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The Future of RFID Technology in Nigeria

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Abstract:

The use of radio-frequency electromagnetic fields is attributed to Radio Frequency Identification (RFID) technology. It transports data between devices, which may include people, and vehicles and goods. This technology is wirelessly connected, has led to innovations in so many areas since its first implementation. RFID has caused a several swing around. For example, this change is apparent in the business area of inventory management, supply chain management and so many other areas. Also, in medicine, RFID has given the world a new hope in intensive care. One may ask, with all the importance of RFID, what is the future of RFID in Nigeria, with too many problems affecting the successful implementation and usage of RFID technology in Nigeria.

This paper aims at predicting the future of RFID in Nigeria and also suggesting ways for better implementation of RFID technology in business in Nigeria.

Keywords: Database, Information Retrieval, Management, RFID Technology, Security

1. Introduction

In this age of technology, the transfer of data between people and things are very vital, e.g., (including people, vehicles, goods and assets), this technology that is adequately capable of this is what can be called RFID (Radio frequency Identification). Technology that transfer data between devices, which are connected remotely depending on the frequency power to determine the covered ranges makes use of radio-frequency electromagnetic fields.

Since the advancement of RFID from 1980s, various facets of human life ranging from transportation, business, security, logistics, medical, transportation and to other areas have revolutionized. Due to technological advancements and development in humans as a result of scientific research and implementations, the need for real-time data storage and processing has become imperative and thus the spread out of RFID in various fields has become an extensive range fire. The population explosion and the introduction of big data have made RFID technology paramount in every field. Imagine our present world with no RFID, data retrieval, processing and management would be as difficult as cutting down a big tree with a blade [5]. For businesses, RFID has caused a turnaround in inventory management, supply chain management, enterprise resource planning, human resource, international trade and lots more. RFID has also given employees opportunity to channel productive hours to achieving organizational goals while data is being managed through RFID technology. In a security, tracking has been improved with RFID. Different objects including humans, goods, vehicles, assets, etc. can be easily tracked using RFID technology.

In Nigeria, however, RFID has been used sparingly in business, security, and in logistics, but faced with several challenges that will be discussed later in this article.

This paper aims at predicting the future of RFID in Nigeria also suggesting ways for better implementation of RFID tech in Nigeria establishment

2. How RFID Works (Basic Principle)

Many cases of RFID exist, but in the highest degree, which can be divided RFID devices into two classes: active and passive (2.1). Active tags work on a power source, usually a battery cell while the lifetime of the passive type, depending on the number of read operations the device experienced by the stored energy.

2.1. Necessary Elements of RFID

RFID is comprised of three (3) essential elements. These components are:

- Tag/responder
- Reader/antenna (interrogator)

- Computer and software infrastructure

The relationship of these components in the RFID system is represented in figure (1):

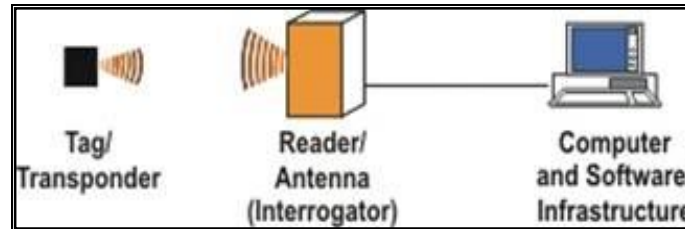


Figure 1

The tag/transponder can be active or passive as discussed earlier. Tags are connected wirelessly to the reader/antenna by means of radio waves. Information is embedded in tags and assigned to products, people, or devices, etc. for identification. When tags come in the range to the Interrogator, data transfer occurs over the radio frequency. Tags are electronic devices usually composed of an integrated antenna and microchips planted on a silicon board. They come in different designs, and shapes. Their designs are influenced by the nature or shape of an object it is designed. Although different designs for tags exist, they all have a common aim of connecting with the interrogator or reader for data communication.

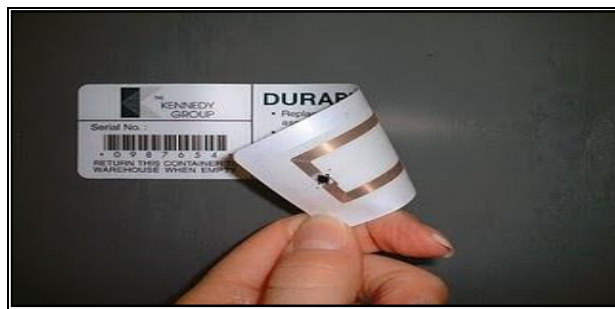


Figure 2: shows an RFID tag on a product:

With the help of the antennas, the readers communicate with the tags. Two basic functions are performed by the readers:

- Receive information from the antenna and converts it to a usable format
- To energies and control antennas (2.2)

Data from the tags are read by the readers and converted for processing by the computer software. In an RFID station, a reader must not come in close contact with the tags to read data, antennas with varying range are used depending on the requirements of the system.

Computer software specially designed for the RFID system are used to perform different functions on the input gotten from the tags. The software also provides an end user interface to the RFID system. According to the need of the system, the software is designed to meet these needs. Example in an inventory system where RFID technology is used to track sales, computer software can be used to record transactions, keep track of inventory, analyze profit margins, etc.

The fundamental principle of an RFID system makes implementation of RFID technology in any area natural and highly profiting. Computer software is robust and has been developed over the years to provide solutions to almost all known problems relating to data processing and security [10].

3. Areas of Application of RFID system in Nigeria

The apparent and real-time identification of an object by means of RFID opens up a vast amount of areas of application and combinations that are yet to be fully maximized to potential in Nigeria. RFID is used in any context where a large number of humans, animals or goods need to be clearly identified [4]. Nigeria being a giant in technology could implement large area in the sector where RFID can forge a great advantages in a vast area, ranging from Identification of animal, human, logistics, stock keeping technologies, system authentication, for drug management, operation of goods and services. As well, it can research in the area of this application: IT planning, Library management, supply management, information retrieval, spare parts management, engineering, container management, luggage tagging. Also, cars anti-theft device, control temperature, asset and event management, tollgate collection, public health care (e.g. Patient and medical equipments).

Increasingly, there are a mixture of applications in customer relationship management and supply chain and many more. All the same, the purpose of this work is to name and describe some of the areas of applications.

3.1. Passport/Identity Cards

The biometric passports requested by the Federal Government of Nigeria are equipped today, with a digital photo and fingerprints. The immigration personnel and provide for passport control with handheld readers that are modest, compact, portable RFID

read/write devices for full dynamic authentication. RFID can also be planted in national or international identity cards. This type of IDs' will be real instant identification of holders [2]. Radio Frequency Identification will improve the time of information processing at hotels, airports, and other locations where immediate identification of persons is wanted.

3.2. Inventory Management and Logistics

Inventory management system that is automatic in nature of its set-up, now uses RFID system. Provided the products in the inventory are attached with RFID [2]. The vantage of this is that, it modifies thorough keeping of records in the Inventory. Companies with extensive logistics utilize RFID in their inventory management, packaging, and transport, especially in the container management [5]. It guarantees real-time identification, traceability and authenticity as well as other important storage information.

3.3. Traffic Control/Toll System

A variety of toll systems implemented in Nigeria today can use RFID technology. These toll systems will be suitable for further development and expansion. The better way Nigeria can make toll collection easier is when vehicles are equipped with tags to improve traffic flow [2]. Each vehicle passing through the toll gates can be identified by the use of RFID and automatically deducts their charges from the accounts based on the information stored in their. It will not only curb drudgery, but will also reduce traffic hold ups at toll gates.

3.4. Library and Document Management

RFID can be used for entering, searching, sorting and for lending & returning books in the library. Also, RFID can be used for the administration and control of vast inventories. RFID technology can make library Inventory faster and more efficient. For example, if a whole shelf of books, can easily be read by an RFID reader tag. The advantage of that can fast track the help to be able well to locate library missing materials. Of course, this will also help with siting books and library materials on time with the advent of a potential user, which is capable of accessing every book in the library at once and may at the same time be used as a measure for security roles in the libraries. For example, the RFID tags are read to check that library materials are properly controlled. This system of Self-check has become very famous and useful in advanced countries, such systems also enable users that are registered to easily check-in or check out multiple of books simultaneously.

3.5. Radio Frequency Identification of Patients in Hospital

Patients in hospitals can be given an RFID wristband, for easy identification of patient's an ailment history, patients and drug information, and for proper monitoring of the patient cases [4]. Active RFIDs can be used for patient and personnel identification and location purposes. RFID can also be implemented to help medical staffs to find vital equipment when urgently needed, and it will also help in spending not much time in the case of an emergency [2]. As such, patient information can be easily located anywhere and read by the RFID system, called "indoor positioning systems," before administering of medication.

4. Challenges of Implementation of RFID Technology in Nigeria

Nigeria is a vast nation filled with innovative and task-oriented people. According to the World Bank in 2012, United States Census Bureau, Nigeria had a population of 168.8 million people [12]. Notwithstanding, we have struggled so much to achieve little in the world of IT. So many factors are responsible for this. However, with respect to the topic of discussion, we will briefly discuss five factors to be taken into consideration when planning to introduce RFID technology in Nigeria:

4.1. Technology

There is an ongoing debate concerning the potential harm of the radio signals, radiation and interferences of some RFID systems of the human body. Such concerns would need to be dissipated. Media and news reports will be forming the public opinion on this issue [5]. Users, business associates and customers will need to trust the implemented RFID technology to be sure that it meets the objective of the set business/organizational goals and does not come with side effects about the health of their customers and employees.

4.2. Organization

It will be necessary that the RFID system is accepted by the employees, within the organization, that user training is provided, that the end user is offered an excellent service and that a suitable communication strategy is developed and implemented [5]. An absolute prerequisite for the successful realization of RFID projects is a simple, easy-to-understand explanation of how the practical application functions and advantages are, for example, the immobilizing technology in cars.

4.3. Legal Issues

It will be critical that the privacy of individuals and personal data are protected and warranted. The use of RFID systems should, therefore, not only comply with applicable data protection laws and regulations, but should also seek to respect any sensitive personal data. The legal system in Nigeria is still not matured to handle such legal issues yet. And this can complicate the efforts made to implement RFID technologies in various sectors of the economy. Although, the quality of the business application concern and the solution scenario, security and outstanding hit on the architecture privacy challenges and pose a potential challenge to the implementation of RFID technology.

Data ownership and partner data integration – When there are different companies involved in business processes, such as commonly found in the Retail supply chain, it can create issues pertaining to the ownership and integration of the data, thereby compromising the integrity of the solution architecture.

4.4. Psychology

Whenever new, invisible technologies are developed and launched, there is a certain amount of psychological resistance and fear. An open discussion about the possible abuse or misuse of technology such as RFID will signal openness and transparency, and will help establish trust. Moreover, Nigerians are known not to be receptive to change quickly.

4.5. Cost

The cost of implementing, maintaining RFID technology will need to be considered to be able to compare the real value with long-term advantages and savings potentials.

4.6. Infrastructure

Some of the support needed to implement RFID technology in most sectors in the Nigerian economy is yet to be established, such as electricity, data-security, technical know-how, etc. Thus, other alternatives that are expensive must be considered before implementing RFID technology in Nigeria. In addition, choosing the appropriate tag or reader technology in a particular application area, can pose to be a potential challenge to implement an RFID solution:

- Large amounts of data—Readers scan each RFID tag several times per second, which generates a high volume of raw data. Although the data is redundant and discarded at the reader level, processing large amounts of data can be difficult.
- Product information maintenance – When a high volume of RFID tags is processed by the reader, the attributes of each tagged product must be continually retrieved from a central product catalogue database – a process that results in challenges for large-scale implementations.
- Configuration and management of users and devices – When a large number of associated hardware devices are distributed throughout multiple facilities, configuration and management can be challenging. The implementation of automated methods for these processes is essential.
- Data integration across multiple facilities – In an enterprise with multiple facilities that are geographically distributed, it is increasingly difficult to manage data in real time while at the same time aggregating it into the central IT facility—a process that can place a significant burden on the network infrastructure.

5. The Future of RFID

RFID is opening a lot of eyes to the value of its applications in transportation and logistics. RFID is increasing visibility not just internally, but supply chain to the others from one goes to the other all over the world used by the vast amount of organization [1]. In Nigeria, a handful of organizations such as Shoprite for inventory and supply chain management. This trend will only increase as RFID technology continues to evolve, improving performance and lowering price points.

5.1. RFID in air-cargo handling

In the future we should have a solution that will cause local air-cargo handling flexible in Nigeria, by applying the use of Radio-Frequency Identification. Presently, there has been much mismanagement of information on managing air-cargo due to faulty handling. Meanwhile, documentation and transfer of goods should be well-accounted for in the sector. The method can be employed here in the use of an RFID system. The program can be designed to give an accurate estimation of a well-documented air cargo transaction, recorded and outputted.

5.2. Sensing Food Safety

One good example of RFID evolution is the increasing interest in using RFID tags as sensors, for example, to monitor food safety on refrigerated trailers. “Let’s say a fruit supplier is sending pallets of pineapples and bananas on the same refrigerated trailer. With each requiring a different temperature to ensure safety,” When one area starts to warm up beyond specification, the RFID tags automatically notify master control and the driver through an on-board vehicle nerve center [8]. In some cases, the tags can automatically cue the compressor to restore the correct temperatures. In other cases, the driver can pull over and check the trailer to make certain the entire shipment maintains safe temperatures and the load won’t be lost. In the event of a food recall, RFID sensors also help ensure all-important traceability.

5.3. Quality Control and More

Some other movements discovering is the use of RFID to ensure supply chain quality control. Organizations are using RFID to track individual shipments and monitor quality control across the supply chain. One organization using RFID for quality control is Correos, the Spanish National Postal Service, which places RFID tags in sample letters sent to various areas of the country. They then follow the RFID with readers throughout the whole process from pickup to delivery, then document where they’ve been successful and where they haven’t. There are many other ways, besides tracking assets that RFID helps instill quality control in transportation and logistics processes and procedures [7].

For example, for transportation companies, RFID can help trucking companies reduce fuel costs with tags placed inside gas tanks automatically recording the amount of fuel and charging the transaction to the system. It eliminates the need for drivers to carry credit cards or cash and reduces the opportunity for robbery and theft [4].” Other examples include using RFID to provide “dead

reckoning” location of assets or people within one meter inside a warehouse or distribution center, and RFID is helping to drive green initiatives such as reusable containers and other returnable transport items (RTIs) and recycling programs.

Third-party carrier Deutsche Post DHL is currently using a Smart Truck pilot project in Berlin to test innovative route planning to deliver better customer service and lower carbon dioxide emissions. RFID tags and readers first ensure that the right packages are on the right truck, and then dispatch sends an optimum route based on real-time traffic conditions. Built-in GPS guides the driver to the first delivery, and RFID checks to ensure the right package has been delivered. Turn-by-turn [9].

5.4. RFID on a Fast Track

Today, RFID is proven technology to provide far-reaching benefits for transportation and logistics organizations [7]. The future of RFID operates far beyond internal closed loop solutions while many of these businesses are successfully exploiting systems, for asset and warehouse management. Transportation and logistics companies in Nigeria are moving inexorably toward deploying open circuit solutions in which every link in the supply chain can utilize the same RFID tags. The industry is already working to fast track the solutions that will get us there, including developing innovative new RFID tagging and reading technologies such as active and semi-active tags, initiatives to enable environmentally-friendly green solutions and solutions to lower supply chain management costs.

Equally important, RFID technology costs are steadily decreasing as adoption continues to grow in Nigeria, thereby allowing a faster return on investment for projects while at the same time allowing profitable RFID deployments across a wider set of materials and goods. In the not-so-distant future, open loop RFID systems will play an ever-increasing role in lifting the curtain of invisibility from the global supply chain, not just Nigeria alone. Delivering a broad range of system management benefits, reducing costs and spurring the global economy to new heights of efficiency, control and Return on Investment (ROI).

6. Conclusion and Suggestions

The need of RFID technology is paramount in every ramification imputable to the speedy growth of technology. Nigeria as a country having a large population of people with different beliefs and culture, the need of real-time data collection and processing has become the basis for security in businesses. So many challenges face the successful use of RFID in Nigeria; these various challenges can all be narrowed to poor awareness of the general public on the use of RFID and lack of steady electricity. RFID has proven itself to be of great importance in every area it has been applied so far. Nigeria needs an explosion of RFID in every field, it can be used as possible, this is because as a commercial nation, and Africans number one investment destination (UNCTAD, 2014) [11]. There is an on bargained need for a move from tradition(local) business methods to modern business methods (the full implementation of technology). Several domestic companies in Nigeria do not only concentrate on domestic trades, but rather also involve in international trading. The method of setup of some of these businesses has also resulted in the traditional practices observed in several companies in Nigeria.

To better adapt to technological development in Nigerian markets, the psychology of company owners in Nigeria needs a great shift from lay man’s business to international standard companies. The poor implementation of point of sale (POS) technology in Nigeria reveals the weakness of many business management teams to adapting to evolving technology. Change in Nigeria follows a chain reaction: Nigerian’s do not change unless there is a cogent reason for a change. To modify mindset of the people of this vast country in order for Nigerians to flow with the trends of the growing technology in RFID, Institutions that make-up the upper levels in the chain must be properly structured to ignite change. Such organizations include:

- Businesses
- Government/non-governmental Agencies
- Social/Religious Groups, etc.

Government should look into the way companies are formed in Nigeria and ensure businesses meet certain conditions before they are authorized to function. If proper conditions, including conditions that allow for natural adaptation to, change in technology are well implemented, businesses will quickly flow with growing technology, thereby giving customers opportunity to accept these technologies as part of life.

There must be a restructuring of the policies of these institutions to favor the adaptation to technological growth, which will create an indirect natural awareness sensor to the general public.

The challenges of inadequate power in Nigeria makes the reliance on RFID a nightmare. Discussing deeply on the topic “factors and solutions to inadequate electricity supply in Nigeria” on this paper will be seen as killing a dog with a broom stick. It is because the problem of inadequate power in Nigeria that is referred a mystery by some Nigerians despite the riches of Nigeria are beyond the scope of this paper. However, we focus on means of implementing and sustaining RFID technology in Nigeria despite this significant limitation. Alternative energy sources can be used as an alternative to poor power supply in Nigeria. This can attract additional charges for running such alternative energy sources, considering the benefits (value, security, profit) RFID adds to an organization, these extra charges could worth it [3].

In conclusion, institutions in Nigeria have roles to play in making the general public receptive to developing technology. Development should also be directed to rescuing Nigeria and several African countries from traditional (local) methods to high improved technological methods. Radio Frequency Identification (RFID) will help keep Nigeria in track with developments around the world and also increase every area of production and services.

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