

RFID, AN ENABLER IN SUPPLY CHAIN MANAGEMENT

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Abstract

In order to serve the market in better way the supply chain must track and trace the products. Tracking and identification of products is essential in today's highly turbulent market. There is pressure on manufacturers, distributors and retailers to maximise efficiency, minimise cost and provide the best possible value for the end-customer. The latest development in the field of tracking and tracing is with Radio Frequency Identification (RFID). Radio Frequency Identification (RFID) Technologies are receiving great importance in modern businesses. In the due course of time RFID will replace the barcode. Integrating RFID in the Supply Chain enhances better tracking and tracing the products. RFID helps the companies to reduce the stock levels, cut down warehouse costs, increase product visibility, and reduce theft and to update the inventory database with real time information. The technical capabilities and limitations of RFIDs are examined in this paper. Parties in the supply chain need to create solid alliance to build RFID network, which must support both technical and operational needs. In the current study an attempt has been made to investigate the importance of RFID technology and its very impact on long term corporate strategies, global markets and its potential role for sustained corporate growth and profitability with help of case studies. The cost factor is found to be in the RFID tagging at product unit level. The future remains very promising for rapid gains in RFID development as long as technology continues to advance through increased research and development initiatives.

Keywords: Supply Chain Management, RFID, Logistics Management, ERP, Technology

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1. INTRODUCTION

The success of any business depends on the efficient design of their Supply Chain. The Supply Chain helps the companies to make their products available at the right time, to the right customers, at right place. There are good numbers of factors like paying utmost attention to the needs of the customer, designing responsive chain, utilizing the latest communication and logistics technologies, employing a sound measurement system for making the right decisions, and always communicating through the total supply chain links plays an important role in the successful management of supply chains in today's dynamic environment (Narsing 2005: 75-80).

In order to serve the market in better way the supply chain must track and trace the products. Tracking and identification of goods is essential in today's highly turbulent market. There is pressure on manufacturers, distributors and retailers to maximise efficiency, minimise cost and provide the best possible value for the end-customer. The latest development in the field of tracking and tracing is with Radio Frequency Identification (RFID).

The companies that invest in RFID (Radio Frequency Identification) have experienced totally new levels of Supply Chain efficiency (Chopra 2011: 134-136). Altogether the RFID increases the better visibility of the products in the supply chain. With RFID technology, large quantities of information can be analyzed and made available to the channel partners in the

supply chain near real time, which is crucial for improving business operations.

Due to integration of RFID in Logistics & Supply Chain not only costs increases but also the complexities of the operations increases. The expenditures for RFID hardware used in supporting Supply Chain Management (SCM) applications were estimated at \$89 Million in 2002 and expected to increase by 42 % by the year 2014. Meanwhile, SCM software applications which integrate RFIDs technology were projected to reach an estimated \$448.4 Million by the same period. In comparison, global expenditures for RFID systems were \$965 Million in 2002 (Hickey 2003: 33-37).

RFID systems are applied mainly in the field of industrial, manufacturing, transportation, retail & healthcare.

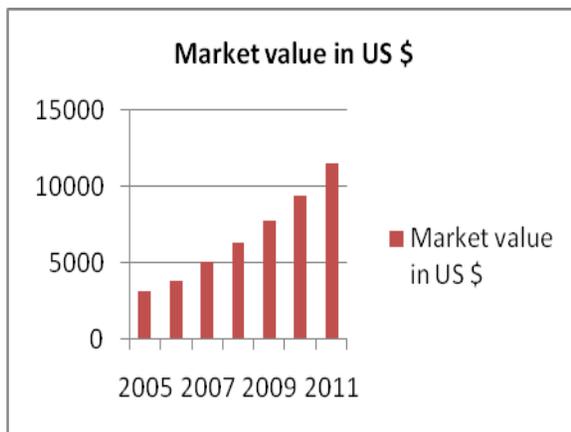
The top five growing RFID application areas in order of ascending growth include: baggage handling, retail item tracking, point-of-sale systems, real-time location and Supply Chain Management (Hickey 2003: 33-37). Wal Mart has taken an excellent step by making it compulsory for its 100 vendors to adapt RFID in their current business operations from January 1, 2005 (Kinsella 2005: 32-36). Due to the overall application RFID in all the logistical & supply chain operations of WalMart, it could successfully identify the products at the pallet level, rather than at the unit level (Tegtmeier 2011 : 30-33).

There are many reasons why firms decide to move forward with or delay investment in RFID technology. The factors that matter

most and least to a sample of firms, that have adopted RFID technology with a sample of firms that yet to embrace RFID technology. The theoretical and practical implications are the both RFID adopters and non-adopters are driven by the promise of greater data accuracy, improved information visibility, process innovation, track and trace capabilities (Keating 2010: 1672-1680)

2. RFID TRENDS

The market forecast by ABI indicates that the market value of RFID reached US\$5.119 billion globally in 2007, growing from 34% from US \$3.813 in 2006, and is estimated to be up to US \$ 15.635 billion by 2014. The compound annual growth rate from 2006 to 2011 is 25%. Among all categories of RFID, software shows the highest compound growth rate upto 36%.



Source: ABI Research, 2008/Q1, Reorganized by the Institute of Information Industry (III)

The Asia Pacific region is the bullish area related to RFID as predicted by ABI. In Asia-Pacific region, the RFID output value will account for 40% of the entire world, far than North America at 33% and Europe at 21%. The main reason of such bullishness in Asia Pacific is that it uses the largest ratio of RFID tags of the world, is the world manufacturing hub and the upstream of supply chain.

Regions	2005	2006	2007	2008	2009	2010	2011
Other Region	167	209	272	373	469	593	600
Asia Pacific	1097	1409	2048	2517	3029	3591	4198
Europe	740	864	1095	1355	1687	2067	2566
North America	1158	1331	1704	2143	2635	3212	4060
Total	3162	3813	5119	6388	7820	9463	11424

Source: ABI Research, 2008/Q1, Reorganized by the Institute of Information Industry (III)

In the current study an attempt has been made to investigate the importance of RFID technology and its very impact on long term corporate strategies, global markets and its potential role for sustained corporate growth and profitability with help of case studies.

3. TECHNICAL FEATURES AND DRAWBACKS

RFID consists of hardware and related supply chain software. In the hardware part it has got tags (having a silicon microchip and an antenna). The RFID chip performs two functions viz, receiving and transmitting data. RFID Tags can be of active or passive.

Passive tags are by far the simplest and least expensive which makes them economically attractive to users. They have no power source as they obtain energy from the radio frequency field emitted by the reader. Semi-active or passive tags have an energy source built onto the micro-chip hence adding to its cost; however, they have the ability to provide broad range coverage and to also read information from sensors (Lawrence 2004 : 9-13).

An RFID operation starts when a RFID reader uses a coiled antenna to create a magnetic field which reaches the chip on a passive tag regardless of its position or placing on the warehouse or on the floor. The chip is energized by the Radio Frequency field and it transmits data with its antenna containing product details like manufacturing date, batch number, expiry date, MRP etc. Multiple RFID tags can be well accessed by a reader which actually varies from a hand held system to a stationary tunnel like device able to scan boxes on a belt conveyor system. Due to this the parties in the supply chain and logistics are supplied with all real time information regarding stock, in-transit materials etc. The RFID reader must be within acceptable distance to reduce interference due to signal overlapping. RFID readers need to be located at strategic locations like near dock doors, pallet racks, conveyors (Kinsella 2005: 32-36).

The frequencies at which RFID tags captures data are of different levels. Low frequency application can range from 125 KHZ to 134 KHZ while high frequency applications range from 13.563 MHZ to 13.567 MHZ (Bednarz 2010: 40-43). RFID technology has a number of operational factors which can adversely impact its efficient operation such as RFID command language, the presence of moisture, radiation, invisible RF interference, attenuation, reflection and refraction of radio waves, the material to which a tag is affixed and to some extent building material content (Goldman, A. and Crawford, K., 2004 : 22-26).

Frequency Band	Description	Range
125-134 KHZ	Low Frequency	To 18 inches
13.563-13.567	High	3-10 feet

MHz	Frequency	
400-1000MHz	Ultra High Frequency	10-30 feet
2.45 GHz	Microwave	10+ feet

Source: QED System

Due to the efficient supply chain management, companies need to procure materials round the globe, and there involves lot of complexities. Like different countries that use different operating standards actually create tremendous barriers to global supply chain integration. Regulatory laws in Asia, Europe and North America are specific regarding frequency and power requirements (Bednarz 2010: 40-43).

4. ECONOMIC FEASIBILITY

Most companies are not willing to incur enough expenditure on RFIDs related infrastructures. Thus, high cost of RFID systems remain a significant barrier against wide spread implementation of RFID. For instance, smart labels can range from \$0.40 to \$1.00 each if purchased in bulk; otherwise, cost would be considerably higher for smaller orders.

Tag Price

QTY	LOW	HIGH	AVERAGE
10K	\$0.12	\$0.18	\$0.15
100K	\$0.11	\$0.14	\$0.12
1M	\$0.09	\$0.13	\$0.11

Source: QED System

4.1 Case –1

Wal-Mart promises to inflict financial strain on its suppliers to comply and deploy RFID infrastructure within existing ERP (Enterprise Resource Planning) systems. Whereas if the suppliers could not implement the same that could lead to loss of contracts with Wal Mart. As a result all the suppliers had implemented RFID system along with ERP in their process. And, it cost huge expenditures for them.

As a result of huge capital expenditure, only 20.2% opted for early adoption, 42.7% for medium adoption and 37.1% accounted for late adopters (Aberdeen Group 2011). What appears to be certain is that RFID technology has not sufficiently progressed where results from Supply Chain Management, asset management and inventory control can produce measurable results.

Process	Total savings(\$)
Labor costs reduction (no barcode scanning required)	6.7bn
Out-of-stock supply chain cost reduction	600m
Theft reduction	575m
Improved tracking through warehousing and distribution centers	300m
Reduced inventory holding and carrying costs	180m
Grand Total	8.4 bn

Source: Wal Mart report 2010

4.2 Case-2

In India, Kishore Biyani-promoted Future Group, owner of brands such as Pantaloon Retail, Big Bazaar and Food Bazaar, is all set to enter into a tie-up with Cisco Systems, one of the world's largest networking companies, to implement Radio Frequency Identification (RFID) technology across all its retail formats in India. The move is significant considering that this will be the largest RFID implementation mandate in Asia. The investment in the RFID technology, close to Rs 200 crore, will be made through Future Knowledge Services (FKS), another Future Group company which specialises in high-end analytics. According to sources, almost 1 million Stock Keeping Units (SKUs) out of a total of 3 million will be tagged with RFID chips. (Economic Times: March 2010, Future Group, Cisco in tie up talks for Retail RFID Project)

5. RFID COST

RFID integration involves three categories of costs (i) hardware cost, (ii) middleware cost and (iii) service costs. Hardware cost covers the cost of tangible elements of RFID system, such as tags and readers. Service cost, such as business process redesign costs and configuration cost. Middleware cost is the cost of software and infrastructure that support and simplifies RFID related operations (Baysan,S and Ustundag, A 2013: 14)

6. RFID BENEFIT

RFID overcomes the limitations of line of sight scanning of Barcode system (Veronnean and Roy 2009). This eliminates the need for human intervention in various stages of Supply Chain (IlieZuder et al 2011). In general increased product availability helps to reduce average inventory level and lost sales quantity. Hence, inventory cost is significantly reduced (Bagchi et. al. 2007)

Thus, Technology and associated cost are identified as the dominant factors affecting compliance among RFID adopters (Bednarz, 2010, Hall, 2010, Sullivan, 2008 and Weisman, 2005).

7. CONCLUSIONS

RFIDs application and scope is huge in companies supply chain & logistics area starting from increased product visibility, reduce out-of-stock items, optimizing warehouse costs, eliminate stock errors, reduce theft and to update inventory database. Thus, helps the company to remain competitive globally. Continued research needs to be carried before RFID can realize its full implementation at a reduced cost structure. And of course this is possible provided that the technology develops at a speed faster than the speed of light.

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