader and NFC tags, the NFC Tags is placed in the file of staff which has a unique identification number, the USB NFC reader will send an issue to each tag present in the reading range of the USB NFC reader. The control units consist of Raspberry pi 3 and a GUI screen. The control units are responsible for receiving the information (UID) from the RFID unit and making all processing needed by the file tracking system. The NFC reader use frequency of 13.56 MHz which is ideal for secure personal identity verification and online payment transactions, access

control, e-payment and network authentication. While the tags have a unique Identification number as follows:

I. UID: fa a7 85 08
II. UID: fa 8b 53 08
III. UID: 62 3a 15 02

5.1.2 Physical Connection of raspberry pi with USB NFC reader

The raspberry pi can be programmed by using php programmig language which is one popular open source language, the raspberry pi needs an operating system to start up the system, so raspbian operating system was used which is more suitable for raspberry pi. An empty SD is needed to flash the raspbian operating system onto the card, afterwards, internet is connected to the raspbeery pi to downloard the necessary libraries that can be used. Finally wireless keyboard is used with the raspberry pi which are needed to work with the raspbian operating system later, the raspberry pi can be programmed. Diagram for the physical connection of the raspberry pi with USB NFC reader is shown as figure 3.1 in chapter 3.

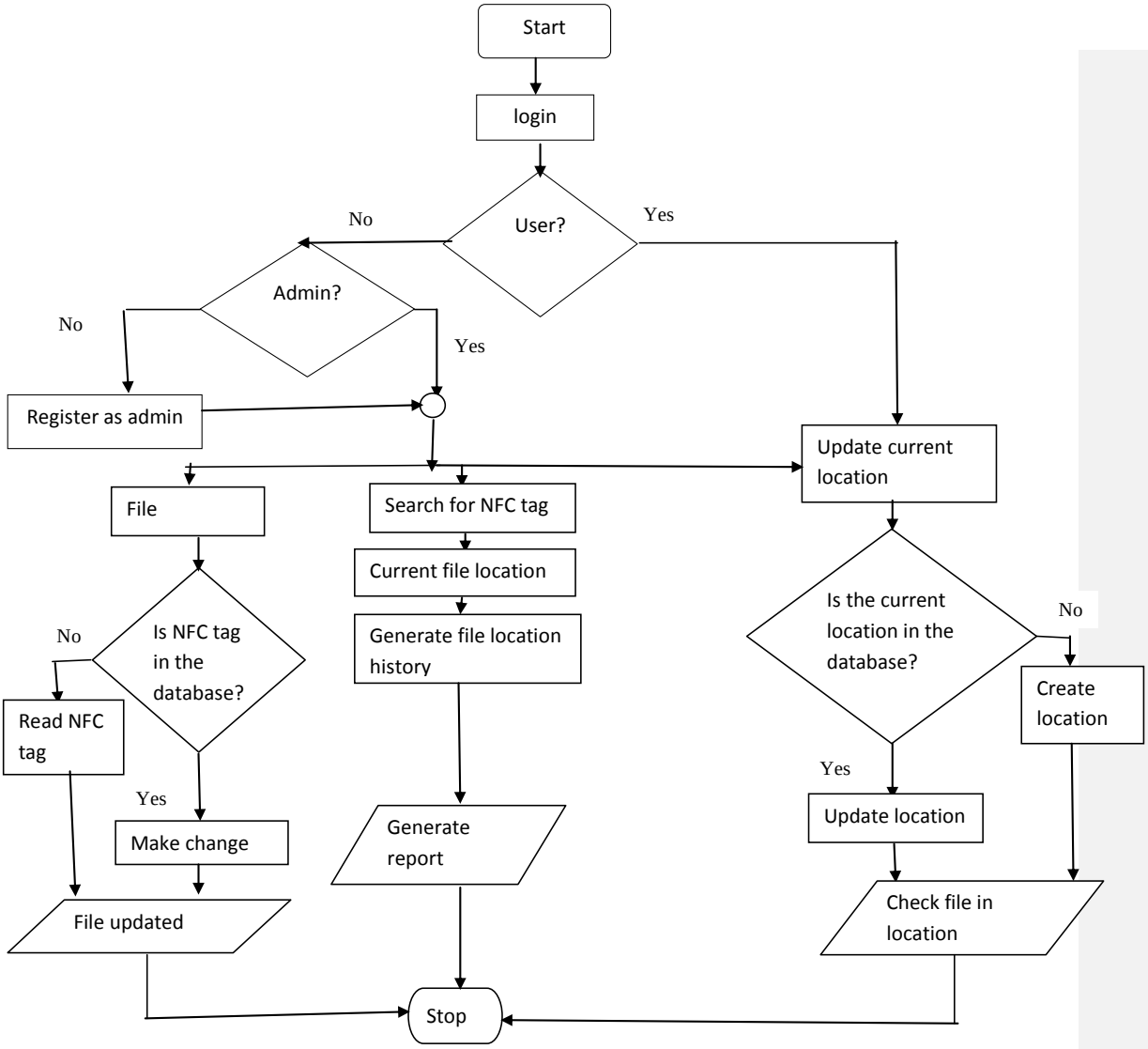

Table 11.5.2. Flow chart of Radio Frequency Identification Tracking System

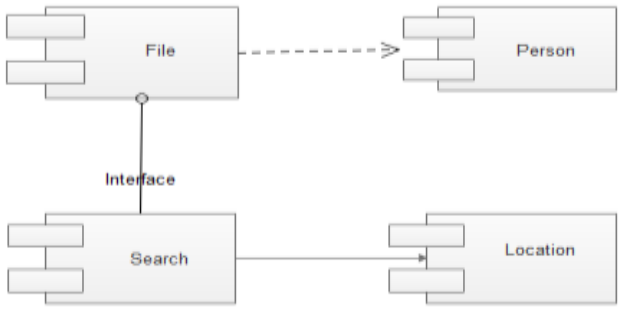

Table 12.5.3 Component Diagram of RFID File Tracking System

In the figure 5.3 above the file component includes create file, delete file of the employee and the search component provide an interface to search a file and location.

5.2 Development Tool and Technologies used in design and Implementation of the System

WAMP Server version 3.0.6 an integrated development tool was selected for the implementation of the system.

- Raspbian operating system
- Apache
- My SQL and
- PHP
- JavaScript
- HTML

At the backend, My SQL and apache warmp server was used for the design of various tables, while HTML and JavaScript are used in implementation of the front end of the developed application.

5.3 Snap shot of system implementation

Figure 5.5 shows the desktop background of Radio Frequency Identification File Tracking. It consists of terminal icon, wastebasket and start menu which is menu bar so when user click on start menu a drop down menu appear which contain sub menu like terminal, internet crown browser, shut down and many more.

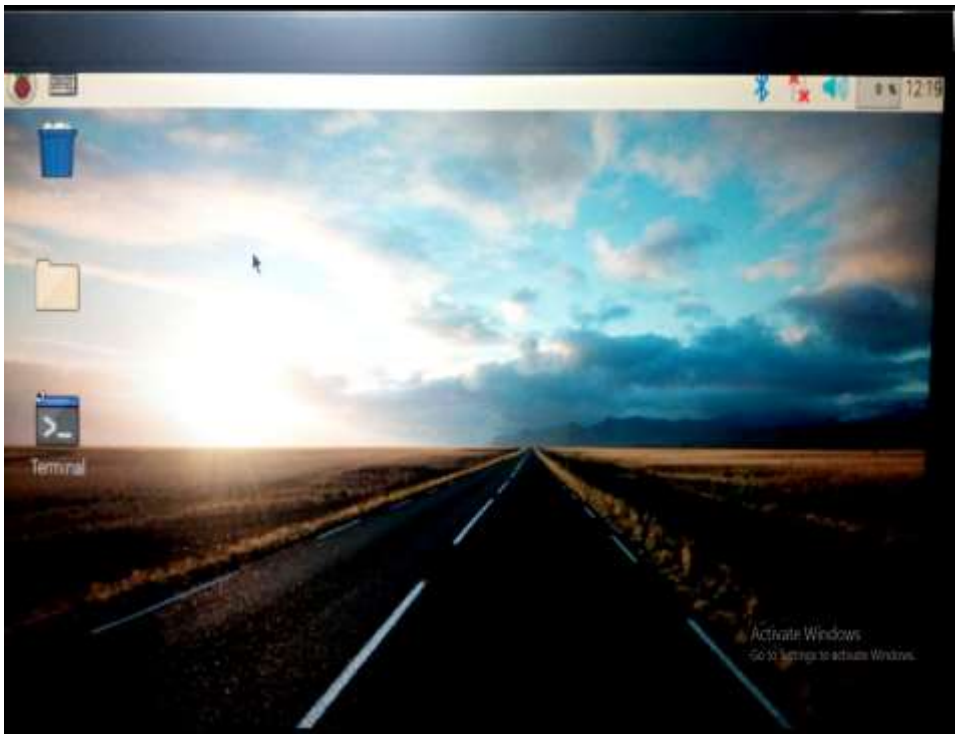

Table 13.5.4 Desktop background of Radio Frequency Identification System

On figure 5.4 above user can log on the terminal by clicking icon on desktop background. This will take you to the terminal where user can type in command like pcsc_scan to scan for tag. This shows the information as figure as in figure 5.5 below.

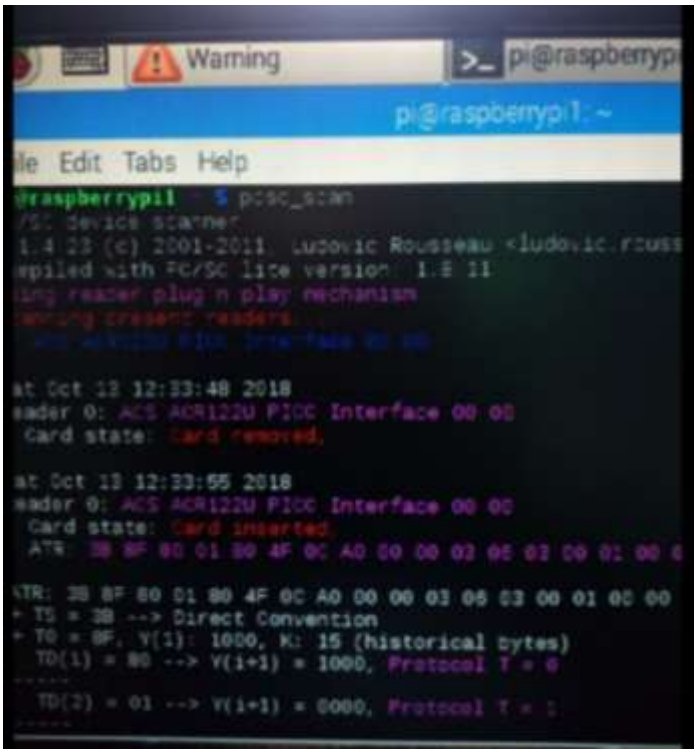

Table 14.5.5 scan PC/SC Reader Connected to the Host

Figure 5.5 is used to check for UID (unique identification number) of each tag, admin can type sudo nfc-list in the terminal, the tag has to be placed in the RFID reader before typing the command in the terminal. The commmand provide unique identication number as in the figure 5.6 below:

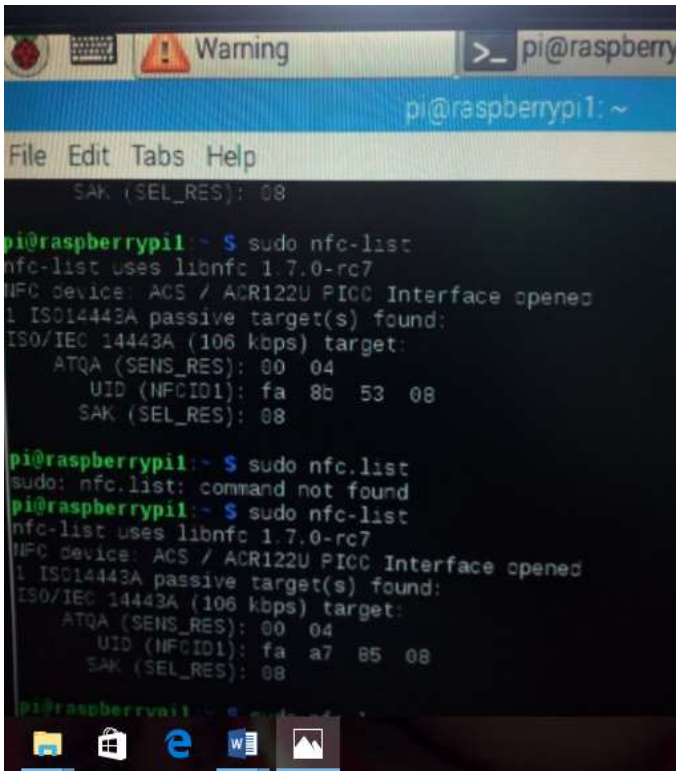

Table 15.5.6 Check for the UID Number of Each Tag

To start the application, admin can click on the start button on the left on the desktop background on the figure 5.6, a dropdown menu appears where admin select internet crown browser but you need to make sure that your Wi-Fi on. By clicking the crown internet browser, a new interface would displays as shown in figure 5.7.

Figure 10.5.7 Login page of Radio Frequency Identification System

The figure 5.7 above allows admin to login or register as new admin to the system. When the user click on register button a new interface appear as shown in the figure 5.8 where new admin enter his username, password, name, and post then he click on register as shown in the figure 5.8 below.

Figure 5.8 Register a New Admin to the System

Figure 5.9 Login Window of File Tracking System

When the admin clicks on Login button instead of Register button in Figure 5.9, it allows the admin to enter the username and the password then click the login button as shown the figure 5.9 above, this display a new interface as shown in figure 5.9. The interface has four main components which include file, search, location and person.

Figure 11.5.10 Reading the staff number (tag) with the reader

Figure 5.10 allow admin to read a file number of the staff with the NFC reader and stored it in the database of the Radio Frequency Identification Tracking System.

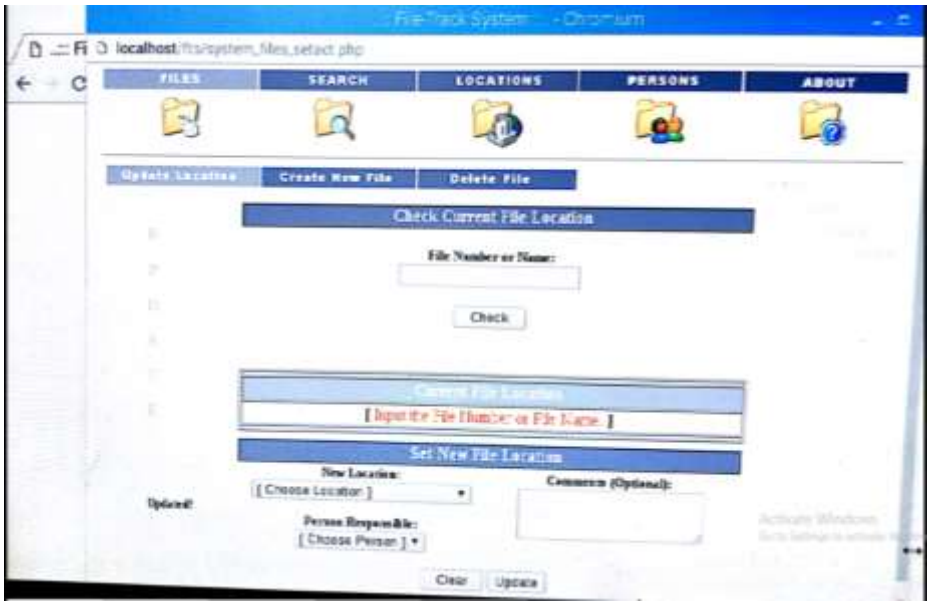

Figure 12.5.11 Update Location

The figure 5.11 above allow the admin to read the file number (tag) with the NFC reader and click check button which show you the current location of the file. Here user can set a new location by selecting on (choose location), person responsible and comment then click update, to update the location.

Figure 13.5.12 Deleting a File

In figure 5.12 above allow the admin to read the file number (tag) using the NFC reader which are already stored in the database then click delete button to delete button to delete the file number in the database**.**

Figure 14.5.13 Create New Location

The figure 5.13 above allow user to add new location to the system where by the user enter name of the new location and then click on create.

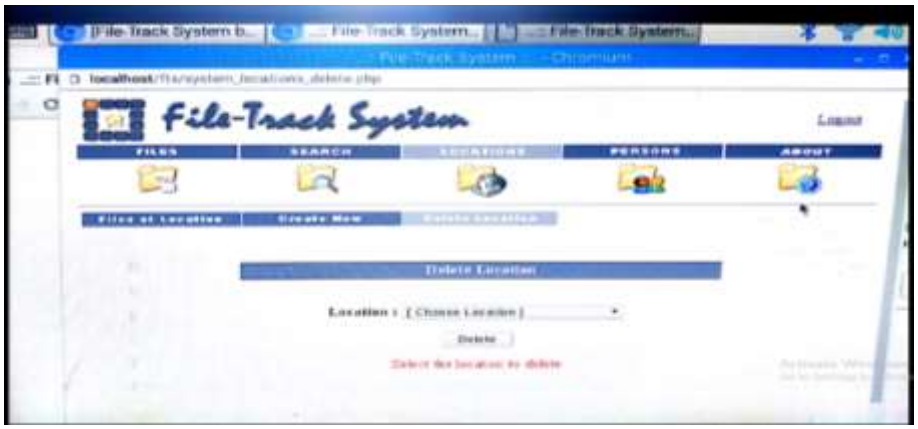

Figure 5.14 Delete Location

Figure 5.14 allow user to delete location by clicking on the drop down Manu then select the location you want to delete and press delete button.

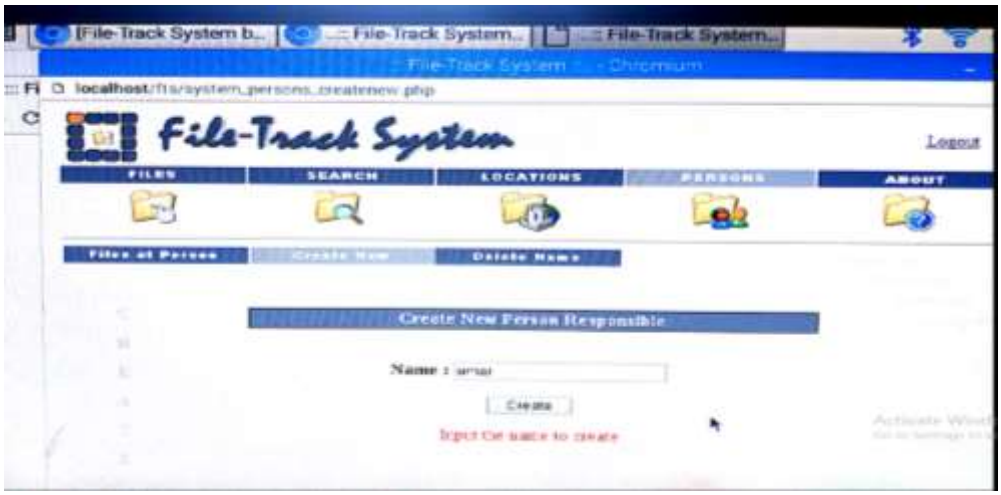

Figure 15.5.15 Create New Person

The interface in Figure 5.15 allow admin to add new person who is responsible for a file.

Figure 16.5.16 Delete Person

The interface in Figure 5.16 allow admin to delete a person in charge of file in the Radio Frequency Identification Tracking System that is no needed in the database. To delete a person in charge of a file, admin select the name of the person from the drop down menu of the interface and then click on delete.

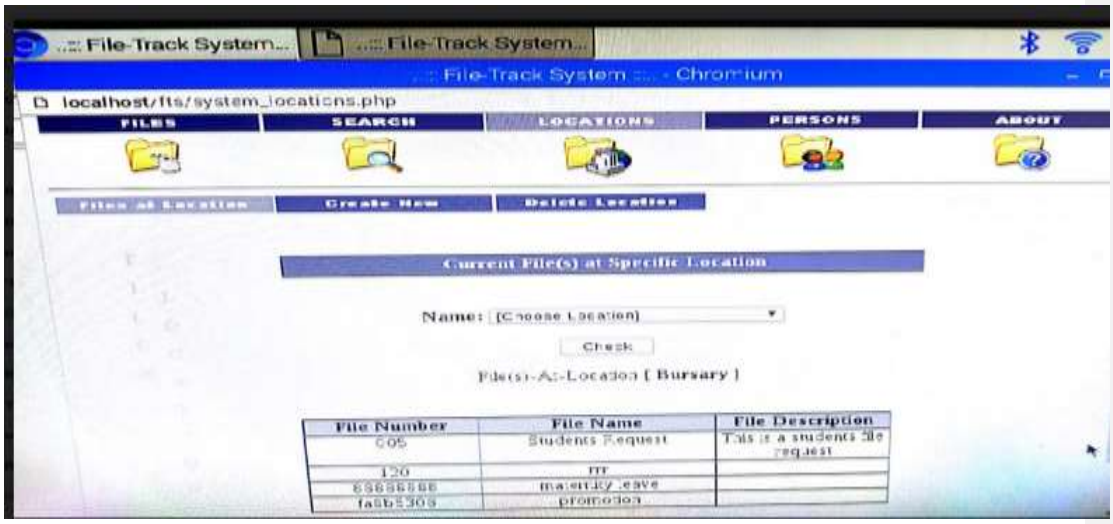

Figure 17.5.17 files at location

Figure 5.17 above allow the admin to view the file at bursary.

Figure 18.5.18 files at person

The figure 5.18 above allow admin to view the files at person

Figure 19.5.19 file location history

The figure 5.19 allow admin to view location history of each file which is the output of the system. This shows the NFC tag number of the file, file name, location of the file, person responsible for file, comments, initiated by, Date and Time

5.4 Validation of Radio Frequency Identification File Tracking System

Figure 20.5.4: Validation of Radio Frequency Identification File Tracking System

	Table 5.4: Validation of radio frequency identification system				
	N	Likert scale	Mean	Std. Deviation	Interpretation
Information Quality	44	4	3.30	1.64888	Strongly agree
System Usefulness	44	4	3.28	1.09848	Strongly agree
System Usage Characteristics	44	4	3.20	1.50317	Agree
Overall	44	4	3.35	0.76492	Strongly agree

Satisfaction					

Source: primary data (2018)

Table 5.1, present the results of validation of radio frequency identification for file tracking system, according to the findings, the five items of the information quality have a mean of 3.30, which on the scale used, corresponded to "strongly agree" hence an excellence rating of the respondents on information quality of Radio Frequency Identification system. In addition, the three items of system usefulness have a mean of 3.28, which correspond to strongly agree hence an excellent rating of the respondents on system usefulness of radio frequency tracking system. This means that the system provides excellent useful information.

Furthermore, the fourth item of system usage characteristic have a mean of 3.20 which on the scale used, corresponded to "agree" hence a very good rating of the respondents on system usage characteristic of Radio Frequency Identification System. Finally, the two item of overall satisfaction has a mean of 3.35 corresponded to strongly agree hence an excellent rating of the respondents on overall satisfaction of Radio Frequency Tracking system.

Comment [M3]: Be mindful of paragraph, u always write in blocks which is not too good for clarity. This has been done now, u can check other part of your work and make adjustment where necessary

CHAPTER SIX
DISCUSSION OF FINDINGS, CONCLUSION, RECOMMENDATION AND CONTRIBUTION TO STUDY

6.0 Introduction

This chapter presents discussion of findings of this study, conclusion, recommendation and contribution to knowledge.

6.1 Demographic Characteristics of Respondents

The findings of the study show that out of 44 respondents, 30 were male which form 68.2%, while 14(31.8%) respondents were female. This mean that there are more male study participants than females.

Meanwhile, the study revealed that 38.3% of the respondents are between the age of 30 and below, followed by 38.6% which are in the range of 31-40 then 18.2% that falls under the age group 41-50 and lastly, 4.5% of the respondents are above 50 years of age. This means that, majority of the respondents in the study are within age groups of 31-40, below 30 and 41-50.

The result of the level of education of the respondents revealed that 18 out of 44 respondents are Bachelor holders followed by 14 Master degree holders, whereas, 22.7% of the respondents possessed PhD degree. Lastly,4.5% of the respondents are Diploma holders. Hence, majority of the participants of this study possessed Bachelor degree and Master degrees.

The finding also revealed that, 18.2% and 52.3% of the respondents have been serving with the University for less than 2 years and between 2 to 5 years respectively. Whereas, 29.5% of respondents have been serving the university for more than 5 years. This shows that, majority of the study respondents have been serving the university between 2-5 years and above 5 years respectively.

6.2 Specific Objectives

6.2.1 To analyze the existing File Tracking System used in Yobe State University of Nigeria

The purpose of this question is to analyze the Radio Frequency Identification for File Management. Based on the interview conducted in chapter four, it was revealed that, the monitoring of file is done manually, by asking the Secretary about the status and location of file in the movement register. The method is found to be inefficient and time consuming. Therefore, an improved method of file monitoring is needed in the University to ensure quick retrieval of files for processing.

The finding is in line with the finding of Omoregbe *et al.,* (2014), which revealed that, files are transferred physically from one desk to another within the department or between departments, because there is need for the file to go through several personnel before it is rendered acceptable, therefore there is drawback in transferring the file from one desk to another such as getting this file missing or forget to document the file. Therefore, there is need for a system that addresses such problem while saving time and energy of the administrative staff.

Based on the challenges encountered in the current file management the finding shows that, the challenges encountered include; duplication of record about file in the movement register, time consuming in updating and retrieving of record. The findings further identified additional challenges to include; nepotism and favoritism, which are usually practiced by some administrative staff of the university.

The finding is in line with the finding of Krasniqi (2013), who reviewed that locating files is one of the greatest problems in universities nowadays. Time is wasted archiving or searching files, energy is wasted chasing misplaced files, deadlines are missed and sometimes files are lost.

Finally, based on whether the file tracking system in the university is cost effective. The findings from the interview informants revealed that at present, all report, and decision are done manually using paper and pen which is not cost effective. Therefore, a computer based need to be deployed in order to minimize cost.

This finding is similar to the finding of Krasniqi (2013) which is revealed that, all report, request and decision that are done manually using paper would now be done through the web. The web application will save time and reduce the cost of paper that are being purchase for that work.

6.2.2 Design of Radio Frequency Identification File Tracking System

The Radio Frequency Identification System was designed using both Hardware and Software component. The hardware component includes the raspberry pi, USB NFC reader, NFC tags, USB to VGA converter, GUI interface, wireless mouse and the power cable. The NFC Tags are placed in the file of staff which has a unique identification number, the USB NFC reader will send response to each tag that are within the reading range of the USB NFC reader. The control units consist of Raspberry pi 3 and GUI screen. The control units are responsible for receiving the information (UID) from the RFID unit and tracking staff files and tagging from where necessary.

While the software development unit consisting of PHP, HTML, JavaScript, MySQL, APACHE and Raspbian operating system. HTML/PHP and JavaScript are used in the front end while PHP, MySQL and apache are used as the backend of the system. JavaScript was used to provide powerful animation features and displaying timely content update. Hypertext Markup language (HTML) was used for creating web pages and web applications. It is by default in every windows so you don't need to purchase extra software. MySQL was used in facilitating effective management of databases by connecting them to the software. It is a stable, reliable and powerful solution with advanced features including: Data security, reduced total cost of ownership and complete work flow. Raspbian is a free operating system based on Debian optimized for the Raspberry Pi hardware. Raspbian Operating System was used as the Operating System of the Radio Frequency Identification Tracking System. Apache was used in the development of web server of the system it is fast, reliable and secure. The developed software was designed to perform the following task in tracking staff file: Reading the file number of staff in the database, setting new location of the file, deleting a file, creating new location, create new person in charge of file, deleting person in charge of file, checking file with person and file location history about the staff.

6.2.3 Implementation Radio Frequency Identification system in Yobe State University

The implementation of Radio Frequency Identification Tracking system follows a number of steps first is to connect all the hardware components correctly and the NFC tag is provided to every staff which is a unique ID for every single staff, also whenever the user tabs his NFC tag on the RFID reader due to the magnetic field induction between RFID and that NFC tag, the tag is read and the tag information is store in the database

that a particular file has been created. The admin can read staff file's number, search for file, update the location, add new user to the system, add person in charge of the file and generate reports of staff and can change the database if need be. The admin would generate file location history of each file as the output of the system. The NFC tag data is already stored in the database and the Raspberry Pi is connected to the server to access the database. The major advantage of this proposed system is that it is cost effective, hence it is desirable to replace manual/ traditional approach with automated File Tracking System.

6.2.4 Validation of Radio Frequency File Tracking System

Based on the analysis of chapter four, from table 4.2.2, the finding revealed that the respondents believed that Radio Frequency Tracking system provide the staff with quality of information with a mean value of 3.30 on the scale used which corresponds to strongly agree '" hence an excellent rating of the respondents on information quality of Radio Frequency Tracking System.

This finding is in line with the findings of Armstrong *et al.,* (2005) which reported that, information quality is the desirable characteristic of the system output. i.e. Management reports. For example, accuracy, timeline, completeness as well as usability. The finding also tallies with the finding of Ojo (2017) who stated that information quality has to do with content issues and characteristic of the information system output. It has been measured by examining the output of an information system in terms of timeliness, accuracy, reliability and trustworthiness. Also the finding is similar to that of DeLone & McLean (2016) who reviewed that Information Quality are desirable characteristic of the system output; i.e. Management reports and Web pages. For examples, relevance, accuracy, completeness, timeliness and usability.

Furthermore, the study also revealed that the system is useful to staff with a mean value of 3.28, which corresponds to strongly agree hence an excellent rating of respondents on system usefulness of Radio Frequency Tracking System. This means that the system provides useful information.

This finding also corresponds with the findings of Jahangir and Begum (2008) who reported that usefulness is the subjective probability that using the system would improve the way a user could complete a given task. The finding also corresponds with the finding of Hussain (2016) which revealed that usefulness as the degree to which a person believes that using a particular system would enhance his or her job performance.

Besides, the findings from the respondents revealed that the staff are satisfied with how the system work based on the analysis conducted. The system usage characteristic had a mean value of 3.35 which corresponds to strongly agree, hence an excellent rating of the respondent on overall satisfaction of Radio Frequency Tracking System.

This finding is in line with the finding of Ojo (2017) who described that user satisfaction as one of the most important measures of system success often measured by overall satisfaction. The finding agrees with the finding of Armstrong *et al.,* (2005) who describe the users level of satisfaction with report and support service.

Finally, the findings also revealed that the system is easy to use, easy to learn, provide quick response and is reliable to use. System usage characteristic has a mean value of 3.20 which on the scale used, corresponded to "agree" hence a very good rating of the respondents on system usage characteristic of radio frequency identification system.

Similarly, this study found that System quality is a desirable characteristic of an information. This agrees with those findings made by Armstrong *et al.,* (2005) in which it was stated that system quality are desirable characteristics of an information system such as ease of use, system flexibility, response time as well as system reliability. It also agrees with the Delone and McLean (2016) where it was reviewed that system quality as desirable characteristics of an information system. For example, ease of use, flexibility, system reliability and ease of learning.

6.3 Conclusion

This research work has discussed the application and implementation of Radio Frequency File Tracking System for file management. The file tracking system using raspberry pi and NFC reader is automated and monitored without any wastage of time that is the time used for searching, proper location of staff file can be eliminated.

The system would help the Registry department proper management of staff file in the university. The implementation of the system was drawn from the findings of the objectives of the study as well as the gap identified from the reviewed literatures.

This study has contributed to the body of knowledge presenting clear working of Radio Frequency Identification File Tracking System. Most of the existing study in the university mainly focuses on design of file tracking system using only open source software such as PHP, MySQL etc. But this study uses both open source hardware and software. Such system to the best of my knowledge has not been created for tertiary institution, to improve this research work a mobile based app should be developed and also the system should be able to track both staff and student file so that the university can be able to keep both the staff and student information up to date.

6.4 Recommendation

The university management should adopt this new system and also involve the researcher in areas where improvement of the new system is needed.

Furthermore, the university management should provide the staff with adequate knowledge, skill and training involved in the deployment of RFID file tracking system.

Also, both public and private University across Nigeria should implement the system. It is hoped that the system would eliminate delay in locating and searching of staff file.

6.5 Contribution to Knowledge

This study has contributed to knowledge in a number of ways:

1. The study has provided a secure system capable of tracking staff files within the registry unit of Yobe State University.
2. The study also brings about a well-organized record keeping, information management and file tracking system.

6.6 Future work

Further research could be done especially in attempting to develop a mobile application version of the Radio Frequency Identification Tracking System for file management that was developed by this study. Besides, another study that could be built upon the system developed by this study is to make it able not only to track staff file but also able to track students' files within universities. Similarly, integration of a PI camera into the RFID developed which can enable the monitor to view the person tracking the file in order to avoid unauthorized access.

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APPENDICES

TABLE 1
Table for Determining Sample Size from a Given Population

N	*S*	*N*	*S*	*N*	*S*
10	10	220	140	1200	291
15	14	230	144	1300	297
20	19	240	148	1400	302
25	24	250	152	1500	306
30	28	260	155	1600	310
35	32	270	159	1700	313
40	36	280	162	1800	317
45	40	290	165	1900	320
50	44	300	169	2000	322
55	48	320	175	2200	327
60	52	340	181	2400	331
65	56	360	186	2600	335
70	59	380	191	2800	338
75	63	400	196	3000	341
80	66	420	201	3500	346
85	70	440	205	4000	351
90	73	460	210	4500	354
95	76	480	214	5000	357
100	80	500	217	6000	361
110	86	550	226	7000	364
120	92	600	234	8000	367
130	97	650	242	9000	368
140	103	700	248	10000	370
150	108	750	254	15000	375
160	113	800	260	20000	377
170	118	850	265	30000	379
180	123	900	269	40000	380
190	127	950	274	50000	381
200	132	1000	278	75000	382
210	136	1100	285	1000000	384

Note.—*N* is population size.
S is sample size.

Appendix II: Questionnaire

Radio Frequency Identification System Validation Questionnaire

This questionnaire is designed to collect data needed for the validation of Radio Frequency Identification Tracking System developed for Yobe State University. Information from the survey questionnaire will help the researcher to determine the usefulness of the system to the registry department of Yobe State University as well as the need to identify any loopholes for an improvement. Your participation in this survey is highly appreciated.

Section A: DEMOGRAPHIC DATA

1. GENDER

   Male ☐ Female ☐

2. AGE

   below 30 ☐ 31-40 ☐ 41-50 ☐ 51 above ☐

3. Level of education

   Certificate ☐ Diploma ☐ Bachelor Degree ☐

   Master Degree ☐ PhD ☐

4. Years of service in the University

Less than 2 years ☐ between 2 to 5 years ☐ Above 5 years ☐

SECTION (B) Instruction: please tick appropriately in the box provided to indicate your response in validation of Radio Frequency Identification. The following abbreviations are interpreted as follows: SD=strongly disagree; D=disagree; A=agree; SA=strongly agree.

		Strongly Disagree	Disagree	Agree	Strongly Agree
	Information Quality (IQ)				
IQ	The Information obtained from the system is clear				
IQ2	The system provide accurate information				
IQ3	The system provides me with sufficient information				
IQ4	The system provides me with up-to-date information				
IQ5	The system provides report that seems to be exactly what I need				
	System Usefulness	Strongly Disagree	Disagree	Agree	Strongly Agree
SU1	Using the system increases productivity				
SU2	Using the system saves time				
SU3	Using the system improves job performance				
	System Usage Characteristics	Strongly Disagree	Disagree	Agree	Strongly Agree
SUC1	The interface of the system is user-friendly				
SUC2	The system is generally easy to use				
SUC3	The system is easy to learn.				
SUC4	It is easy to conduct my tasks with the system				
	Overall Satisfaction	Strongly Disagree	Disagree	Agree	Strongly Agree
OS1	Do you feel the system meets the file				

	tracking needs of the university registry department ?				
OS2	Overall, how often are you satisfied with the system?				

Appendix III: Interview Guide

1. What type of files do you handle in Yobe State University?
2. How do you monitor the movement of files from one office to another in Yobe State University?
3. Is the current method of file monitoring in the University efficient to facilitate quick decision making process?
4. What are the challenges encountered in the existing file monitoring method used in the University?
5. What is your expected improvement to address the aforementioned challenges above?

Appendix IV: Interview Transcript

Participant's code:

Interviwee1

Interviewee2

Interviewee3

Interviewer

The first interview was conducted with the registrar of Yobe State University, Damaturu, Nigeria, what type of files do you handle in the registry department of Yobe State University?

Interviewee1

The type of files we handle include: Academic and Non-Academic staff files. Both files are used to keep records of academic and non-academic staff of the University. The files are used to keep track of promotions, leaves, disciplinary cases, appointments and many other cases as the need arises of individual staff in the university.

Interviewer

How do you monitor the movement of files from one office to another in Yobe State University?

Interviewee 1

The monitoring of movement of files from one office to another are usually done manually using a movement register to track the status and location of the file. This method tends to pose a lot of challenges in terms of efficiency due to bureaucratic bottleneck associated with the method.

Interviewer

Is the current method of file monitoring in the University efficient to facilitate quick decision making process?

Interviewee 1

To the best of my knowledge the current method of file monitoring is inefficient due to difficulty in quick access to the status of file as well its location in the file movement register.

Interviewer

What are the challenges encountered in the existing file monitoring method used in the University?

Interviewee 1

The challenges we encountered with the current file monitoring method used in the university include: delay in retrieving and updating file movement information as well as duplication of record about respective files in the file movement register which may lead to difficulty in file handling process.

Interviewer

Is there a need to improve the current file tracking method in the University?

Interviewee 1

Yes, there is a need to improve the current file tracking method in the University in order to ensure its efficiency and effectiveness so that the challenges associated with the method can be minimized.

Interviewer

Is the current method of file tracking in the University cost effective?

Interviewee 1

The current method of file tracking in the University is not cost effective because it is usually carry out manually using paper and pen. It will be better if computer can be deployed to replace the current paper based method in order to minimize cost of file tracking in the University.

Interviewer

What type of files do you handle in the registry department of Yobe State University?

Interviewee 2

The Registry department of the University is usually handles two categories of files which includes: Non-academic and Academic staff files, which are used to keep track of necessary information about the university staff. The information includes: Appointment, Leave, Maternity etc.

Interviewer

How do you monitor the movement of files from one office to another in Yobe state university?

Interviewee 2

We usually monitor movement of file in the registry by asking the Secretary the present and the last location of the file which can be derived from file movement register. This method is time consuming and inefficient.

Interviewer

Is the current method of file monitoring in the university efficient to facilitate quick decision making process?

Interviewee 2

The current method of file monitoring is inefficient, considering huge volume of data that are usually tracked in the file movement register this may cause a lot of delay in monitoring respective files.

Interviewer

What are the challenges encountered in the existing file monitoring method used in the university?

Interviewee 2

The current method of file used in the university is characterized with nepotism, favoritism as well as corrupt practices among staff which is usually hinder the efficient and effective management of file in the university. In addition, there is also problem of improper documentation of file movement which is usually result to difficulty in tracking of file.

Interviewer

Is there a need to improve the current file tracking method in the university?

Interviewee 2

Yes, it is important to improve the current method so that, it can enable us to track our files as fast as possible to eliminate delay and quick location of file so that appropriate decision can be taken. In addition, we want an improve system that is capable of capturing file details as well as notifying the personnel concern about the movement of the file.

Interviewer

Is the current method of file tracking in the university cost effective?

Interviewee 2

No, the current method is not cost affective in the sense that all the decision, report and request are done manually using paper. Therefore, in order to improve the method computer based can be deployed.

Interviewer

What type of files do you handle in the registry department of Yobe State University?

Interviewee 3

Based on my experience, we handle two type of file which include: Academic and non-academic staff file, the files are used to handle promotion, employment as well as disciplinary cases among others.

Interviewer

How do you monitor the movement of files from one office to another in Yobe state university?

Interviewee 3

Normally we monitor the movement of files from one office to another by checking the present and last location of file in the movement register.

Interviewer

Is the current method of file monitoring in the university efficient to facilitate quick decision making process?

Interviewee 3

This method is ineffective, because there is delay in checking the location of the file in the movement register, considering the large number of file that are treated.

Interviewer

What are the challenges encountered in the existing file monitoring method used in the university?

Interviewee 3

Normally the challenges we faced with the current method in the university include: Forgetting to document a file, Time consuming in updating a record as well as time consuming in retrieving of information.

Interviewer

Is there a need to improve the current file tracking method in the university?

Interviewee 3

Yes, there is need to improve the file tracking method that is used in university, so that we can have quick location of file and also eliminate the corrupt practice among staff.

Interviewer

Is the current method of file tracking in the university cost effective?

Interviewer 3

No, because all the report and decision are done using the paper work, which consumed a lot of time in retrieving and updating a file. So if computer based can be deployed it can minimize the problem of manual method used in the university.

Appendix V: Budget

The following is the budget intended for the project to be successful

Item	Cost	Person responsible	Sponsor
Prototype Design and Testing	100,000/=	Usman B. Mohammad	Usman B. Mohammad
Keyboard, Mouse	45,000/=	Usman B. Mohammad	Usman B. Mohammad
Research	200,000	Usman B. Mohammad	Usman B. Mohammad
Staff Training	1,500,000	Usman B. Mohammad	Yobe State University
RFID Reader	73000	Usman B. Mohammad	Usman B. Mohammad
Raspberry Pi 3	489,100/=	Usman B. Mohammad	Usman B. Mohammad
Cost of shipping	365000	Usman B. Mohammad	Usman B. Mohammad
Total	2772100 ugx		

The total amount is in Ugandan shilling

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Directorate of Higher Degrees and Research
Office of the Director

Our ref: 1163-04156-05436

Thursday 19th April, 2018

Dear Sir/Madam,

RE: INTRODUCTION LETTER FOR MOHAMMED BALA USMAN
REG. NO. 1163-04156-05436

The above mentioned candidate is a student of Kampala International University pursuing a Master of Science in Computer Science.

He is interested in conducting a research for his dissertation titled, ***"Design of a Radio Frequency Identification Tracking System for File Management: A Case Study of Yobe State University Nigeria".***

Your organization has been identified as a valuable source of information pertaining to the research subject of interest. The purpose of this letter is to request you to kindly cooperate and avail the researcher with the pertinent information he may need. It is our belief that the findings from this research will benefit KIU and your organization.

Any information shared with the researcher will be used for academic purposes only and shall be kept with utmost confidentiality.

I appreciate any assistance rendered to the researcher.

Yours Sincerely,

KIU
20 APR 2018
DIRECTOR
DHDR
KAMPALA

Dr. Claire M. Mugerwa
Director

C.c. DVC, Academic Affairs
Dean, SCIT