

RFID: Enhancing Supply Chain Processes and Delivering Increased Customer Satisfaction

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Abstract. Radio Frequency Identification (RFID) is a wireless technology with roots extending back to the end of World War II. It has served as the foundation for familiar consumer vertical applications like secure access control (badged door entry), electronic toll collection, electronic article surveillance (EAS), pet recovery/identification, and e-wallet retail sales (Mobil Speedpass). However, RFID has only recently achieved notoriety as a stimulus for dramatically increasing supply chain visibility with announcements by Wal-Mart, Target, Best Buy, Albertsons, and the U.S. Department of Defense, requiring their suppliers to tag shipments using RFID. With those mandates as a backdrop, advocates are betting on RFID as the catalyst for improving performance in the supply chain, and ultimately increasing customer satisfaction. The challenges to wholesale adoption continue to be RFID's significant investment cost and rapid technological change, which limit buy-in by those suppliers expected to provide RFID tags on cases and pallets of products.

Introduction. RFID is not a new technology. It has existed since the mid-1940s, when it was used to identify approaching aircraft as friend or foe at the end of World War II. In its current form as a "smart label", RFID has been successfully implemented in several vertical industry applications as shown in the figure below, including e-wallet applications, secure access, and electronic article surveillance.

Called "the next generation bar code", RFID's non-line-of-sight and unique serialization properties promise significant supply chain potential to provide levels of visibility that bar code cannot. The formation of the Auto-ID Center in October 1999 by the Massachusetts Institute of Technology (MIT), the Uniform Code Council (UCC), Procter and Gamble, Wal-Mart, and Gillette, was a major step in the establishment of an open system based on RFID. This system uses the Internet to identify goods anywhere in the world employing a labeling convention called the electronic product code, or EPC (the Auto-ID Center closed in October 2003 and transferred its technology to EPCglobal, which is administering and developing EPC standards). However, it was the announcement by Wal-Mart in June 2003, requiring its top 100 suppliers to affix passive RFID tags to pallet- and case-level deliveries by January 2005 that mobilized the industry with a true sense of urgency. Followed by similar announcements in October 2003 by the United States Department of Defense (DoD), February 2004 by Target, March 2004 by Albertsons, and September 2004 by Best Buy, third party suppliers and trading partners in the industrial and consumer packaged goods sectors found themselves in the middle of a crash course in understanding what RFID was, how to comply with the mandates, and how RFID might impact their businesses.

The Advantage of RFID. Bars codes, first introduced commercially during the early 1970s, have become nearly ubiquitous and are found on products as diverse as individual packages of chewing gum to automobiles and automobile parts. While providing more visibility in the

RFID in Practice



Retail Sales - Speedpass
(Mobil, McDonalds, Stop&Shop)



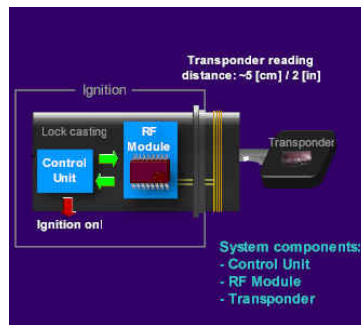
Electronic Article Surveillance (EAS)



Secure Access



Electronic Toll Collection (ETC)



Automotive Anti-Theft Immobilization Systems



Pet Recovery - Animal Identification

supply chain over the manual processes it replaced, bar codes have inherent limitations because (1) they require specific alignment with scanners to be read accurately (line-of-sight), (2) they are limited in the amount of data they can store, and (3) harsh environments can compromise bar code label survivability, and hence readability. To understand these limitations, one only need a retail checkout experience in which a significant level of effort is required to align a bar code with a scanner or where a stock keeping unit (SKU) is manually keyed when a scanning attempt is unsuccessful.

Contrast this with RFID, where tags may be read without special alignment (and, in some instances when buried by other products), where multiple tags can be read simultaneously, and where tags are durably packaged to survive harsh environments.

Each RFID tag is also unique, carrying an individual serial number and identity. While bar codes on identical boxes of products carry the same SKU, RFID tags on the same products would identify each with a unique identity. This one-of-a-kind identity can be associated with product information relating to price, date of manufacture, lot number, expiration date, shipping destination, among a multitude of other descriptive information. The advantages offered by this serial nature of RFID are powerful, both for the product manufacturer and the seller or user of the product. These advantages center on product traceability, for anti-counterfeiting and e-pedigree applications, warranty tracking, and product recall information. Product traceability is especially valuable in pharmaceutical and healthcare applications.

The Supply Chain Opportunity. RFID can positively impact the supply chain in the following areas.

- Product shrink
- Out-of-stocks
- Reduction of shipping and receiving errors
- Labor efficiencies

Industry research has shown that retail shrink levels historically are approximately two percent of sales, costing retailers an estimated \$32 billion in the USA and some \$30 billion in Europe in 2001. More importantly, shrink mitigation efforts employed in recent years have not produced the expected results, with the USA 2001 shrink rate equaling the 10-year average. Some business case analyses estimate that RFID can improve shrink rates by 25 percent at the case level and up to 40 percent at the item level. These forecasts, while optimistic, are encouraging retailers to test RFID for reducing shrink within their four walls, without the participation of their suppliers.

Industry studies also estimate that 30 percent of out-of-stock situations in retail occur at a store shelf even though the supply of product in question is located somewhere within the establishment. Out-of-stocks occur because store personnel do not know where replenishment product is located. As a result, out-of-stocks seriously affect retail sales, brand loyalty, and consumer satisfaction. Industry executives universally agree that out-of-stock reductions are the single largest benefit area offered by RFID for both manufacturers (suppliers) and retailers by improving product visibility in the back room.

Shared back room product visibility outside the four walls of the retailer to the manufacturer should dramatically benefit all trading partners, improving replenishment processes and ultimately resulting in fewer out-of-stocks at the store shelves.

Elimination of shipping and receiving errors between manufacturers/suppliers and retailers, and even between distribution centers and receiving points within the same organization involve cooperative tracking of shipments from point of origin to destination. It also involves cooperative communication between trading partners, eliminating discrepancies that require significant administrative and management support for resolution. As a result, the reduction in these shipping and receiving errors will result in lower administrative labor costs. With shipping and receiving error reduction, the amount of product typically written off from charges related to erroneous charges should also decrease.

RFID may also offer labor efficiencies that may be directly associated with the non-line-of-sight improvements associated with the technology. These labor efficiencies are due to reductions in data entry, audits, exception handling, and in automating bar code or otherwise manual processes in the distribution centers and store back rooms. RFID is especially beneficial when injected into well known trouble spots that address receiving, putaway, picking, staging, shipping, and physical stocktaking.

Summary - Where Are We Today? Prompted to action by the promise of benefits from RFID implemented in the supply chain, retailers today are tagging pallets, dollies, cases, and trays to track units internally within their own four walls. The mandates from Wal-Mart, the U.S.

Department of Defense, Target, Best Buy, and Albertsons are extending the impact of RFID to manufacturers/suppliers who are required to tag their products being shipped to their customer trading partners. Until these suppliers use RFID in earnest for improving both shipping and receiving to their customers and their own supply chain operations, RFID uptake will be tempered by the cost of implementing RFID technology. Indeed, many suppliers are choosing to adopt a “slap and ship” solution solely focused on mandate compliance, not the larger potential benefits that may be realized by extending the reach of RFID into the core of their businesses. The challenge is breaking the business-as-usual paradigm of today and replacing it with the potential business transformation supported by this revolutionary wireless technology.

RFID rollouts today are focused on pallet- and case-level tagging. As a result, implementations are targeted at distribution center dock doors, conveyor systems, store receiving dock doors, and store doors that separate the retail floor from the back room. The visibility supplied by this level of tagging can dramatically impact out-of-stock reductions, shrink, and shipping errors. Item level tagging is on the horizon, offering capabilities that will extend to the retail floor via “smart shelves” that alert of out-of-stock situations and automated checkout using item level RFID tags. The supply chain boundaries will extend upstream from trading partner to trading partner, and downstream to the consumer.

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