

Feasibility of Implementing RFID Technology in the Warehousing Sector of Sri Lanka: A Literature Review

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1. Introduction

All warehouses typically have the same workflows and processes. Shipments are received. Goods are counted and put away. Orders come in. Items are picked and then shipped to stores or factories. It is possible to quantify the benefits that RFID could deliver by improving these processes.

RFID means Radio Frequency Identification using typical transceivers (transmitter/receivers), or RFID readers, which consist of a radio frequency module, a control unit, and a coupling element to interrogate electronic tags via radio frequency communication (Sarma, Weis, and Engels 2003) [1].

The RFID technology can be used to improve supply chain efficiency and effectiveness (Chen et al. n.d.) [2].

Warehouses globally are utilising this technology while warehouses in Sri Lanka are yet to use RFID. Very little research has been conducted in Sri Lanka regarding RFID adaption in the warehousing sector. This research is conducted to gather comprehensive details from existing literature to find out the feasibility of implementing RFID in the warehousing sector of Sri Lanka.

1.1. Research Question

This research will attempt to solve following research questions:

- Is RFID technology successful in global warehouse practices?
- What are the success factors for implementing RFID technology in global warehouse operations, as per literature?

According to literature, which aspects of feasibility should be considered for RFID technology to be implemented in warehouse sector of Sri Lanka?

2. Research Objective

RFID ensures that the right goods are available in the right place with no discrepancies and zero errors (Ollivier 1995) [3]. The objective of this study is to collect reliable and comprehensive data from literature under following topics.

- 1) RFID adoption level in warehouses in a global context

- 2) Decision making process with RFID technology in global warehouse practices (Managerial level)
- 3) Benefits of RFID adoption in warehouse operations
- 4) Barriers and criticalities to adoption of RFID in warehouse operations

3. Methodology

In order to gain a comprehensive picture of RFID practices in warehousing sector, the following keywords were used in the search: *RFID technology, 3PL and RFID, RFID implementation, RFID adoption, RFID warehouses, RFID barriers, RFID benefits, RFID logistics, RFID decision making*. The main database used was Emerald Insight due to high accessibility through a registered account under University of Moratuwa.

From above search, 40 articles were selected as the sample for this research, with the abstracts and conclusions of each in relation to the relevant topic being observed. First a deep study of each article was done and thereafter the articles were categorised into four main categories considering their content and matching them with research objectives. Thereafter the articles were analysed further to obtain comprehensive data for feasibility analysis (Table 1).

Table 1: Categories of Research Articles

| Category | Articles |
|---|----------|
| 1) RFID adoption level in warehouse operations globally | 11 |
| 2) Decision making process with RFID technology in warehouse sector | 9 |
| 3) Benefits of RFID adoption in warehouse operations | 13 |
| 4) Barriers and criticalities to adoption of RFID in warehouse sector | 7 |

4. Results & Findings

4.1. RFID Adoption Level in Warehouses Operations Globally

Overall, the literature analysis shows a growing interest in RFID applications in warehousing sector. This is mainly due to several factors. First, a number of RFID applications have become available in the market at lower initial cost. Second, all these applications have been designed to support a wider number of functions in the warehousing sector and better meet the business requirements [4].

4.2. Decision Making Process with RFID Technology in Warehouse Sector

In order to complete the decision-making process successfully, authors have highlighted the need for coordination among players involved as one of the key requirements both at the strategic and tactical/operational levels.

4.3. Benefits of RFID Adoption in Warehouse Operations

Warehouse practices can be utilised with RFID solutions to diminish working expenses by reducing work costs, claims and returns [5]. This will help to decrease the labour costs, reductions in inventory and lowering the inventory write-off from the return goods and those items that are un-saleable at the end.

4.4. Barriers and Criticalities to Adoption of RFID in Warehouse Sector

The noticed barriers that affect implementation of RFID are company culture, top management obligation, poor operative administration and lack of funds, unstable inventory control, and unstable customer supervision and longer lead times [6].

5. Conclusions and Recommendations

Analysis of the articles in relation to the research objectives demonstrates that the implementation of RFID in the warehouse sector has allowed organisations to use profit management tools and techniques to enhance product mix, prices, and inventory and workforce level. Large global companies and many 3PL companies will be the preliminary beneficiaries. Many companies will take advantage to increase profitability and enhance productivity. Lack of initial investment and management obligations can be indicated as main barriers.

This research provides a preliminary analysis of literature concerning the implementation of RFID in the warehouse sector globally. One of the key limitations of this research is that the literature review was mainly limited to the Emerald database. The next step in this research would be to conduct a survey of warehouse operating companies and 3PL companies to study the feasibility of implementing RFID technology in the warehouse sector of Sri Lanka.

References

- [1] Sarma, Sanjay E., Stephen A. Weis, and Daniel W. Engels. 2003. "RFID Systems and Security and Privacy Implications." Pp. 454-69 in. Retrieved February 2, 2018 (http://link.springer.com/10.1007/3-540-36400-5_33).
- [2] Chen, J.C., CH Cheng, PTB Huang-Expert Systems with Applications, and undefined 2013. n.d. "Supply Chain Management with Lean Production and RFID Application: A Case Study." Elsevier. Retrieved February 2, 2018 (<https://www.sciencedirect.com/science/article/pii/S0957417412012882>).
- [3] Ollivier, Michael. 1995. "RFID Enhances Materials Handling." *Sensor Review* 15(1):36-39. Retrieved March 26, 2018 (<http://www.emeraldinsight.com/doi/10.1108/EUM0000000004267>).
- [4] Baldini, G., Oliveri, F., Braun, M., Seuschek, H., & Hess, E. (2012). Securing disaster supply chains with cryptography enhanced RFID. *Disaster Prevention*

and Management: An International Journal, 21(1), 51-70.

<https://doi.org/10.1108/09653561211202700>

- [5] Angeles, R. (2007). An empirical study of the anticipated consumer response to RFID product item tagging. *Industrial Management & Data Systems*, 107(4), 461-483. <https://doi.org/10.1108/02635570710740643>
- [6] Balocco, R., Miragliotta, G., Perego, A., & Tumino, A. (2011). RFID adoption in the FMCG supply chain: an interpretative framework. *Supply Chain Management: An International Journal*, 16(5), 299-315. <https://doi.org/10.1108/13598541111155820>

Keywords: *RFID Technology, RFID Implementation, RFID Adoption, RFID Warehouses, RFID Barriers, RFID Logistics, RFID Decision Making*