Stewardship of Library a Social Institution embracing RFID and IoT

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Abstract

Radio frequency identification (RFID) and Internet of Things (IoT) systems have successfully applied in different areas like manufacturing industry for inventory management, automated tool, supply chain, agriculture, animals firm, transportation, healthcare, sweep card for entry in office etc. In the present article attempt has been made to discuss about RFID and IOT technology, and how library manager can implement both the technology in library management. Actually RFID technology is not exactly new technology because this technology is used 50 years back in the European countries, but for the library prospects application of this technology is emerging. IoT is new technology, though it combines many old technologies to form a new system or technology. This system is at young age, many improvements yet to come in future.

Keywords: *Rfid, IoT, Tag, Transponder, Sensor.*

1. MATERIALS AND METHODS

The present paper is based on non-systematical study, literature search was main tool which conduct with the help books, and journals. Search engine was used to find and collect resources. After going through collected various materials few of them were selected for the present work which includes Indian and Foreign publication.

2. OBJECTIVE OF THE STUDY

The present paper is communicative type. Main objective the paper is to commutate to the librarian's society about the outlook of recent technology i.e. RFID and IoT and its application in library management. This paper will help the librarian's society to take decision whether to adopt these technologies in the library or not seeing the futuristic application.

3. INTRODUCTION

RFID Technology: The word RF in RFID stands for ''radio frequency'', the ''ID'' means ''identifier''. RFID (Radio Frequency Identification) is wireless radio frequency wave or electromagnetic field to transfer data for auto identification of different objects. Tagging item with RFID tags on an object allows RFID reader to reads and capture information stored in the tag automatically. These tags are mainly contains Chip and Antenna. There is a little bit of difference between RFID and Barcode. Barcode read with Barcode reader which emit laser beam, whereas RFID read with an electromagnetic field rather than by a laser beam. RFID is an advanced technology in comparison to barcodes. The most important think is RFID can read tag in hidden inside the object. Tags are no needed to be visible to read like barcode. A tag contains the chip having capacity to hold information of many bytes which is a great feature and have capacity to expand as future technology. Fist RFID device was developed by **Mario Cardullo's** which was patented on 1973, [1] it first used a passive radio transponder along with memory.[2] In 1983, the first patent to be associated with the abbreviation RFID was granted to Charles Walton.[3]

4.   COMPONENTS OF RFID

A RFID works with various Components which are integrated in such a way that it performs action in desired way.
   1. RFID Reader.
   2. Tag or Label
   3. Antenna.
   4. Communication and application infrastructure.

1. RFID Reader- Its main function is to read radio frequency wave to identify objects which embedded with tag.

2. Tag or label- RFID tags or labels are embedded with a microchip that stores and processes information, with a transmitter and a receiver. There are mainly three types of RFID tags that are familiar to most consumers who use the technology.[4]
Active Tag- Active tags are powered by a battery and thus can be read at a greater range from the RFID reader; up to hundreds of meters.   AIDC means automated identification and data capturing is one technique of RFID.[5]
 Passive tag (Battery assisted)- The passive is battery assisted tag it gets activated in the presence of Radio frequency identification radar.

A passive tag- In this type of tag there is no battery so tag uses radio energy which is transmitted by the reader. This tag is cheaper and smaller in size normally this tag use reader transmitted radio energy. In this system reader's reception range may be adjust from 1feet to 2000 [6], which permit flexibility in the applications of supervision and asset protection.

3. Antenna: Act as tag detector, it creates magnetic field so that reader can read the tag.

4. Communication and application infrastructure: Application software and IT infrastructure needed to enable reader and RFID work through it.

5. INTERNET OF THINGS (IOT)

The whole society is passing through a rapid transformation from isolated system to ubiquitous internet enabled things which are efficient enough to interact with each other to generate data, analyzed and extract data and this is done by system called IoT. The internet of things is an upcoming technology which aims to connect different devices to the existing Internet infrastructure to work for a purpose; these can be a interaction between human-to-machine and machine-to-machine. IOT devices usually consist of sensors and microcontrollers. Data is obtained from sensors and these sensors are connected with cloud computing software server via internet[7].
Now days we have heard about a different word like smart home, smart appliance (such as home security system, lighting fixtures) etc. Actually smart houses are using combined different technology like cameras, sensors, Wi-Fi connected with smart mobile and speakers. These devices support each other and can be control with the devices which are associated with the system.

6.   COMPONENT AND WORKING SYSTEM OF IOT

 IoT work with four embedded components: 1. Sensors/devices, 2. connectivity, 3. Data processing, 4. User interface.[8]

1) Sensors: The most important component of IoT is sensor or device, sensors collect minute data from their surrounding environment.
2) Connectivity: After the data is collected by the sensors it transfers the data to the cloud infrastructure i.e. IoT platforms. While the data is transfer by the sensors to cloud server, it need a medium or a connection like Wi-Fi, WAN, Bluetooth, and mobile hotspot. Efficiency of IoT function depends on the speed of medium.
3) Data Processing: Once the data is send to the cloud server, data processing are done by the software. Analysis can be simple one or may be complex one, but IoT system work according to the situation to output the result as per the demand of the situation.
4) User Interface: After the data processing information are made useful and send to the user via notification alert (such as email, text, notification, etc.). In some IoT system devices are pre-programmed to take action automatically in such case this device adjusts the action of the system itself according to the set program, it do not wait for

instruction. Like to regulate the temperature of AC where temperature is preset, so the system automatically adjusts the temperature.

In other IoT system users have the facility to perform and adjust the action and affect the system thorough their mobile app or some other gadgets. For an example, the user might remotely adjust the temperature of the cold storage through a mobile app.

7.   APPLICATION OF RFID AND IOT IN THE LIBRARY

Libraries are adapting RFID technology to replace barcodes pasted on the library items which may offer much more advantages to the library. Some of the area where of library where RFID may be applying for batter output, again IOT has much more advantage then the RFID, and RFID act as part of IoT system. Some of the common futuristic application of both the technology may be adopt in the library management are discussed below.[9]

1. Inventory Management: RFID and IoT may be used as another method of inventory management and this can have done by applying sensors or tag on different library item. The system can track movements of each item in the library.

2. Act as Security device: RFID act as a security device, taking the place of the more traditional electromagnetic security strip installed at the door which automatically sound beep alert the authority with a beep sound on unauthorized movement of the objects. [10] Similarly in IoT the entire inventory is equipped with tag, so movement of the item keeps tracing on the objects. Theft can be stopped by enabling the doors with sensors which gives beep sound or by sending massage alarm to the authority in their mobile app or in a computer.

3. Self-service checkout: RFID and IoT have the facility for Self-service checkout by the library user. RFID tags can be read through an item, there is no need to open a book or other item to scan it, and a stack of books can be read simultaneously. RIFD reader read books tags while books are in motion on a user hand. Checkout can all be done by the borrowers themselves, reducing the need for library staff assistance. With IoT user can check for the books overdue on their mobile app which is additional benefit of IOT in comparison to RFID.

4. Stock verification: - With portable readers, whole shelf inventories can be checked within seconds. A portable RFID reader reads RFID tags through an item which is shelved on rack. So a reader can automatically count available books on a shelf and thus stock verification can be done in a short span of time. [11] As in IoT system used sensor device, so with the sensor total collection can be find out any time without wasting of time, and also the missing sensor indicate the lost or unavailable item in the premises.

5. User reorganization: In IoT system has sensors and camera at the library gate can do face recognition of all the visitors.

6. Fire Detection: The fire detection devices connected with IoT may automatically send the message to the Fire Department or library authority which helps to take timely action.

7. Library Assistance: With IoT user can request the required resource, ask for directions to that book in the library by voice communication through their mobile app which are connected with library IoT system.

8. **Virtual tour and Book Tracking**: user can have virtual tour of the library using the mobile app connected to the IoT,

9. Book availability and Book reservation: In IoT system every member of the library having smart mobile are connected with mobile app with IoT system. So the user can check the availability of the book in the app and can request a book for reservation which is already borrowed by some other user.

10. **Monitoring of library by librarian:** Librarian may have the capacity to monitor the library sitting at home, using the mobile app librarian many perform various activity of the library from any ware. This is going to be the big advantage of IoT system in coming future.

8.   CHALLENGES IN EMBRACING RFID AND IOT

The Internet of Things holds great promise but also brings significant concerns, some of which are discussed below.

1. Data security: The data needs to be stored securely, to prevent hacking attacks on cloud servers. Cloud storage normally is considered to be secured one, so it needed to encrypted IoT platform and server properly to secure data from unauthorized access.[12]

2. Connectivity: In the IoT infrastructure internet plays a vital role even we can say internet is the heart of IoT system. Through the internet real time data transmission take place ant it is the base of this system. Without network or due to poor connectivity the sensors will not work properly, it will cause server failure. It cannot monitor or process data and the data cannot be sent to the server for further action without the internet.[13]

3. Privacy issues: This issue has been raised many times. This technology has the capacity to read up to 100 meters of range. So there is some privacy issue over whether sensitive information could be collected from an unwilling source. Though, library tags or sensors do not contain any user information.[14] Because majority of the libraries use a very low cost tag or sensors so the frequency only readable up to 10 feet and library normally do not capture private and sensitive information. [15] .

4. Indexing of data: In the IoT system different embedded device have the capacity to collect huge data and storage is not a problem in the present situation as cost of storage is media is very less. Therefore, it demands specialized human resource to analyze and index the tore information for better output.

5. Cost factors: IoT system is the combination of different technology, so the cost the technology is very high, it will be difficult for the smaller library to absorb.

6. **Lack of Common Standard:**
There is lack of common standard seen in IoT system. As it works with combination of different technology but the equipment are manufactured without following common standard.[16]

9. CONCLUSION

From the above discussion we can see various advantages and various applications of RFID and IOT in the library. These technologies have the capacity to bring revolution in the library, through many challenges are there. But every field needs to be flourished, need to be change as per the needs. As we can see that RFID is the replacement of Barcode technology, similarly IoT have far better prospects in future which are going to automate every non-living object. It became necessity of the library to adopt these technologies to fulfill the demands of the present tech based society. IoT has great future ahead because it is now in at young age of development, it has many prospect to develop in coming future.

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