

Radio Frequency Identification (RFID) for Warehouse Management System

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UNIVERSITI TEKNIKAL MALAYSIA MELAKA

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This report is submitted in partial fulfillment of the requirements for the award of Bachelor of Electronic Engineering (Telecommunication Electronics) With Honors

Faculty of Electronic and Computer Engineering
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DECLARATION

I declare that this report entitle “*RFID for Warehouse Management System*” is the result of my own research except as cited in the references. The report has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

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DECLARATION

“I hereby declare that I have read through this report entitle “RFID for Warehouse Management System” and found that it has comply the partial fulfillment for awarding the degree of Bachelor of Electronic & Computer Engineering (Telecommunication)”

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Date: 23 APRIL 2010

DEDICATION

First and foremost, I would like to express my appreciation to the GOD for giving me the strength and knowledge to encounter obstacles in my project. Then, my sincere thanks would also for my beloved parents for giving me the full support who shore up whenever I needed that really help me to reach this stage of my project successfully. A big thank you goes to my sister, brother and my friends to be so compassionate and cooperative towards me in doing my project.

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ABSTRAK

Radio Frequency Identification (RFID) untuk Sistem Pengurusan Gudang merupakan sebuah sistem yang direka untuk memantau produk atau barang yang bergerak masuk dan keluar daripada gudang. Teknologi RFID yang diadaptasi dalam projek ini adalah bertujuan untuk meningkatkan keberkesanan penggunaan gudang untuk beroperasi dalam sesebuah syarikat.

Projek yang menggunakan pengantaraan Graphic User Interface (GUI) yang dirancang menggunakan Visual Basic atau dikenali sebagai bahasa pengaturcaraan vb.net. Antara muka sistem telah berinteraksi dengan peranti RFID untuk memantau persediaan secara automatik. Sistem yang direka akan memberikan persediaan yang tepat keatas produk atau barang di gudang. Sistem tersebut juga direka untuk membantu pengurusan gudang untuk menambah data baru atau mengemas kini data yang sedia ada dengan mudah. Disamping itu, sistem ini juga boleh membantu pengurusan gudang untuk membuat akaun asas. Secara keseluruhan konsep yang diaplikasi dari projek ini adalah untuk memantau gudang dengan berkesan dengan mengurangkan masa operasi gudang tersebut.

ABSTRACT

Radio Frequency Identification (RFID) for Warehouse Management System is a system that designed to monitor the products or items that moving in and out of warehouses. The RFID technology had been implemented in this project to improve the efficient of the warehouses to operate in companies.

The project that uses Graphical User Interface (GUI) that designed using Visual Basic or known as vb.net programming language. The interface of the system had been interacted with the RFID device to monitor the inventory automatically. The system that designed will give the accurate inventory of the product or items in the warehouses. The system also designed to help the warehouses management to add new data or update the existing data easily. Beside that, the system also can help the warehouse management to do basic accounts. Overall concept of this project is to monitor the warehouses efficiently by reduce the operation time of the warehouses.



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CHAPTER 1

INTRODUCTION

In this era new of technologies, there is a lot of improvement have been made to help to reduce the obstacles of the human beings in daily life. In the list of improvement Radio Frequency Identification (RFID) become a powerful emerging technologies to help varies type of application. This technology has been around for many years, but it is only in the past few years that have seen a surge in its acceptance and massive growth in its use. In this project, it's rather used in to manage the warehouse management in companies. There is a lot of descriptions have been to describe about RFID, where all the description about the device given according to the applications that they had used this RFID.

For this project, it is best to describe this device as a capturing data about an object without using human to read the data. Beside that, it is also a generic term that is used to describe a system that transmits the identity (in the form of a unique serial number) of an object or person wirelessly, using radio waves. It is grouped under the broad category of automatic identification technologies. The idea of an RFID system is to enable data to be transmitted by a portable device, called a tag, which is read by an RFID reader and processed according to needs of a particular application. For this project, the RFID is used to monitor the items or product that moving in and out of the warehouses.

Currently, the existing system operates manually which have a lot of drawbacks such as stock control is not well managed. Therefore, this system is

designed and developed in order to provide a convenient way to monitor the stock in warehouse. The system is using software such as Visual Basic and hardware RFID reader it features the use of RFID reader technology to update the warehouse in real time situation.

1.1 Objectives

The main objective of this project is to create a Graphical User Interface (GUI) for proper inventory system. The GUI had been designed by using Vb.net programming language. It also implemented to detect the RFID tag on the product by the RFID reader. Furthermore, it also to ensure the reader sends the data to the database. This project is to monitor the items or product that moving in and out of the warehouses without the help of human manual data entry. By doing this, it's tremendously reduced the operation time of the warehouse management. Besides that, the advantage of using RFID devices if compared to bar codes system is the RFID can detect more than an items that pass by the reader at same time and no need line of sight detection. Rather than that, it also can keep accurate inventory records for all the items in the warehouses.

1.2 Scope of Project

A Graphical User Interface (GUI) is created in Visual Basic (Vb.net). GUI interface is the main part of this project, where the user monitor the all process flow using this interface and give command to the RFID reader to work as what had been programmed such as read the tags. The RFID reader is used to detect the RFID tag placed on the product. The reader will operate once the interfaces give command to detect the tags in the product. The connection between the hardware and vb.net are made by using coding that declared the com port of the hardware to be identified by the computer. Rather than that, the software of the hardware also is installed and is used to do connection of the read tag to the system. The data from the reader is

ensured to be successfully saved in the created database. Database table had been created in MS Access 2007 for all the tags to be identified by the system of the product. Hence, all tag had been scanned and the data entry about the product had been made such as product name, price, quantity, and description.

CHAPTER 2

LITERATURE REVIEW

2.1. Problem Statement

The existing problem in warehouses nowadays is most of the system used is depends on manual data entry. It's not that if do a manual data entry is not fine but the tendency of the human to provide errors which cost further consequences is undeniable. Monitoring the database is not an easy job to describe about, but the unpredictable mistakes in manual system can cause cost an unexpected loses in the companies. It's because the profits or income of the companies is rely on the warehouse management department of the production companies. The existing warehouse system does not have a proper inventory database. If the database is improper the warehouses management needs time to identify all the items and product exist in the warehouses. The tendency for the warehouse missed out to order the product that in demand can cause the retailer or buyer to look for other companies is very high. The lost of such customer can cost waste in term of income. The existing warehouse system inventory databases provide more wastage in terms of time and money. The problems that exist may look tiny but the cause of this problem can cost until the companies bankruptcy.

2.2 Background Study

2.2.1 RFID Technology

The RFID for Warehouse Management System, when you hear the term RFID used today is most commonly refers burgeoning business application for managing

and tracking supply chains, especially in the materials, manufacturing, and retail industries. There is two different concept or application had been combined together to manage a system to work efficiently. The two different concept or application contain of RFID and inventory system.

The RFID technology is a relatively new technology. It is used mainly for automated data collection, similar to barcodes. RFID is easily integrated with Barcode technologies to optimize data capture and exchange. RFID technology was invented in 1948, but it was not mainstreamed for commercial applications until the 1980s. One of its first known applications was during World War II, when it was used by the British radar system to differentiate between German aircraft and their own aircraft with attached radio transponders.

In 1977, the technology which had been developed in government labs for these applications was transferred to the public sector by Los Alamos Scientific Laboratories (LASL) resulting in two companies forming to explore possible civilian uses. These companies were Amtech in New Mexico and Identronix Research in Santa Cruz, California [6]. Later after 2 years, a low pass frequency (125 kHz) transponder or tag had been developed in companies featuring in small transponder or tag. This type of transponder at 1st was encapsulated in glass and injected under the cow's skin to monitor or track the cows. The problem was that cows were being given hormones and medicine when they were ill. But it was hard to make sure each cow got the right dosage and wasn't given two doses accidently. [7] Furthermore, automatic feeding without overfeeding could be accomplished when the animal's unique ID code was obtained from the transponder. [6] Hence, they came out with a solution to track the cows that already given dosage by using the tag to input the data of the cows in right track. Since, it's reduce the accidental to happen the system still been used in cows around the world.

After that, the concept has been implemented in companies to track or detect truck that going in and out by putting the transponder in the truck and the reader at the

gate of the companies at secure facilities. The gate antenna would power up the transponder in the truck, which would react with an ID and potentially other data, such as the driver's ID. [1] This system was commercialized in the mid-1980s when the Los Alamos scientists who worked on the project left to form a company to develop automated toll payment systems. [1] Since from that, this system had widely used in roads to monitor and collect toll money from the users.

Eventually, after the low frequency had been commercialized, then the companies move up the radio frequency to high frequency (13.56MHz). Companies, particularly those in Europe, began using it to track reusable containers and other assets. Today, 13.56MHz RFID systems are used for access control, payment systems (Mobile Speedpass) and contactless smart card. [1] In the early 1990s, IBM engineers developed and patented an Ultra-high frequency (UHF) RFID system. UHF offered longer read range (up to 20 feet under good conditions) and faster data transfer. IBM did some early pilots with Wal-Mart, but never commercialized this technology.

In the mid-1990s, IBM sold its patents to Intermec, a bar code system provider. Intermec RFID systems have been installed in numerous different applications, from warehouse tracking to farming. But the technology was expensive at the time due to the low volume of sales and lack of open, international standard. [2] UHF RFID got a boost in 1999, when the Uniform Code Council, EAN International, Procter & Gamble and Gillette put up funding to establish the Auto-ID Center at the Massachusetts Institute of Technology. [1] The idea was to set only serial number on the tag to maintain the price down (a simple complex chip with more memory). Data associated with the serial number on the tag would be stored in a database that would be accessible over the Internet. [1] Between 1999 and 2003, the Auto-ID Center gained the support of more than 100 large end-user companies, plus the U.S. Department of Defense and many key RFID vendors. [2] The technology was licensed to the Uniform Code Council in 2003, and the Uniform Code Council created EPC global, as a joint venture with EAN International, to commercialize EPC technology. The Auto-ID

Center closed its doors in October 2003, and its research responsibilities were passed on to Auto-ID Labs.

Future of RFID is unsure, however, technology at this time is to stay. Companies have lots of obstacles to conquer to make technology a possible choice to implement. Privacy issues will continue, even though price for RFID system will reduce. Only recently, due to technology advances have the price points dropped to where RFID is now feasible for companies to adopt. For RFID to be winning, companies should work with the privacy supporter groups to expand a fair means to apply RFID without disaffecting their clientele. [2] The acceptance is rising at a very speedy rate among lots of countries are now taking RFID technology in various sectors like business, marketplace and manufacturing. Some of the biggest retailers in the world like Albertsons, Metro, Target, Tesco, Wal-Mart and the U.S Department of Defense also plan to use EPC technology to track goods in their supply chain. [1]

At present, RFID is used all over the place. From the animal tracking to the container tracking, as well as credit cards to the library cards, we see use of RFID. Few of RFID applications can remove human interference completely. [2] RFID technology not just to provide better functionality but as well greater clearness. But, as each coin has both sides, RFID technology has few side effects as well. The utilization of RFID creates problems about privacy of the individual. These concerns rise from the future of RFID tags attached to the products that consumes buy. [2]

2.2.2 Warehouse / Inventory System

Warehouse or Inventory management is the heart of the distribution business. A warehouse management system helps to efficiently manage the operation of warehouse to control costs and ensure a smoothly running sales and fulfillment operation. [6] Regardless of the form of inventory that a business has, inappropriate management of such inventory can result in over ordering of stock, under ordering,

and loss. Mismanagement of inventory in a warehouse or in a business can even result in theft: items from storage can be stolen without the knowledge of the business owner if the inventory is not properly tracked. [6] Inventory management and proper warehouse management puts business owners in a position in which they know what they have lost in the event of theft, vandalism, or some other unforeseen incident arises: knowing the value of inventory ensures that the business owner will be eligible for more accurate reimbursement from the insurance company.

2.2.3 RFID Implementation in Warehouse Management System

Wal-Mart was among the first commercial enterprises to select RFID technology to achieve improvements in the inventory supply process and theft control. Wal-Mart started the process of implementing RFID throughout its retail distribution chain by requiring its top 100 suppliers to use RFID tags by year-end 2004 on the pallets and cases they shipped to Wal-Mart. However, in 2004 due to the status of standards and limited tag production capabilities, manufacturers of RFID tags were unable to meet the volume of demand within Wal-Mart's desired time frame. As the standards further evolved, production capabilities expanded and price points kept dropping, Wal-Mart's implementation is now in full swing with most of their top suppliers delivering to all of Wal-Mart's distributions centers.[6]

The advent of Radio Frequency Identification (RFID) technology has created a tidal wave of information, research and articles that praise this new technology. Major retailers such as Tesco, Marks & Spencer, Prada and never forget Wal-Mart have already start utilizing this new technology in their supply chains, although some have adopted a wait and see approach. [7, 8] One of the biggest benefits RFID provides is that items can be traced across the supply chain and can be located in a warehouse within seconds. This is a very attractive advantage to businesses as they seek to make their supply chains have increased rapidly in the past few years[7], there are still many retailers can generate. [8] In the recent years the visibility of RFID in the media and

trade press has sharply increased mainly due to recent trials and implementation strategies by some high profile companies.

RFID use has started to penetrate other corporate supply chains, but in many cases these implementations are closed loop systems. In other words, the RFID is deployed within a particular corporation's supply chain, but not between them and their business trading partners. Plus other applications like not leaving tools behind in the airplane after maintenance.

2.2.4 Summary

The study about the RFID and the warehouse management system shows how important the application plays the role in the business corporate. Inventory management is a primary part of today's businesses. The warehouse is the places where the profit or cash flow of the business corporate relies on to make the business stable all the way without loss or flop. To make inventory to be efficient enough to make the businesses corporate maintain and avoid the mismanagement to be occur, the RFID technology can play an important role to overcome this problem to the warehouses. Even though all the product have to tagged with the RFID tag to be read by the RFID reader to save the data into the system causes some cost to business corporate, but the beneficiary to the business corporate after the implementation of the RFID is worth.

All the way, the bar code scanning system make the people life easier but still the bar scanner have to hold by a person to scan the bar code product. It still become burden to the person that have to monitor the products or items that they sale or receive. This project will become a major transfer for the bar code user to change to automatic scanning system where the product or items can monitor by the RFID reader itself without relies on the human capacity. It makes the management of the warehouses to manage it more efficiently and smoothly without any errors in calculation and mismanage on the products or items.

The study on background about this project, the implementation of the RFID in warehouses had been started by some of the retailer such as Wal-Mart, but they still rely on the other company to use RFID tags to be tagged in their company products. So that the product that enter in the RFID reader user warehouses can really benefits of the use of the RFID technology in the companies. It's still become major problem for RFID technology to be implemented in the warehouses. Since the price of the tag of RFID becoming less compare to before, such a project can really help the business corporate to get benefits of it.