RFID TECHNOLOGY: A CONTRIBUTION FOR MODERN ERA

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Abstract—

A library is a growing Organization, as it grows in size the problems associated with the maintenance and security of the documents also grows. The researchers have always helped the librarian in solving their problems. To solve the problems of space and the time they have taught librarians to digitize the documents and share over network. Bar-codes have served the librarians and libraries for a long time, and now it is slowly getting replaced by RFID. Radio frequency identification (RFID) technology has undergone rapid developments in recent years. RFID is a revolutionary technology for modern libraries. RFID with a variety of sensors (such as temperature, pressure, and motion) to collect rich data in support of timely decision making and situation analysis. After a review of the current state of development of the knowledge domain, the future directions for RFID and sensor technologies research are proposed at the end of the paper. This paper is written for those who are interested in leveraging RFID and sensor technologies and transforming that field of study into a formal discipline in this paper we3 describe the design of a visualization system using the RFID and sensor techniques. This paper presents a sensor-enabled logistics Architecture framework leveraging on the integrated usage of RFID and sensor technologies to address different vulnerable voids. It is usually urged that the two emerging technologies, Radio Frequency Identification (RFID) and sensor technology are inadequate in physical assets management.

***Index Terms*— Radio Frequency Identification (RFID), Sensor Technologies, RFID tags, Literature review.**

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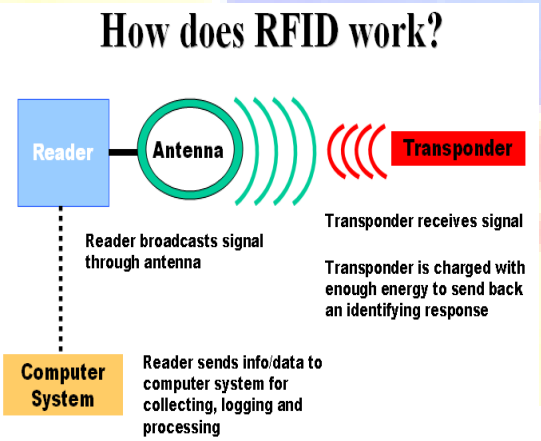
I. INTRODUCTION

RFID concept technology was developed in 1948 but it has had to wait fifty years before it has been able to deliver on its original promise. The advent of tiny integrated circuits (Chips) allowed solution designers to add intelligence to the movement of goods through the supply chain and when a chip and an aerial were attached to a sticky label the RFID "Tag" was born. The tag now come in all shapes and sizes and are attached to a staggering range of items with a wide range of applications from cars(Electronic Tools)to earring(Brand Protection)RFID is also called dedicated short range communication(DSRC).RFID technology has undergone rapid development in recent years. From the mid-1990 onwards, it has gained acceptance as one of the business automation technologies for enhancing efficiency of asset identification and tracking. Indeed, users can simply label the items with RFID tags to visualize and detect the tagged object ubiquitously. Attracted by this unique and automatic identification capability , an increasing number of industries have shown interest in adopting RFID technology in their business operations, particularly in fields of manufacturing (4)-(6),(32) Logistics (7),(8), (22),asset management(9)and healthcare (10)-(12).Apart from these applications recent RFID research focuses on formulating research agenda (13)Cost benefit analysis(14).These types of discussions provide valuable insights for both academics and practitioners involved in employing RFID technology in business operations .Meanwhile lowering of the tag price has been identified as a critical factor that5 determines the diffusion rate of RFID system implementation in companies also. RFID is a technique that uses wireless radio to identify objects from a distance, without requiring line of sight or physical contact (4). Recently, lower cost and increasing capabilities of RFID technique and the creation of the electronic product code (EPC) have made this technique more attractive. FID technology is an automatic identification method to store and retrieve data with RFID tag and transponder. This technique will be further studied to suit the environment of distributed manufacturing network and intrinsic operations. A sensor Integrated RFID Network platform (SINET) is introduced for cold chain logistics in Shenzhen-Hong Kong food supply chain. It integrates RFID and sensor technologies in a soft binding manner to best facilitate the current cold chain logistics applications. By monitoring food's storing and delivering conditions, logistic data are uploaded to SINET to seamlessly supervise the whole cold chain's operation and improve food safety. The structure of SINET and RFID enabling Shenzhen-Hong Kong

integrated food safety and supply chain information public platform is explored. RFID is a data collection technology that uses electronic tags for storing data. The tag also known as a label "Electronic label" "Transponder" or "Code Plate "is made up of an RFID chip attached to an antenna.

Although RFID technology has reached the mainstream in contemporary business operations, it lacks the capability of obtaining environmental data and providing information on the condition of the tagged objects. Since the main purpose of RFID technology is to detect the [presence of tagged objects, to bridge this limitation, more research activities have emerged from the integration of RFID with a variety of sensors. As a part of RFID and sensor technology research, this paper focuses on surveying the current development of such integration through review and classification of published articles from 1998-2010 in order to explore the technologies leveraging framework and development trend emerged from that period. The classified results aim to highlight the current development and applications of the integration of RFID and sensor technologies. Furthermore, future research directions in the domain covered by this review are also proposed at the end of this paper.



ii. **RFID Technologies in libraries**

The CONCEPT of RFID can be simplified to that of an electronic barcode and can be used to identify, track, sort or detect library holdings at the circulation desk and in the daily stock maintenance. This system, consist of smart RFID labels, hardware and software, provides libraries with more effective way of managing their collections while providing greater customer

service to their patrons. The technology works through flexible, paper-thin smart labels, approximately 2"x2" in size, which allows it to be placed inconspicuously on the inside cover of each book in a library's collection. The tag consists of an etched antenna and a tiny chip which stores vital bibliographic data including a unique Accession number to identify each item. This contrasts with a barcode label, which does not store any information, but merely points to a database. These smart labels are applied directly on library books and can be read with an RFID interrogator/scanner. Line of sight is not essential for reading the tags with the scanner, therefore, the books require much less human handling to be read and processed. Middleware or Savant software integrates the reader hardware with the existing library automation software for seamless functioning of circulation. The information contained on microchips in the tags affixed to library materials is read using radio frequency technology regardless of item orientation or alignment. It provide s a contact less data link, without need for line of sight, for example, the documents in the shelves or cardboard boxes can be checked without removing or opening. RFID has no concerns about harsh environments that restrict other auto ID technologies such as bar codes. Tags have a discrete memory capacity that varies from 96 bits to 2 Kbytes. In addition to tags an RFID system requires a means for reading or "interrogating" the tags to obtain the stored data and then some means of communications this tag data to library information system. RFID based systems have been implemented for efficient document tracking purpose throughout the libraries that combine, easier and faster charging and discharging of documents, security of materials, inventorying, stock verification and shelf handling.

iii. **Requirement for RFID and Sensor Technologies**

In addition to system infrastructure for executing different applications to capture data and information into repository, as well as networking infrastructure for internal and external data communications ranging from business transactions to safety and quality monitoring, different RFID and sensor technologies are needed to support the food safety and quality management. Regarding identification and traceability, the supermarket management has decided to use of a

mix of barcodes, passive RFID tags, and sensor-enabled active tags. Such a decision has been made mainly due to the most challenging aspect in food retailing industry- the relatively low profit margin and the large volume of many different types of food items sold daily in the supermarket. Because of this cost limitation, the barcode technology is currently a viable option to tag each food product unit. Passive RFID tags are designed to be used in cases or boxes. Some of the cases and boxes circulate within supply chains in the supermarket and thus the corresponding RFID tags can be reused. Sensor-embedded RFID tags are relatively expensive but they are able to capture in situ environmental conditions for food products. Also because of its size like a mobile phone, sensor-embedded RFID tags are applied to reusable pallets. Through the aggregation functionality in EPC global Architecture Framework, cases and its food product items can be associated with the corresponding pallet's identification for accessing sensor data. The operational performance of components, machines and process can be divided into four states: normal operations state, degraded state, maintenance state and failure state (21).These four states of machines have drastically affected the key elements of competitiveness within the manufacturing system including quality, cost and productivity. Therefore, accurate measurement of machine states is critical for manufacturers to fine tune the manufacturing schedule and maintenance strategy thereby making sure the machine is operated at desired status. During the last decade, many sophisticated sensors and computerized components are capable of delivering data about machine's status and performance (22).The operation of sensor to be record the performance of machine by transferring recorded sensor signals to the data processing device, and the data is used to reveal the performance of the machine at certain aspect. They include time series (23), frequency domain analysis (24) and joint time frequently domain (25).In the literature of sensor application study, numbers of researches demonstrate how the sensor captures machine states and its degradation rate. For, example, an intelligent maintenance tool termed "Watchdog Agent" was proposed to track health degradation rate of machine and pinpoint which components of a machine are likely to fail (22)The Watchdog Agent assesses and quantifies the machine degradation through quantitatively describing the corresponding change in sensor signatures. It seems that few research study show how to apply sensor data into the machine operation planning and flexibility measurements in a manufacturing system. The first tier is a data capturing tier. It adopts two kinds of data capturing technologies: sensor and RFID Different

types of sensors such as temperature, current, pressure, vibration and limit switch are used to capture the characteristics and statuses of different machines in the shop floor such as operation, setup and shut down periods. On the other hand, RFID technology is adopted to capture the identity and status of tagged objects that are processed by the machine in the shop floor. The RFID technology involves three elements RFID tags, an antenna and readers. The RFID tags are attached to the work-in-process (WIP) goods that are processed by different shop floors during the production. Each tag contains the product information such as its name, item number, type, model, and color size customer name and delivery date. In addition, RFID tags are attached to the material handling equipment such as forklifts.

Flow Chart for issuing Alerts

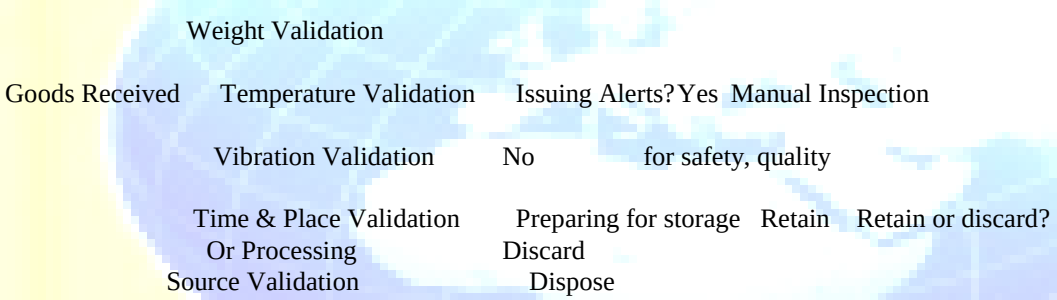


Figure Shows Flow Chart for Issuing Alerts Based on Sensor Data Assessment

In terms of sensor, data, the supermarket management has determined to capture temperature, humidity, and vibration sensor data for monitoring purposes. The food, code published by US Food and Drug Administration provides the bias to develop various temperature- based sensor assessment models.

Figure. Shows some potential violations of normal or accept-able conditions based on identification, traceability, and monitoring information. When food products are being received in pack houses, fresh food center, or retail stores, sensor data about weight, temperature, and vibration can be read and analyzed for abnormal activities.

IV CONCLUSION

THE PURPOSE OF OUR RESEARCH WAS TO PROVIDE A FRAMEWORK FOR CLASSIFYING LITERATURE ON LEVERAGING RFID AND SENSOR TECHNOLOGY, AND TO IDENTIFY RELATED FUTURE RESEARCH DIRECTION. WE ACHIEVED OUR GOALS THROUGH A RIGOROUS KEYWORDS EXAMINATION OF THE RELATED LITERATURE THAT IDENTIFIED ARTICLES FROM 10 REFERRED JOURNALS PUBLISHED IN THE PERIOD FROM 1998-2008. THE REVIEW, CLASSIFICATION, AND ANALYSIS OF THE EXISTING LITERATURE REVEAL THAT THE RECENT DEVELOPMENT AND FOCUS HAVE BEEN ON THE DESIGN OF SENSOR-BASED TAG, READER AND ANTENNA WAS WELL AS THE DEVELOPMENT OF INTEGRATION FRAMEWORK. STUDIES ON THE STANDARDIZATION OF RFID AND SENSOR DATA, AS WELL AS SECURITY ISSUES ARE SUGGESTED TO BE PURSUED FURTHER. FURTHERMORE, LESSONS LEARNT AND CASE SHARING WILL ALSO CONTRIBUTE TO THE BODY OF KNOWLEDGE ON THE IMPLEMENTATION AND ADOPTION OF SYSTEMS THAT INTEGRATE RFID AND SENSOR TECHNOLOGIES. FINALLY, IT IS HOPED THAT THIS RESEARCH HAS PRODUCED A COMPREHENSIVE LITERATURE REVIEW FOR THOSE WHO ARE INTERESTED IN RFID AND SENSOR TECHNOLOGIES.

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