PalArch's Journal of Archaeology of Egypt / Egyptology

LOGISTICS SYSTEM BY USING RFID TECHNOLOGY

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Darren Leon, Intan Farahana Binti Kamsin. Logistics System by Using RFID Technology-- Palarch's Journal of Archaeology of Egypt/Egyptology 17(7), 8659-8667. ISSN 1567-214x.

keywords: Logistics System, RFID Technology, Web Application.

ABSTRACT:
In Industry 4.0, rising of system usage by utilizing the new emerging technology like Internet of Things, Big Data, and Cloud Computing has become very important for many industries especially Logistics industries to expedite their business operations. The purpose of this study is to understand what is needed for one of the Logistics company which is Sarana Tata Indoraya to improve the low operation level and reduce the high cost. The analysis of developing the new system will be based on Manager's and 5 of Sarana Tata Indoraya employees' opinion which are collected from Interview. The development of Web-based Logistics system by utilizing RFID technology has become the important role in improving Sarana Tata Indoraya effectiveness and efficiency in their business operations. From this research, it is hoped to help the reader especially in Logistics area to understand better about some of the concept that needed to develop the Sarana Tata Indoraya Logistics system for reducing the high cost and improving the Sarana Tata Indoraya business operations.

INTRODUCTION

Sarana Tata Indoraya is one of Logistics company in Indonesia. Their operations are still done without system. With the Logistics system develop for Sarana Tata Indoraya, it can improve their operational management and compete with other logistics company in this Industry 4.0 era. This system used Web Application and RFID to develop the Logistics system for Sarana Tata Indoraya. Therefore, in this research present the idea of developing the logistics system for Sarana Tata Indoraya by understanding what Logistics, Logistics system, Web Application and RFID technology are.

LITERATURE REVIEW

Logistics

Before developing the Logistics System, need to know first about what Logistics is. [9] defined the Logistics is the management of the product flow between the point of origin and the point of the consumer consume the product to meet the requirements, for example customers or companies, while [1] claim that Logistics is part of the supply chain that handle the transporting and storing effectively and efficiently the products and information flow. Another Logistics definition from [20] is a vast service industry, connected of traffic and transportation, delivery and storage, packaging, information, and other resources to support the constant economic development. Based from the definitions, it can be said that Logistics is an operation that deals with the management of transporting or delivering the product and information flow to the consumer.

Industry 4.0 has influenced many sectors growth especially Logistics sector. [14] said that Industry 4.0 is the new manufacturing technologies, which allow vertically and horizontally integrated production plants, flexible processes allowing individualized mass production, intelligent machine which can exchange data among themselves and control the process of productions and logistics themselves while, [5] stated that Industry 4.0 is growing advances using digital transformation to change and modernization of entire value chain. Another definition from [13] is the set of transformational changes in manufacturing and industrial processes that support the next industrial next industrial revolution and the transition to smart manufacturing. From the definitions, Industry 4.0 can be defined as a modernization of manufacturing and industrial processes by using the new emerging technologies such as: Artificial Intelligence, Internet of Things, Big Data and many others.

Logistics System

After knowing terms of Logistics and Industry 4.0, the Logistics system can now be developed. [3] emphasize that Logistics System is one of the transportation terms for coordinates industrial management functions, modern system logistics applications that designed for serving and supporting various business and industrial functions, while in point of view of [17] said that Logistics system is modern logistics system based on IT use which utilize the information in the planning, managing and control. Another point of view from [19] stated that Logistics system is a system that manage cargo transformation and information flow. Based on their definitions, Logistics system can be defined as a system that utilize IT to handle the flow of various businesses and industrial processes.

For the Logistics system components, [3] the logistics system has many system components that consist of the supply chain management core services such as: Order Processing, Warehouse and transportation, and Financial Management, while [17] said that Logistics system has four subsystems such as: (1) Order Processing, inquiries, and information storage capabilities, (2) scientific management control planning and implementation functions, (3) Accurate and timely feedback function, (4) Timely statistical analysis of data and decision-making functions. Based on [7], Logistics system has several

modules which consist of business management system, warehouse management system, distribution management, and accounting management system. Therefore, there are various kind of components that logistics system has. There are order management, warehouse management, distribution management and accounting management.

Web Application

The Logistics System will be developed by utilizing the Web Application. According to [6] Web Application is a system that allows users to submit and retrieve data to/from a database via internet using their web browser, while based on [4] Web Application is an interaction system based on browser or server model. Another definition based on [15] Web Application is an application program that work in relation with a web server to execute a variety of task from the simple until complex transaction. From the definitions above, Web Application can be defined as a system that allow users to do specific function by using web browser.

For the Web Applications components, [6] stated that Web Applications has a web server, application server, database server that integrated each other and connect to the internet, while based on [4] Web Application has MVC mechanism which are Model (data layer), view (presentation layer) and controller (control layer). Besides those statement, there is [8] claim that Web Application has a three-tier architecture which consist of application logic, presentation and data management that are developed and maintained in a different tier. Based on those statements, the components of Web Applications of three tiers which are Presentation layer (user interface), Application layer (logic), and Database Layer (data management).

In the application layer, programming language is the one which perform the calculation or other logics in Web Application. [6] specify that the Web Application are written using Java Programming Language and [4] also state that Web Application is depending on Java Language as the programming language. But [8] said that Web Application not only can be supported by using Java but also JavaScript, Ruby, and PHP. From the statements above, there are a lot of languages that can support the Web Application development such as: Java, JavaScript, Ruby, PHP and etc. But in web application, the most used language is Java.

RFID Technology

Besides Web Applications, RFID technology will also be utilized to develop the Logistics system. [18] said RFID is a non-contact auto-recognition technology. RFID recognizes the object by using radio frequency signal to track the goods and exchange data faster, while [3] claim that RFID concept is almost same with barcode technology, it requires a proper optical reader and special tags applied on goods in order for the goods to be tracked. [10] emphasize that RFID is an automate identification technology and data capture technology that relies on radio signal transmission. From the definitions, RFID can be said is a tracking technology that using radio signal transmission to track the products information.

There are some components that operate the RFID technology. The compositions of RFID system based on [18] are consist of three components which are (1) Tag: consists of coupling cells and chips, there is an antenna in the tag for communicating with radio frequency antenna. (2) Reader: to fetch the information in the tag. (3) Antenna: transmit radio frequency information between tag and reader, while [3] said that the component of RFID consists of two components which are an integrated circuit to store and process information, and an antenna to transmit and receive the signal. Beside those statements, [10] emphasize that RFID system is consisting of three elements which are transponder, reader, and middleware. Transponder is the RFID tag to hold data that can be read and/or written, reader that communicate using radio signal with RFID tags and deliver information in digital format to the middleware or the system that connect the RFID hardware with and enterprise applications. From the components mentioned above, RFID system can be said the composition of tags to store information and communicate by using the antenna as the signal transmission to the reader and the reader will fetch that information then deliver the information to the system.

Similar Systems

There are two systems that are similar to the Sarana Tata Indoraya' system. They are Longitude World system and Blue Yonder system which formerly known as JDA system. These two similar systems are web-based system.

Figure 1 Longitude World Interface

Figure 2 Blue Yonder Interface

Based from the comparison table, shows that Longitude World's system and Blue Yonder's system only have three and four criteria from overall criteria,

while Sarana Tata Indoraya's system has fulfilled all the criteria. Due to many tracking issues in these days, there are a lot of people cannot track their shipment location. The people need to know the real time location of the shipment so they can know whether their shipment is on the right track or not. Therefore, based on the tracking issues, there is a need to develop a system which consist RFID for this system.

For the conclusion, there are five criteria in the Sarana Tata Indoraya's system. There are transportation management, Customer Relationship management, Order Management, E-Invoice and RFID as the additional criteria that are not possessed by Longitude World's System and Blue Yonder's System. It will make the Sarana Tata Indoraya's system has a better tracking than other systems that are not implement the RFID technology.

Table 1 System Comparison

Systems / Criteria	STI's System	Longitude World's System	Blue Yonder's System
Transportation Management	✓	✓	✓
Customer Relationship Management	✓	✓	
Order Management	✓		✓
RFID	✓		
E-Invoice	✓	✓	✓

PROBLEM STATEMENT

Based on [2], there are many industrial logistics companies that carry out their operations under a traditional logistics method. In this method, the systems are not integrated and most of the coordination is done by using phone which are very high-price and not effective. [16] Zhou also stated that the operations of traditional logistics is costly, and the management is not effective.

AIM AND OBJECTIVES

Aim

To improve the efficiency, effectiveness and reduce the cost of Sarana Tata Indoraya company's business operational.

Objectives

- To develop a RFID technology to track the shipment information
- To provide a medium for the registration shipment request in Sarana Tata Indoraya Web Application
- To change the invoice from manual to computerized which is E-invoice system.
- To provide a transport management for increasing the accuracy of order fulfilment.
- To provide a Customer Relationship Management to analyse customer's characteristics.

RESEARCH QUESTION

- How will the RFID technology work as the tracker of the shipment?

- How could the Sarana Tata Indoraya Web Application provide a medium for the order registration?
- How will be the manual invoice system change E-invoice system?
- How will the transport management increase the order fulfilment accuracy?
- How will the CRM help in analysing the customer's characteristics?

SIGNIFICANCE OF RESEARCH

This project will affect customer experience because there is a platform for customers to make their shipment orders. Therefore, not require using third party platform like Gmail or by calling through phone. They also can track the shipment by using the RFID technology. The system will contribute to the effective of the work of the employees since the system will manage the incoming order and the invoice management more efficient and effective.

RESEARCH METHODOLOGY

For the qualitative method, the chosen method is interview. The interview will be addressed to four employees and one manager of Sarana Tata Indoraya company. Interview is one of the qualitative methods that give open-ended questions in a structured way with the individual within a small number of respondents for gaining their perspective about the particular idea, system and etc. Interview usually done for collecting detailed information about the research questions. The researcher can clarify directly about an issue for further understanding from the data that been collected during the interview session which is why it is good for measuring the behaviour, opinions, preferences and etc [11].

The Sampling Method

The selected sampling method for the interview is convenience sampling also known as availability sampling. This sampling method is a type of non-probability sampling that focus on gathering information from members of the population who are available to participate in the study [12]. The members for this study will be focused on the manager of Sarana Tata Indoraya and some of the employees.

The reason of using convenience sampling because it gives several benefits while gathering the information. Because of this sampling method is focused on availability, the data collection can be facilitated in short duration of time and the availability make this method easier to be conducted instead of looking for respondent which is quite troublesome. This method is also cheaper because of need less planning and repeated call backs.

Basically, the convenience sampling will be done using interview. The manager and some of the employees will be asked with some questions related to business process of Sarana Tata Indoraya. After gathering the information, the collection of the information will be used to analyze what problem is of or what is needed in the system to improve the quality of the business process.

RESULTS AND DISCUSSION

Basically, the system's function will be differentiated according to the user's login. There will be three types of users which are Customer, Employee, and Manager.

For the customers, they can make a registration for ordering the shipment. After the shipment has been requested and the invoice already been made, the customers can make the payment based on the invoice given. The systems also enable real-time tracking for the users to track the shipment according to the unique tag ID and view the shipment details.

For the Employees, they can use the system to process the shipment request that made by the customer and generate the E-Invoice according to specific shipment request. The Employees will generate the unique tag ID that will be attached to the shipment. The system allows the shipment to be assigned to the specific transportation by the Employees to decrease the shipment error and to manage the shipment details. The shipment real-time tracking also can be done by the Employees and can view the shipment details.

For the Manager, the registration of new employee and delete the employee credential can be done by the manager. The Manager also can generate the overall report that related to the company using the Customer Relationship Management in the system for making better decision.

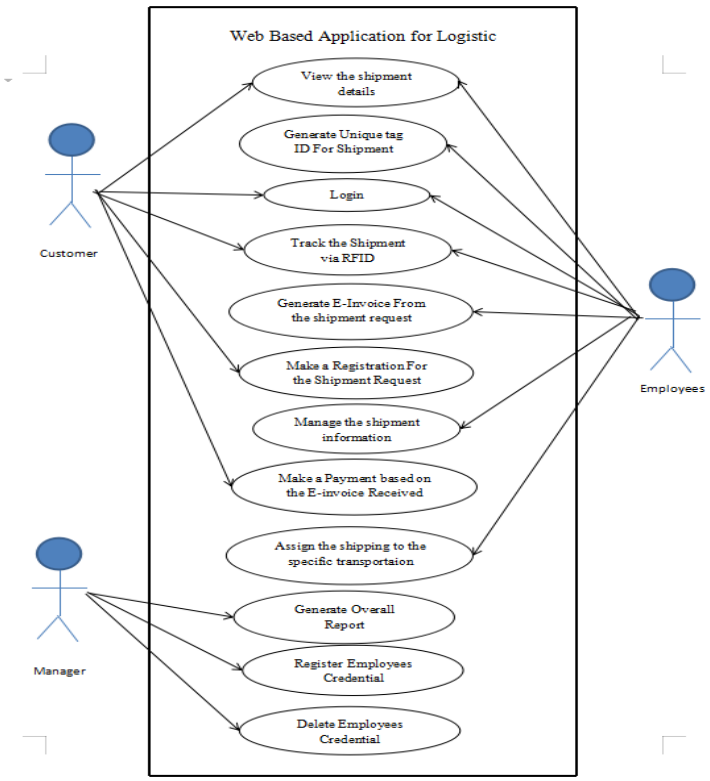

Figure 3 STI's Use Case Diagram

CONCLUSIONS

This paper discusses the proposition of the Logistics system for Sarana Tata Indoraya. Before developing the system, it is needed to understand Logistics, Logistics system, Web Application and RFID concepts. The functions of the

proposed system are derived from those concepts and based on the result from interview done with the manager and employees in this research. The system will affect not only for customer's experience but also contribute to improve effectiveness work of the employees in Sarana Tata Indoraya.

The finding of this study will be able to help the reader to understand better about the importance of system in Logistics aspects and for those who are new to Logistics can know the concept of logistics and some other technology.

This limitation of the system is analyzing the gathered data for decision making. The next work will be about implementing Big Data to Sarana Tata Indoraya's system. Over time, there will be new information comes out from the data as well as the new growth opportunities. From the Big data, Sarana Tata Indoraya can create new strategies or making innovation to compete with other company.

ACKNOWLEDGMENTS

Thank to Asia Pacific University, Malaysia for the international conference opportunity also for journal publication and the highest gratitude to Sarana Tata Indoraya Company, Indonesia, Pekanbaru.

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