

The Importance of Radio Frequency Identification (RFID) For the Effectiveness and Efficiency of Supply Chain Management by Customer Perceptions

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ABSTRACT

The purpose of the paper is to examine the customer perception of radio frequency identification or RFID technology utilization in supply chain efficiency and effectiveness. Data from sample of 80 customers' perception were collected and the model was assessed using a structural equation methodology. Findings indicate that utilization of RFID technology can help in improved supply chain efficiency and effectiveness. Data were collected during the growth stage of RFID technology adoption and were only collected respondents on downstream of supply chain sector. The paper describes one of the first empirically based studies investigating the customer perception of RFID technology implementation on supply chain performance.

Keywords

RFID, Supply Chain, Customer perception, Effectiveness, Efficiency

1.0 INTRODUCTION

Radio frequency identification (RFID) is tag that contains identity information about a product (similar to a bar code). The tag enables businesses to identify and track assets wirelessly. Customer perception is an important component of our relationship with our customer. Although RFID is still in the early market, it providing lot internal benefits to downstream customers. RFID helps to reduce the manufacturing costs. RFID utilization would either directly and indirectly affect the financial performance of the organization. Indirectly impact is RFID change through supply chain productivity. Today, globalizing economy competition is getting more and fiercer. On the other hand, customer behavior becomes more hybrids. To development a strong relationship between organization and customer is no longer simple as price and quality alone. Somehow, the trend is more to perceived experience a customer makes in his/her

various interactions with the organization. If customer is satisfied that mean that services provided has met his expectations and was not dissatisfied by it. The paper is first to use primary data collected from respondents to look for answer to the question; 'Does the successful adoption of RFID technology within organization lead to efficiency and effectiveness outcomes that result in improved customer perception on supply chain performance?' Current example of RFID application in Malaysia include toll system such as 'touch n go' card along the highway. The first RFID passports also known as 'E-passport' was successful issued by Malaysia government in 1998. Most car keys nowadays contain an RFID chip to prevent theft, and lots employees use a 'smartcard' to gain access to the office each day. The paper introduces RFID technology and its potential implications. Finally, the paper looks at the customer perception could have on supply chain facilities and the effectiveness and efficiency for the organization performance.

2.0 LITERATURE REVIEW

One of the ten greatest contributory technologies was identified by RFID of the twenty first century. Nowadays, organizations adapt to the global trend, they lined up to use RFID. First applying RFID technology was into general systems theory to organizations and management. Supply chain management has its heart the creation of a finely tuned collection of the subsystems (supply chain members) that share information and sometimes resources in order to achieve common goals (Johnson *et al.* cited by Pamela, 2009). RFID makes existing supply chain management system more productive. David (2004) stated that the goal of supply chain management is to have the right product at the right price in the right place at the right time. Inventory is only necessary because of poor information. RFID had made the supply chain movement with visibility. 'The adoption of technologies that enhance information sharing can positively influence the relationship between supply

chain members (Kent et al., cited by Pamela, 2010). According to Barbara (2012), the best levels of growth for RFID utilizations can be found in the fields of asset tracking, cargo tracking and security, supply chain management, and identification documents. According to Yahia (2007), utilization of RFID has numerous of advantage. RFID able reduced shrinkage; include misplacement, spoilage, shoplifting, and organized retail crimes. Furthermore, RFID increased data accuracy whereby accurate information has great potential to improve the quality of management decisions. According to Harry (2007), the integrated logistics information management system is a web-based system that integrates RFID technology to visualize logistics processes. It links the entire core logistics processes so that logistics services can be provided and visualized on real-time base. Bring it together, RFID would provide faster, better and more accurate information into the system, allowing companies to optimize resources further.

2.1 RFID Utilization

RFID technology utilization reflects the degree to which manufacturers have adopted RFID technology to track all types of inventory through organizational and supply chain process (Green *et al.* cited by Pamela, 2010). As we known, RFID technology has the ability to trace of goods movement as they progress the supply chain to utilization customers. However, Agnes (2005) argues that RFID technology is a supply chain focused, rather than an organizationally focused, technology because of the ability to track resources throughout the extended supply chain. According to Yahia (2010), RFID technology given better supply chain and inventory management, tracking work-in-process, tracking administrative errors, increase customers' satisfy.

2.2 Customer Perception Based On Efficiency And Effectiveness

The primary objective of a supply chain is 'creating net value, building a competitive infrastructure, leveraging worldwide logistics, synchronizing supply with demand, and measuring performance globally', given by *APICS Dictionary* cited by Pamela, 2004. Next, the purpose of a supply chain's activities is to provide efficiency and effectiveness to the organizations that are members. Supply chain researchers tend to think in terms of either efficiency in supply chain performance or effectiveness but not typically both, with the supply chain first being effective and then moving towards becoming more efficient in performance. According to Yahia (2010),

to ensure optimum supply chain performance, organizations must figure out to reduce costs, accelerate operations, and improve quality both in their own processes and in their partner organizations. In this point, efficiency and effectiveness are given example as customer satisfaction.

2.2.1 Efficiency Outcomes

RFID technology enable the organizational improve the flow of goods and lead to improve the efficiency supply chain performance. Efficiency related to an organization's ability to produce goods and services at relatively low total costs to immediate customer, based on the organization's capabilities to eliminate waste and fully utilize resources (Hofer et al., cited by Pamela, 2004). Competitive advantage may be gained through the reduction of costs and ultimately prices to the final customers of the supply chain (Hunt *et al.*, cited by Pamela, 2004). Organizations focused on their supply chain partners, putting effort to enhance efficiency-related capabilities. Accordingly, an efficiency outcome is achieved through activities that focus on the timely production of goods or services at lower costs (Drcker *et al.*, cited by Pamela, 2004).). On the efficiency front, technologies have been used to increase the role of the customer in the form of self-service technologies (Meuter et al., cited by Jeffery, 2009). Additionally, they have been used to reduce the need for transactions at physical locations via web-enabled activities (Zinkhan cited by Jeffery, 2009) or to find ways to more effectively match the organization's resources to the needs of customers in the form of revenue management systems (Kimes, cited by Jeffery, 2009). Efficiency is a measure of productivity in which what has been accomplished is measured against what is possible to accomplish.

2.2.2 Effectiveness Outcomes

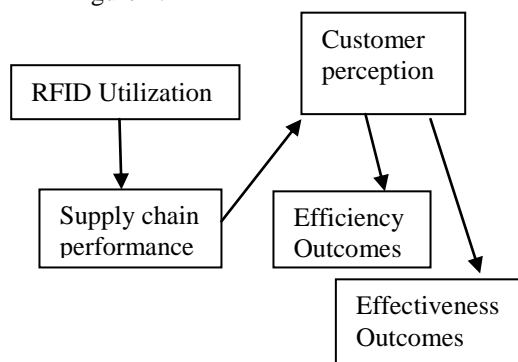
While both efficiency and effectiveness are important, sector of effectiveness looking as striving to deliver more value to the customer. According to Pamela (2010), she found that supply chains focused on effectiveness are concerned with having access to needed resources. Organizations have to focus with activities that enhance effectiveness. Effectiveness characterizes supply chain that desire capabilities, outcomes and benefit (Eden cited by Pamela, 2004). Effectiveness outcome is achieved through activities that have expected potential to enhance performance. In short, effectiveness is defined as the organization's ability to satisfy customer needs (Drucker cited by Pamela, 2004). According to Jeffery (2009), an organization can opt to focus on improving

effectiveness in the form of using technology to enrich the relationship with its customer base. This focus can take the form of using technology to track customers tastes and habits via customer relationship management systems (Rigby cited by Jeffery, 2009) or employing it in order to provide a higher degree of customization of the experience (Murthi et al., cited by Jeffery, 2009).

2.3 Theoretical Model

For the system theory as a basis, the paper proposes RFID utilization and outcomes performance model with efficiency and effectiveness as the main constructs. The model incorporates RFID technology utilization within customer perception as antecedent to both efficiency and effectiveness outcomes and the efficiency and effectiveness outcomes as antecedent to both organizational and supply chain performance. Figure 1 is shown the theoretical model. There are several individual relationships among the model. The model supports an integrated investigation of capability of RFID technology utilization to improve an organization supply chain performance of customer perception. Outcomes results are based on efficiency and effectiveness. Thus, the role that RFID technology can play both within the organization supply chain performance and customer perception.

Figure 1:



3.0 METHODOLOGY

Data were collected by two methods, either via online data service or via distributed the questionnaire to respondents. Using systems theory as a basis, RFID utilization and outcomes performance model was develop from the literature. Data from a sample of 80 customer's perception were collected and the model was assessed using a structural equation methodology. The respondents were of Kedah and were aged 21 years to 65 years old. The questionnaires were

conducted in English only. The respondents were categorized as UUM students, lecturer, manager, or customer who benefits from RFID. Among the respondents, about 60% of them held as UUM students, 20% held lecturer position, and 20% held manager position. All of them are customers who experience from RFID technology through the supply chain services. Measurement scale item means for the 4 different categories were compared using analysis of variance or descriptive statistic. The comparisons resulted in non-significant different indicating that the concerns related to non-response bias are minimized. It support by graph and bar chat. The measurement scale choose for efficiency outcomes are deliver zero-defect products, eliminate late, damage and incomplete orders, deliver products accurate on-time, and minimize total product cost. However, effectiveness outcomes are measure deliver value-added services, deliver accurate quantities, quick respond to and solve problems, and reduced the shrinkage.

4.0 FINDINGS

Almost 85 percent downstream or customers were agreeing that utilization of RFID improve the supply chain activities. In our sample, 4 out of 80 downstream do not expect a positive improvement on upstream respond more quickly to downstream need by sharing information with RFID technology. Pie chart has shown in figure 2. The downstream are not overly optimistic about a positive quickly respond either, with approximately 50% believing that they will not see a positive quickly respond. Next, as was found in the outcomes, none of the downstream reported a low level of the utilization of RFID enable the supply chain members know movement with the real time basis. Bar chart has shown in figure 3. When asked about the real time basis of products movement, the respondents have given very high marks. There was a strong agreement among the respondents that supply chain activities will benefit from RFID, and supply chain performance will gain more efficiency and effectiveness. Respondents were pretty much neutral when it comes to suppliers benefiting and able to delivery small lot sizes and shipping case to final customers. Bar chart has shown in figure 5. It is belief that the pressure for RFID adoption in the future will continue to come from suppliers. The supply chain activities will respond only if there is a demand from downstream to implement RFID technology as the suppliers do not see improved performance in supply chain activities by utilization of RFID. There was a strong agreement among the respondents that supply chain activities will benefit from RFID, and supply chain performance will gain more efficiency and effectiveness. Pie chart has shown in figure 4.

Figure 2

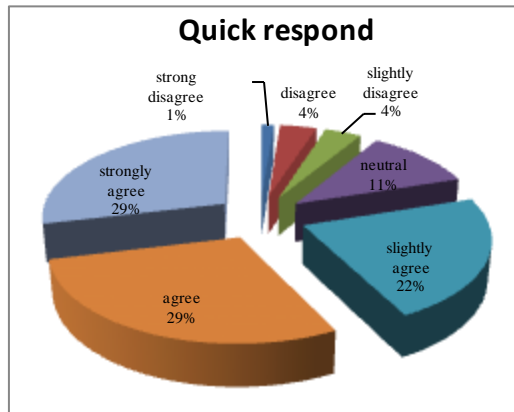


Figure 3

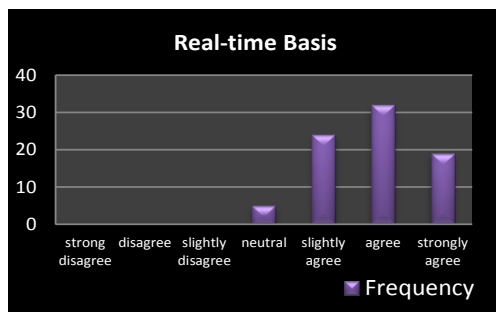


Figure 4

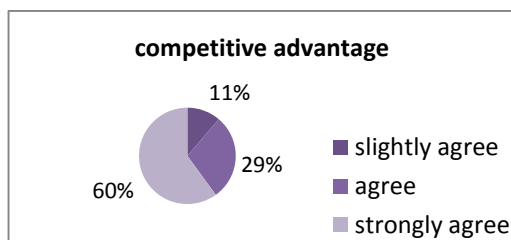
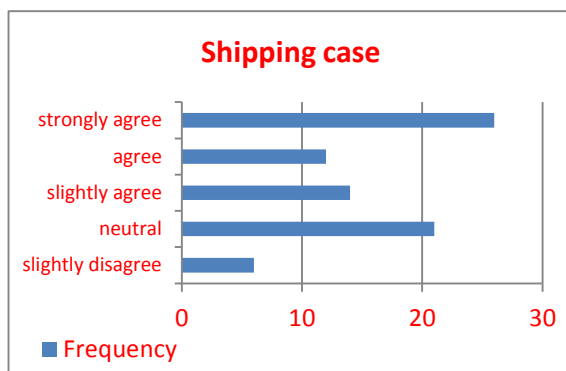


Figure 5



4.1 Association between the variable

RFID technology utilization positively impacts efficiency outcomes. A study provides evidence those firms have expectations that utilizations of RFID can improve effectiveness (Vijayaraman cited by Pamela, 2004). Next, RFID technology utilization positively impacts effectiveness outcomes. Based on the research done, RFID utilization in term of managing inventory flows, products, raw materials, and inventory levels was found to significantly impact both efficiency and effectiveness outcomes. RFID utilization impacted efficiency in terms of tracking inventory levels, supply chain costs, warranty returns cash-to cycle time and inventory days of supply. RFID utilization also significantly impacted effectiveness outcomes such as speed of delivery, accuracy and availability of information, level of customer service, fill rate and order fulfillment. When forced to adopt RFID by a downstream supply chain member many suppliers see adoption as a cost of doing business rather than as an opportunity to acquire data that could lead to effectiveness and efficiency gains. Effectiveness outcomes relate to customer satisfaction that filter through to the ultimate customers of the supply chain (supply chain performance) before impacting organizational performance. Efficiency outcomes should, therefore, lead to increased sales, profits, and return on investment (Pamela, 2004).

5.0 RECOMMENDATION

Based on the results of this study, organization (upstream or supplier) address the need to improve organizational performance. Organizations that have embraced RFID technology have seen improved efficiency that leads to improved organizational performance and improved effectiveness that leads to improved organizational performance through improved supply chain performance. Generally, downstream of supply chain can expect improved efficiency and improved effectiveness from investment in RFID technology. Upstream should consider both the operational and marketing-related benefits of the technology as they consider the costs and benefits of such an investment. Organizations that are being forced to adopt RFID technology under pressure from customers can take some solace from the results of this study. On the face, it appears that adoption of the technology increases costs with no concomitant increases in benefits. This short sightedness may result from the traditional “efficiency” mindset. Adoption of the technology may in fact lead to more highly satisfied immediate and ultimate customers leading to increased revenues from additional sales.

6.0 DISCUSSION & CONCLUSION

As discussed earlier, RFID utilization allows for a better performance. It improves the response changes and fulfills the need of customer in supply chain performance. The paper theorized a model which the organization's degree of RFID technology may either directly and indirectly, through its enhanced ability efficiency and effectiveness of supply chain performance. Moreover, RFID technology used in cell phone, it make the management able to trace and track the movement of goods. It helps in the real-time solution. In short, RFID can provide convenient, more reliable, high accurate mean of capturing data on the goods movement. According to Pamela (2004), RFID simplifies the checking and monitoring of tasks, and provide up-to-date information on process status, enabling us to react swiftly to unforeseen events. These capabilities are exactly what we need to create and manage a sophisticated, adaptive supply network. Respondents who were frequent get in touch with RFID felt that the entire technology has been improved the supply chain performance. Frequent attempt had an experience of RFID with several organizations and was used to the services offered by the upstream. So, they were more adaptable to minor changes during their services and also knew whom to address to get a reliable seamless service. Reviewing the literature and conducting this study indicates that customer perception as RFID has been improved supply chain performance. Moreover, the improvement made the supply chain become effectiveness and efficiency.

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