USING RFID-RTE TO INCREASE EFFICIENCY IN THE SUPPLY CHAIN

Aggarwal, Rebecca and Lim, Ming K.

Engineering Systems and Management
School of Engineering and Applied Science
Aston University
Aston Triangle, Birmingham B4 7ET, U.K.
Email: aggarwar@aston.ac.uk, m.k.lim@aston.ac.uk

Abstract:

This paper aims to explore the application of Radio Frequency Identification (RFID) to Returnable transit equipment (RTE) in the supply chain. Particular attention is applied to the current structures of RTE networks as formulated by RTE providers. The problems related to RTE usage are described and the effect to the network analyzed. RFID is investigated as a tool to assist with the movement of the RTE both from the client's and RTE provider's point of view.

Keywords:

RFID, Supply Chain Management

1. INTRODUCTION

Returnable transit equipment (RTE) usage is continuing to rise, however, research into the potential of RTE within the realm of supply chain management and logistics is limited [14]. The use of RTE has been highlighted as a cost effective option for the movement and storage of goods, particularly, within the retailing sector in the UK and the automotive industry in the US [14].

However, one main problem has been the management and control of the RTE [8]. An effective solution of resolving problems and finding better supply chain solutions is to give control of the RTE and related activities to a third party logistics (3PL) provider [14] [9]. The use of 3PL providers can entice companies to invest in RTE networks as the financial requirements with installing such a system can be spread and therefore, the risk reduced for the clients [14]. Although the area of 3PL is growing [11], research into the area from the point of view of the provider is very limited [1].

In addition, another solution is the application of Radio Frequency Identification (RFID). In some cases it has been reported that companies can lose from about 10%-15% of their RTE fleet annually [10] which, decreases the amount of RTE available to utilize and therefore, increases replacement costs. RFID is an effective tool to create visibility and assist with efficient tracking [7]. The application of RFID to RTE is at an early stage and further research is required [5].

Although there are models illustrating the investment potential and gains of a RTE system [14] there is very little research investigating the cost/benefit analysis of RFID with RTE [5]. Additionally, there is even less research investigating the efficiency and effectiveness gains that a 3PL provider can bring to a RFID-RTE supply chain network. Therefore, further research is required of 3PL managed RFID-RTE network from the perspectives of both the 3PL provider and their clients.

The following paper will define RTE and describe its function and associated networks. Particular focus will be assigned to the 3PL pooling network and the problems that occur. The application of RFID is proposed as a value-adding solution to assist with the smooth flow of RTE providing supply chain efficiency and effectiveness benefiting both the 3PL provider and their clients.

2. RETURNABLE EQUIPMENT

2.1. Definition

RTE can also be known as Returnable Transport Items (RTIs) which, is defined by the International Organization for Standardization as “all means to assemble goods for transportation, storage, handling and product protection in the supply chain which are returned for further usage, including for example pallets with and without cash deposits as well as all forms of reusable crates, trays, boxes, roll pallets, barrels, trolleys, pallet collars and lids” [8]. In addition RTE may be referred to as “logistical packaging” which, encompasses any processes where packaging has facilitated any logistical activities in the supply chain [13]. Therefore, RTE refers to any equipment that can be used multiple times within the supply chain to transport or store goods.

2.2. RTE Functions

The basic function for RTE is to assist with the movement of the client's goods to the right place, at the right time and in the right condition. Furthermore, other functions can include, enhancing communication within the supply chain between different parties and as a more cost effective option of goods protection [3]. Therefore, the RTE must be easy to handle, store and move. Also, on a higher level the packaging can become another way that companies can aim to add value to logistical processes and gain a competitive advantage [6] especially if the RTE is combined with other technologies such as RFID, GPS and sensors.

2.3. Pooling Equipment

Often in RTE pools the responsibility of maintaining and controlling the RTE in order for it to fulfill its function has been unclear [9]. It is highlighted that further research is required into investigating the economic, financial and operational issues that may come with using RTE as well as the state of the ownership of the RTE [14]. More recently, the RTE is provided to companies via 3PL providers where equipment is pooled. In this research the 3PL providers own all the RTE and it is hired out to their clients in accordance with requirements. The following sections investigate how value can be added to the 3PL provider's RTE network and in turn their client's supply chains.

2.4. RTE Network

In this paper, the focus is on the client's outbound networks. The 3PL providers RTE network would consist of any logistics activities that are carried out for their clients on their outbound distribution systems.

In addition to satisfying the clients' outbound functions the 3PL provider would need to complete its own inbound and outbound processes for the acquisition, storage and distribution of the RTE.

Fig. 1 illustrates a 3PL provider's network where there are three clients with different outbound supply chains. The two layers of RTE movement are represented by the different arrows. The dashed arrows represent the flows of empty RTE, first, from the supplier to the 3PL provider and then onto the three clients. Then there is the movement of RTE from the client's sites back to the RTE feed station where the RTE are maintained and then distributed back into the

network. The second layer of RTE movement is between the clients sites and is represented by solid arrows.

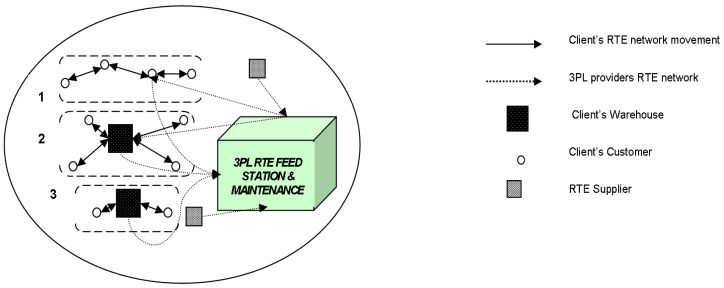

Figure 1: 3PL provider's network of three clients describing RTE flows.

In this network the provider is in control of the RTE to and from the client's sites and the maintenance. Once it has been dispatched to the client's then the client's are responsible for moving the RTE within their networks. However, for better control of the RTE it would be advantageous to both parties if the provider had control of the movement the RTE of each client. This would give the 3PL provider the ability to leverage fully the maximum potential of gaining efficiency from the RTE by utilizing the full network visibility of the RTE.

2.5. Problems with third party pooling RTE networks

A particular issue for 3PL providers is the misplacement and loss of RTE from the network [9]. Other additional problems include long cycle times with untraceable equipment and balancing supply and demand which, are discussed below in further detail.

2.5.1. Long Cycle Times

The cycle time of a RTE network is in two parts, firstly, there is the time the provider takes in delivering the right RTE, retrieving them, reworking them and putting them back into the system. The second part is the time it takes the clients to use the RTE, empty and return. Often this is the part in the RTE cycle where the RTE is held for too long. A study carried out on Canada Post revealed that the constant unavailability of the RTE for their client's was not because there was a shortage but because of the RTE return time from the clients to Canada Post [3].

The main operational problem was the lack of information available as to the location of the RTE and that the benefit to the RTE provider

depends much on the turnaround of the RTE by the clients. The longer the cycle time the likelier a RTE provider would move from making a profit to a loss. Therefore, the onus shifts to the RTE provider to use incentives and implement reliable networks for the customers to return the empty RTE as quickly as possible. To achieve this, an efficient real-time tracking system is required. RFID is an option which was not considered in this study.

2.5.2. Balancing Supply and Demand

Often the balance of supply and demand of RTE can be distorted by inefficient, long cycle times. After reducing the cycle time, in order to continue to meet supply and demand, visibility is essential. Particularly, within equipment pooling where the uncertainty in demand has always been a big problem [9]. RFID is a technology that can be used to increase the visibility, reduce the uncertainty of demand and hence assist with the on time and in full supply of RTE.

3. RFID AS A TOOL FOR SOLUTIONS

3.1. Increase Asset Visibility

Within the RTE pooling environment the location of each RTE is crucial. However, this is usually a problem due to the limited visibility. Therefore, RFID is an option to increase visibility in order to be able to locate the RTE and communicate the status in a quick and efficient manner [4].

RFID is a tool that can be used to gather data at crucial points in the network in real-time, for example, at depots and bottlenecks. If RTE leaves the network the information can be traced so that future incidences of loss can be prevented. Also, each individual RTE would have a unique identification and so individual pieces can be located. This knowledge can crucially assist with more efficient decision-making and facilitate streamlining supply chain processes.

3.2. Reduce Cycle Times

In a 3PL RTE pool the shorter the cycle time the lower the initial investment cost [14]. Therefore, the most important factor is to get the quickest RTE turnaround possible. Creating visibility assists with the location of the RTE but in order to reduce cycle times the next step is to track and trace each piece of RTE.

RFID can be used to ensure that each piece of RTE is continually moving and if it gets stuck in the network then an alert can be sent and the problem investigated by the 3PL provider. Further analysis can provide information as to any regular problems that are caused during the flow of the RTE network and then changes made to the supply chain processes in order to ensure smooth flow.

3.3. Add Value

The 3PL provider, in order to be successful, must add value to their clients that the clients themselves would struggle to achieve at the same cost [1]. In this research it is proposed that value can be added with RFID via a layered approach with the levels of a strategic, tactical and operational nature.

Fig. 2 illustrates the different levels of value that can be added on strategic, tactical and operational levels. The value-added potential of RFID-RTE is investigated from both the perspective of the 3PL provider's RTE network and the client's supply chain. Also, it is illustrated with two dotted arrows that as value is added on a strategic level, a positive filter effect occurs as the value-added activities move through the tactical and operational levels.

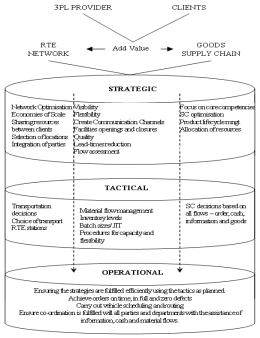

Fig. 2. Illustrates adding to the RTE network via the application of RFID.

3.3.1. Strategic Level

The most important value-added process is visibility as it allows the 3PL provider to provide flexibility and responsiveness. By increasing visibility common areas such as assessment of flows and creating communication channels can be achieved.

From a 3PL viewpoint the strategic optimization variable could be based on achieving asset utilization or RTE flow rate. Also, with

increased visibility, the 3PL provider can add value by pursuing economies of scale and sharing resources between clients. In order for 3PL to fully utilize resources they are required to reach a balance of standardized resources so that the RTE can be interchanged freely whilst still offering tailored supply chain solutions to each client. In addition, RFID can enable the 3PL provider to maximize the flow and utilization of their assets and hence, increase their return on assets.

From the perspective of the client by granting responsibility of goods transport and storage to 3PL, the clients, are free to concentrate on core competencies allowing them to make better use of their own resources and therefore, adding different streams of value to the business. Moreover, the RFID-RTE can assist with lead-time reduction and increased goods flow, adding value throughout the whole network increasing productivity and efficiency.

3.3.2. Tactical Level

On a tactical level the policies, in order to determine the material flow, are assessed both in terms of production and transport, for example, batch sizes and inventory levels [12]. The decisions made on production and transport is inextricably linked and therefore, in order to add tactical value successfully the decisions on all areas should be implemented together.

3.3.3. Operational Level

On an operational level, processes are developed in order to ensure that all the objectives set strategically and tactically are met [12]. As the value-added process filters through to the operational level the client can see reductions in manual labor, inventory, shrinkage and out-of-stock items. By using RFID-RTE the operational processes can become automated thereby streamlining the supply chain and adding value.

4. CONCLUSION

RFID-RTE cost reductions and efficiency gains are approached from the perspective of all parties in the network. Increasing asset visibility, reducing cycle times, introducing tracking and tracing, reducing product lead-time and ensuring quality of the goods are all services that the 3PL provider can offer and charge increasing their revenue whilst at the same time improving both the efficiency of the RTE network and the client's supply chains.

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