

# Paper Based Document Tracking Using Radio Frequency Identification

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**Abstract:** At present we are running in the globalized electronic and computerized world of 21<sup>st</sup> century, everything is in palms of our hand; anything that we need is just here in the blink of an eye, even though we have to cope up somehow with physical aspect of the things. Paper documents are very significant information carter and are considered to be the asset of every organization. The core intent of this research paper is to track the paper documents in an office premises. The emerging RFID technology is being used for this research because of its automatic nature and robustness. This research is based on two aspects of tracking, manual and automatic. Both aspects will be carried out using RFID technology depending upon the scenario. The RFID system is composed of RFID tag, reader and computer. Documents are tagged to be tracked using RFID devices such as hand held and fixed. RFID reader would be installed at every office desk from where document has to be processed and also some main spots in the organization. When the document found in the locality of reader then the location and all related information about the document is stored into the centralized database. The Interface software operated under administrator is responsible for the managing and tracking of the document and also responsible for the supervision of the confidentiality of the document. It is an automated application, easy to control, time saving and more notably it is secure and reliable that heightens the reputation of the organization.

**Keywords:** *RFID, Document, Smart Management, Security, Tracking*

## 1. Introduction

Paper documents are used almost everywhere in every office and in a massive quantity. Paper documents are incredibly essential for every person; they could be their degree certificates, medical records, utility invoices, and any legal document etc. but after long time if you need those papers again or being misplaced than you need the miracle happen and you get your desired documents. All that can do well when the paper documents are managed in a proper way like category wise, type wise, date and time wise etc. This research proposes a system that is used to track the paper documents using the RFID technology.

There are a lot of tracking applications being developed using RFID technology such as vehicle tracking, supply chain management for tracking products and controlling their inventory efficiently, toll tax payments, person identification/tracking, in health care for tracking the record history, schools, universities, libraries, and many more applications are being operated under this technology.

There are number of offices which are running manual systems for managing the documents. Huge measures of documents are being maintained in registers and in files folders. If the document has to be processed in different department of the same office how they manage all that. People are submitting their applications, forms, documents for process as the requirement of the office.

Taking real time example in the treasury office, where person is submitting his pension document to be processed. This document has to be processed in multiple departments in that offices like checking, calculating and signatures etc.

person is asked to come again to collect his document, when he comes he is being asked to wait still because this time which department is currently dealing with that document. In such office scenarios people are worried about their submitted applications and documents, whether they are entertained, kept safe or they have been lost. So cope up with this type of problem this research named "paper Based Document Tracking Using Radio Frequency Identification" has been proposed In order to get the required document so quick when needed with the use of automatic and contactless technology which is Radio Frequency Identification RFID.

The Radio Frequency Identification (RFID) is an automated technology operated under radio waves. It does not require line of sight between an object and the scanner. It has the ability of multiple scans at a time automatically. The RFID system encompasses of two main parts reader and the tags. There are different types of readers available such as handheld and fixed with different types like, active, passive, semi passive and besides that different types of tags to be used with readers and moreover various frequencies such as low frequency, high frequency, ultra high frequency operated under different range slots. Tags are attached to the objects with the relevant information to be tracked by reader, and the reader identifies the tags with the tag id, and reads the tag data depending upon the available frequency ranges.

RFID technology uses the radio waves which automatically identifies and tracks the objects within the allowable frequency ranges. There are lot of other technologies that could be used to track but the major

reason behind using RFID technology is that, it does not limited to the single orientation of the document, it tracks so fast and without human intervention, also it is the only technology that tracks even though in water, metal, sand. Using this automated technology, searching of documents becomes fast, easy, and accurate.

## 2. Related Work

A number of studies have been seen that focus on the implementation of RFID in different application areas due to the novelty of the technology to enhance the competitiveness. Some of the research related articles by different authors are discussed below:

Isaacman Marvin and Denis McGreivy in [1] Imposes on many objectives of the research by applying RFID technology; One of those objective is to provide a computer based System which automatically or manually locates and tracks documents placed cabinets, shelves and on desks of the in offices. Another objective is to provide an automatic document tracking System that is able to rapidly identify missing files from the system. Another objective is to provide a system to locate the passively tagged documents, from a distance of over three meters from the user's personal computer. All the objectives are achieved by keeping low cost in mind.

Rouibah Kamel and Khaled Al-Zanki in [2] presented the case study on the assessment of the RFID technology in a ministry of finance department in an Arab country. The case study shows the adoption of RFID technology in three phases as defining scenarios where the RFID can be useful to implement, identifying the total cost on implementing the RFID technology and to decide about the RFID adoption for the identified scenarios.

Anjum, Rumana, and Vijaya Kamble in [3] proposed an automatic attendance system where students are assigned the ID cards with RFID chip which is used to track students in the institute. Student's attendance can be automatically marked because RFID readers are placed all around the campus to monitor the activities done by the student that whether they are attending lectures or bunking lectures and wasting time in the campus and polluting the campus surroundings etc. System is capable of monitoring retention of the students, if their attendance is below 70%, alerts are sent to the parents.

In another study [5] which have highlighted the immensely use of RFID technology in supply chain management and logistics that support a lot to the retailers, suppliers, distributors and manufacturers to reduce the labor cost by employing this tremendous technology also by surveys, its impact on the business market.

Challenges and quick adoption of RFID technology has been explored by authors. How companies/organizations are migrated to this new boosted RFID technology to get the success in their businesses and also for strengthen the use of the RFID technology [6].

Authors in [7] have emphasized on the algorithm (anti-collision algorithm), protocols (authentication, privacy protection), and performance facet in terms of the RFID technology's sensing and localization ability. Also

addressed some future advises for deploying RFID technology.

S.L. Ting, Albert H. C. Tsang, Y. K. Tse in [9], presented a methodical and logical RFID based deployed structure validated under both users and professionals. The framework summarizes the vitals assignments to be carried out in the deployment procedure. The framework suggests essential considerations to the practitioners for the implementation of RFID system.

## 3. Methodology

The paper based document tracking system using RFID is the composition of hardware and the software. The hardware part is the combination of RFID reader, RFID tags and the computer hosting the tracking application. The software part is the host of the application designed using XAMPP packaged with Apache server, Maria DB database, and the PHP as programming language for controlling the logics. Administrator can logged into the system by proper user id and password and he is allowed to check all the necessary information of the document in the application like log of the every document along with time in, time out, date, type of the document. Admin has the full authority to view, add, edit any document and can delete any document at any time.brought in the office for processing. The attached RFID tag contains the unique ID number, and lot of information depending upon the application criteria plus the type of technology used in the application. Document is scanned and the information is to be inserted by the user interface into the system along with the information of the owner of document, date and time and the currently logged in admin name.

For manually tracking of the paper document, passive RFID device is used in which the document tag id is inserted in the device to locate the required document whose tag id is put into the device. Tag attached to the document when matched with the id put into the device, the device beeps when matched or show kind of light in the direction where document is placed. The device and the tag come in the session and share information provided on the tag.

### 3.1 RFID Tag

The RFID tag also called Transponder is a memory type contains the information in the form of bits to be read by the reader. There is a communication channel between transmission and receiving of data. RFID tags are of different types like active, passive, semi-passive and know how to be implied with any of the active, passive, semi passive systems respectively along with the type of memory used and the transmission channel.

Active tags have integrated circuits with built in power resource which provisions energy for the outgoing signal. They are very robust than other tag types due to their active nature and communicating with the reader throughout their life. Due to their onboard circuitry they are capable of storing more bytes of data and can effectively transmit at a greater distance even in water and metal environment. The disadvantages of these tags are their cost and size. Passive RFID tags get energized when tag encounter radio signals.

The popularity of these tags is their low cost, smaller size and a long life to be used by the vast applications. The semi passive tags are similar to passive tags only the difference is that these tags have battery attached.

### 3.2 RFID Reader

The RFID reader also called Transceiver is a device controlled with the radio waves, which is used to read data from the tag to be tracked by the reader on the based information. There are different types of readers available like hand held and fixed accommodated with the different tag types. RFID readers scan based on the frequency ranges types such as low, high, and ultra high frequencies.

### 3.3 Antenna

Antenna is the communication link between transponder and transceiver due to the produced electromagnetic field. There are different sizes and shapes of antennas available that can be fixed anywhere that constantly help in scanning process.

### 3.4 RFID Systems

The RFID tag and RFID reader are collectively known as RFID systems which communicate to each other. There are three different types of RFID systems such as active RFID systems, passive v systems, and Battery assisted systems.

Active RFID systems use compatible active tags and readers to accommodate within the system. Passive RFID systems use compatible passive tags and readers to accommodate within the system. Battery assisted RFID systems use compatible battery assisted tags and readers to accommodate within the system respectively

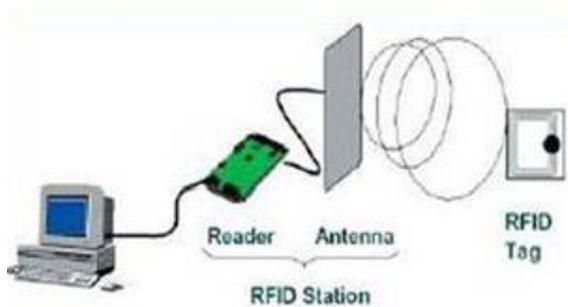


Figure.1. RFID System Architecture

## 4. Results and Discussion

The This research is based on two aspects for tracking the documents. One is manual and the other is automatic. The manual system uses the hand held passive RFID device to track the RFID tagged document by putting the tag id of the document into the device. The RFID device searches the document from piles of files in the shelves or depending upon the management of the document. It is very important that the documents should be tagged followed by the categories, so that they are searched efficiently within few seconds.

The automatic part is comprises of RFID reader, RFID tag, tagged documents, and a computer for monitoring and running the RFID based application.

The host system is integrated with graphical user interface to form a RFID based document tracking system. The system consists of admin login panel with admin name and password to get in to the system, main tracking menu for adding new document in the record, searching particular document, editing particular document information, searching for the particular document status and reporting when the document is processed.

Querying mechanism of the database has been used in the running application to insert new document along with its details, fetch document when required, update any document any time, and search for required document at any time. Any operation performed on document like registering new admin, adding new document, editing, searching and deleting of the document is updated in the centralized database running at every department of the office. Document processing and details are maintained in the centralized database so that any time we will be able to get the information and informed to the owner of the document.

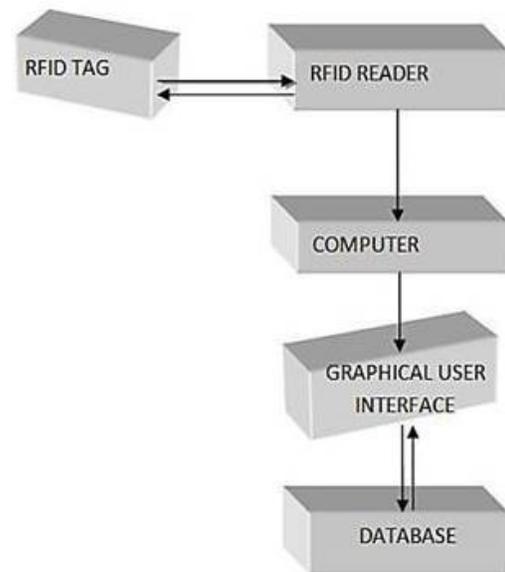


Figure.2. Overview of Document Tracking System

### 4.1 Graphical User Interface

The graphical user interface has been formed using XAMPP version (3.2.2) packaged with Apache server to interconnect the data with logic, MariaDB database to store all the document details, date time, PHP programming language for incorporating document details in the application.

There are three tables built using PHPMyAdmin, one is for maintaining the details of the administrators such as name, id, login time etc, and the second one is for maintaining the document detail such as owner of the document, admin name, date and time, type of the document, status of the document etc, and the third table is the log table for maintaining the system access timings of the administrators and the activities timings of the documents.

### 4.2 Login Page

Login page is being created with security that allows only legitimate users get access to the system. Only administrators are logged in to the system with their username and password to access this automated tracking system.

After successfully logged in to the system by admin, he is allowed to add the new document in the record with full details; he can update the detail of any particular document. Administrator can search any information of the document and status.

Administrator can quit from the system by clicking the exit button on the page, by this he will be logged off from the system. The time and date along with other details will be saved in the log table of the database. Administrator can go to previous page of almost every page by clicking the BACK button for making any amendments in the requirements for the documents.

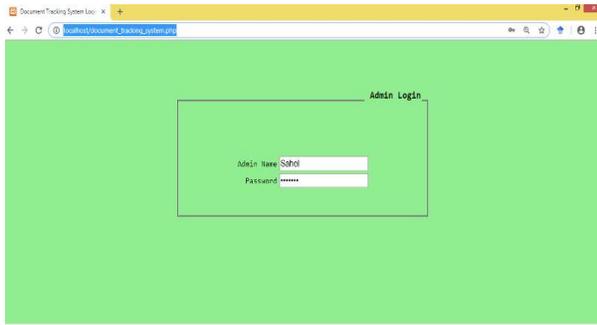


Figure.3. System Login Page

#### 4.3 System Main Page

This is the page which is displayed after successfully logged in by the administrator with his full name and timing detail on the screen along with the main application window where administrator can register new document, edit document and at any time can delete document. He can search for any document and its detail like the type of the document, date and time, owner of the document, logged in admin name, etc. Administrator has the right to close the application any time by clicking the CLOSE button.

#### 4.4 Add/Edit/Delete/Search Document

This is the main page of the tracking system which has Document Add, Update, Delete, and Search facility. For using the ADD facility, admin has to put the document ID, document owner name, document type, email and contact detail of the document to be added in the database record.

For using the EDIT facility, admin has to put the document id of the document to be edited and press the edit button to change the details of that document. For using DELETE facility, admin has to click the Delete button and put the document id of the document to be deleted and press the delete button to remove that document from the database and the whole system. For using the SEARCH facility, admin has to click on the Search Button on the main application window; after clicking on the search button, the document id is asked by the form window, by putting the document id and clicking on the GO button, the information is displayed for the required document. Every

page is provided with add, update, search, and delete facility along with BACK and HOME button from where administrator can go to the previous page or the home page as desired.

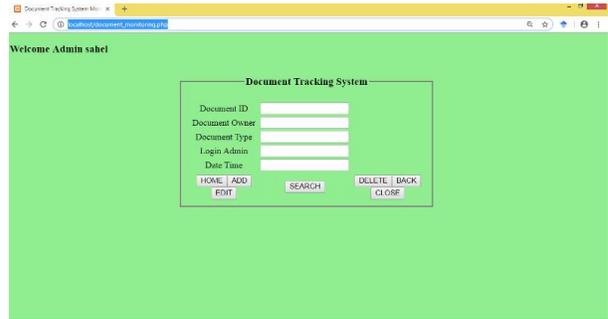


Figure.4. System Monitoring Page

## 5. Conclusion

In Even though in the 21st century, the digital world, Paperless offices are just the dreams because paper and documents can be important and necessary in the form of degree certificate, admit cards, medical record, offer letters, etc. papers are still and will be important always but the problem comes with the managing of those papers in order to get it when needed most importantly get it quickly. This research outlines the issues of the productive time spent by workers searching for documents and proposes a straight forward solution for the contextualizing of office objects such as documents, files, etc. in the form of document tracking system using an emerging RFID technology to provide a tracking system in real time. The RFID based document tracking system simplifies the conventional manual system which is labor intensive and subject to errors, most bothering is time consuming. The RFID based document management system provides a useful support for the immediate look-up of related working information. The RFID based document management system provides automatic real time information on the location of documents within the organization.

## 6. Future Work

RFID can be seen as the most highlighted technology in many industries these days moreover to be used utmost in every industry. In future RFID technology will be used everywhere around the world due to its tremendous features, excellent performance and robustness. All document management systems and other software applications will be migrated to RFID technology. In order to locate the documents quickly, this is the optimum technology till now.

In future this technology could bring more intelligence into the system by which RFID tagged confidential documents cannot be moved without high authority permission because the system makes an alarm. Alerts will be sent whenever a document is due for renewal, update and near to expiry.

Further more in future this research work can bring more ease by adding online reporting through messages,

because almost everyone these days having cell phones and ready for any kind of online transactions, so that the document given for processing could be downloaded with the authentication id which is the document id given at the time of submission of the document and make print of it.

Document tracking approach can be best utilized in government offices for tracking old record, in universities for tracking student's original submitted documents, in banking for tracking client's old or missing receipts, in courier services for tracking customer's courier information, in hospitals for tracking patient's history records.

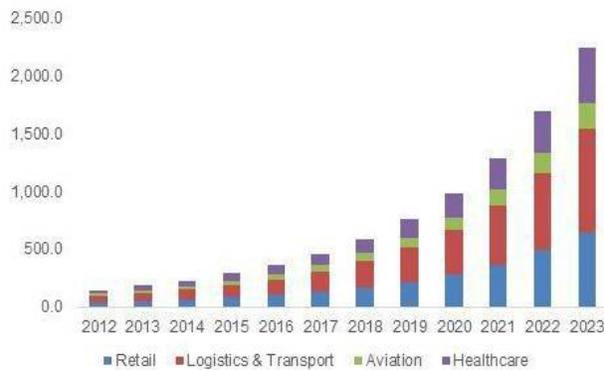


Figure.5. Future Graph of RFID Technology

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