

The Potential of Radio Frequency Identification (RFID) Technology Implementation in Malaysian Shipbuilding Industry

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Abstract

Radio Frequency Identification (RFID) is one of the most efficient technologies for tracking system to ease complex logistics processes and make them more effective. A lot of heavy and manufacturing industries have implemented this technology, and by far resulting in a lot of advantages. Therefore, RFID is often emphasized to increase efficiency especially when dealing with inventory and logistics management. Due to benefits of RFID implementation, the application is expected to be further explored and be used in shipbuilding activities at shipyards. As an initial effort, this research was conducted to measure the feasibility of RFID implementation in Malaysian shipbuilding industry. The feasibility will support the potential of RFID implementation in Malaysian shipbuilding. Three research objectives are set for this research, which are to determine the way RFID technology is being implemented in shipbuilding processes, to evaluate the awareness of the people in shipbuilding industry regarding RFID technology, and to investigate the feasibility and suitability of RFID application in Malaysia shipbuilding. Prior to that, four research questions have been constructed, which are mainly based on survey and interview sessions. The end of this paper presents discussions on the results and some recommendations regarding the potential RFID implementation in Malaysian shipbuilding industry.

Keywords: Malaysian Shipbuilding, RFID, Shipyard

1. INTRODUCTION

The massive modern development of technology is gradually replacing all the conventional systems in ships constructions, storage of materials and performance control of employees within the shipbuilding environment around the world. It is

crucial to implement simple but effective methods to ensure that all processes involved can be achieved.

There are many kinds of RFID systems used in different applications and settings. These systems have different power sources, operating frequencies and functionalities. The properties and regulatory

restrictions of a particular RFID system will determine its manufacturing costs, physical specifications and performance. Some of the most familiar RFID applications are item-level tagging with electronic product codes, proximity cards for physical access control, and contact-less payment systems. Many more applications are expected to become economical in the coming years. [1]

A lot of researches and experiments have been done to prove the effectiveness of RFID system in several main industries in the world, hence promoting its implementation in shipbuilding processes, indirectly increasing the competitiveness of shipyards. Thus, RFID technology is beginning to be used in shipbuilding profoundly in the access control and tracking of workers at the yard. Moreover, it is found that RFID can be utilized to simplify the perplexity of ships construction processes and supply chain, in a way that it can track and monitor different stages in design, construction and life cycle of products.

2. OBJECTIVES

This aim of this research is to study the potential of RFID implementation in Malaysian shipbuilding industry as a way to increase the competitiveness of shipyards, in the sense of its integration of identification and tracking systems throughout the ship production as well as its complex supply chain along the processes. This aim was achieved through the following objectives; to determine the way RFID technology is being implemented in shipbuilding processes, to evaluate the awareness of the people in shipbuilding industry regarding RFID technology and to determine the feasibility and suitability of RFID application in Malaysia shipbuilding. These outcomes then will be interpreted as a general idea, in term of predicting the potential to be implemented in Malaysian shipbuilding industry.

In this study, these objectives were achieved by distributing and gathering answers of four research questions set up upon starting the collection of the data. The research questions are: “Are the people working at Malaysian shipyards generally aware about RFID technology?”, “How would RFID implementation enhance the productivity of some areas in shipbuilding activity?”, “Can the

implementation of RFID in shipbuilding be effectively cost-saving?”, and “Is our marine industry ready to accommodate the deployment of this technology?” The research was conducted particularly within the scope of 3 main areas of shipbuilding activities, which are the storage of plates in warehouse, the performance control of shipyard workers, and the outfitting of a vessel.

3. RFID IN MALAYSIAN SHIPBUILDING

3.1 Radio Frequency Identification

Radio Frequency Identification (RFID) is an automatic method used with information technology system, and is a contactless transmission method for identification of objects. As compared to barcode, RFID has the ability to automatically identify and track objects without line of sight. The basic system consists of three parts, which are RFID tags, RFID readers and a host computer with the IT system. The tags typically consist of a silicon chip which acts as the data carrier, comprising of antennas and an electronic circuit. They are manufactured in many shapes and sizes, and possess different performance capabilities based on pre-programmed characteristics, but they only have two types; passive or active. A passive tag uses electromagnetic energy generated by a reader as its power source, which makes it much lighter, smaller, less expensive and has a virtually unlimited useful life; but has disadvantages of having a shorter read range, requires more powerful reader, provides less data storage capacity and also more sensitive to electromagnetic noise [2]

3.2 RFID in Shipbuilding

Pruyn [3] stated that the implementation of RFID technology in shipbuilding activity could be a promising way to enhance its productivity, thus making shipyards rather competitive. With this advanced technology of tracking system in inventory management and logistics handlings, RFID is foreseen to have a good deployment in shipbuilding industry. The aim of this research is to investigate the feasibility of this technology in Malaysian shipbuilding industry. Currently, one of the main challenges for most shipbuilding companies is to manage the activities performed by a network of suppliers worldwide. Empirical evidence shows that the lack of integration and coordination between partners of the same supply chain affects the quality and the delivery [4].

Supply chain management (SCM) has been proposed to ease management of the flow of material, information, and service through the supply chain. However, the literature only emphasizes the high-volume sector, while other sectors are largely ignored [4].

3.3 Malaysian Shipbuilding Industry

The tremendous growth of shipping activities in Malaysia has uplifted the maritime sector, specifically towards the economic aspects. Besides the status of Malaysia as a maritime nation, it is now more significant for the government and stakeholders at local shipyards to optimize quality implementation in shipbuilding towards greater competitiveness [5]. There have been mismatches between the growing demands for shipyard in the country with its quality implementation in shipbuilding sector. This situation arises due to the inability of local shipyards to cater standard requirement, and quality by customer demand.

According to Khalid N. [5], developing adequate tonnage in merchant shipping is a matter of national importance as 80 percent of Malaysia's international trade depends on seaborne transport, and the nation depends on foreign-built vessels to carry much of its trade. The industry is also an important source of employment and provides a platform for skills in various activities such as naval architecture, engineering, welding and fabrication. Additionally, it is extensively linked with many other industries such as steel, glass, logistics, storage, bulk-breaking of goods, and services such as port services, financing, insurance and consultancy.

4. RESEARCH METHODOLOGY

In this study, data collection was based on both qualitative and quantitative methods. Data was collected from dependent and independent variables through questionnaires, interview by using transcription and reporting, documents analysis and cross referencing for validations. SPSS software and inferential statistics were used for analysis and presentation of data.

A survey using questionnaires was conducted at three Class A Malaysian shipyards, in order to survey awareness among people at the shipyards regarding the implementation of RFID system in shipbuilding activities. The questionnaires had two major sections: close and open ended sections. The close ended section was further subdivided into three different sections particularly on the general information of RFID, shipyards' productivity and cost efficiency of the shipyards' performances. Meanwhile, the open ended section resorted to evaluate the economic feasibility of adopting RFID in the Malaysian shipbuilding industry.

5. RESULT AND DISCUSSIONS

The potential of the RFID implementation in Malaysian shipbuilding at first was measured by assessing the awareness of the respondents. The results should be proportionally inclined to the positive potential of RFID implementation in Malaysian shipbuilding if the majority of respondents are aware with the RFID technology, application and its contribution. If otherwise, it can be concluded that RFID is still not ready to be implemented in Malaysian shipbuilding. With the overall mean score of above 3, as in Figure 1.0, all three companies showed positive responses of the awareness level in all aspects of the questionnaires; which covered three (3) sections: Section 1- general awareness of respondents on RFID technology, Section 2- its application in increasing shipyards productivity, and Section 3- how would RFID technology be highly cost efficient for shipyards activities.

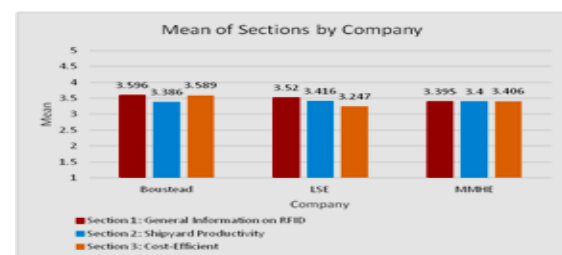


Figure 1. Mean Result of Each Section by Company

The quantitative analysis of these close-ended items of the questionnaires came out positive, concluding that people working at shipyards and involved in

shipbuilding activities are indeed aware, that the implementation of RFID technology can enhance the shipyard's productivity, thus eventually be cost efficient to the company. By having this level of awareness, it supports the probability of saying that RFID has a potential to be implemented in Malaysian shipbuilding industry.

Table 1. Z-Test Result of Each Section

	N	Mean	Std. Deviation	Significant Value, P
Sec1: People working at shipyards generally are not aware about RFID technology	88	3.4989	0.79068	0.000
Sec2: RFID technology may not enhance the productivity of some areas in shipbuilding activities	88	3.3988	0.76088	0.000
Sec3: The RFID application is not effectively cost-saving.	88	3.4953	0.80336	0.000

These results of survey had been discussed further by referring to the Z- Test, as shown in Table 1. Table 1.0 shows the analysis of three sections of survey; regarding the awareness about RFID, the shipyard productivity and the cost efficiency with a test value of 3 with 95% Confidence Level (Critical Value, $\alpha = 0.05$). The result of mean for each sections gives values more than 3 (test value), which is 3.4989 for Section 1, 3.3988 for Section 2 and 3.4953 for Section 3. The result also has been validated by evaluating the significant value, P. All these three sections show that, the null hypotheses,

H0 are rejected since the significant value, P is less than the critical value, α . These figures deduce that the claim of these three (3) sections is valid, indicating that the people working at shipyards are aware about RFID technology. It also indicates that the RFID technology does enhance the productivity of some areas in shipbuilding activities. Besides, the claim is also valid by which respondents agree that the RFID application is effectively cost-saving. From these results, it can be concluded that by having this level of awareness, RFID technology is feasible to be implemented in shipbuilding activity in Malaysia.

However, the collected answers of the open-ended items and the responses from the interviews indicate that RFID implementation in Malaysian shipbuilding industry is unfeasible economically. The conclusion is made from several points of views, in which majority of the respondents agreed that our country's ship production is low. The respondents gave this answer by referring to their annual vessel production, which is still in low demand trend. Another factor that makes the implementation unfeasible economically is due to small amount of shipyard workers. Compared to other manufacturing industries, it still can be said that shipbuilding industry generally has small amount of workers, thus sometimes makes the RFID technology not worthy; similar with the storage and warehouse issues. According to the respondents, shipyards mostly have a minimum amount of storage plating in their warehouses. 'Just in Time' motto for material handling and storage for their current condition is just sufficient to save the cost. The existence of RFID in this issue seems like not giving a significant impact on the effectiveness of their yard.

6. CONCLUSION

As far as literature is concerned, by implementing RFID in certain sections, shipyards can be rather competitive, and that shipbuilding processes can be more effective. From the survey of this study, most of the respondents agreed with this beneficial impact, as discussed earlier. However, since there is no dire necessity or huge stake that requires the implementation of RFID as a solution, RFID is found economically unfeasible to be deployed. The unstable economy also seems not supporting this

notion since RFID implementation might incur a very high cost. Therefore, within the scope of the research, and through the qualitative analysis, it can be concluded that from the economy perspective, Malaysia is still not ready to implement this technology in its shipbuilding industry.

Nevertheless, RFID technology still has a potential to be implemented in Malaysian shipbuilding industry if certain parameters are met in the future, for example, high demand of ship construction orders, huge amount of shipyard workers and large number of plate storage requirement in shipyards warehouses. When this technology is already practical to be implemented, it can surely increase the productivity of Malaysian shipyards, thus boosting the marine economy in Malaysia.

For the improvisation of future research on the subject, some recommendations can be considered to come out with more significant benefits of the research. A pilot test needs to be practically conducted in one of the Class AA shipyards to further examine the feasibility of implementing RFID in the shipbuilding activities. The deployment of RFID in the pilot test will result in justifying the suitability of adapting this technology into our shipbuilding activities.

In addition, the research scope can be expanded to cover more areas of shipbuilding activities, such as the inbound and outbound logistics, marketing and sales activities, and also design stages of vessels. By these, the study will be more comprehensive to confirm if it is really feasible to deploy RFID in Malaysian shipbuilding industry. Lastly, the government, as a policy maker, probably should consider giving incentives to shipping companies to deploy this technology, in order to encourage the development of Malaysian shipbuilding industry economy, thus increasing its productivity and competitiveness. By doing this, Malaysian shipyards can be more competitive to other countries' shipyards.

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