

RFIDs and the Changing Marketplace

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INTRODUCTION

The Oxford Dictionary defines RFID as “Radio frequency identification, denoting technologies that use radio waves to identify people or objects carrying encoded microchips” (Oxford Dictionary, 2014). The cost of the small microchips has been falling over the past few decades enabling wider and more frequent applications. The most commonly used RFID that is approximately 1 inch by 1 inch, and can easily be added to individual packages of goods or products found in stores, typically behind a barcode. A smaller RFID that is implantable in animals to track their location and identification (Holloway, 2006; Voulodimos, Patrikakisa, Sideridisb, Ntafisb, & Xylourib, 2010).

These devices emit an electromagnetic field that has a unique code to identify it as a specific microchip to a reading device. Depending on which band frequency is used, as well as the size and power capability of the microchip, RFID ranges can be detected at a distance of between 10 centimeters and 200 meters with the cost range of only a few cents to \$5 per chip depending on the size and range (Belian, 2012; Cardullo, 2003).

A typical structure of RFID can be connected into the Internet to be used as an information system. Each individual tag is detected by an antenna at a range up to 200 meters away. The radio signal is then broadcasted to a RFID reader, which decodes the signal to identify the unique tag name. The info embedded in the tag is then uploaded to a server that can be shared on a typical computer.

The wide variety of different RFID chips allows businesses to adapt the technology to best suit their product application. As the technology continues to grow, the prices per each RFID tag are expected to drop, while the sizes are expected to shrink, and transmitting range is expected to increase. This will continually enable wider adoption of this technology to new applications in industry creating more organizational change (Chia-Chen, Yang, & Wen-Yuan, 2007; Sharifi, Ismail, Qiu, & Tavani, 2013).

HOW RFIDS ARE CHANGING THE WAY WE TRACK ITEMS

RFID grew largely in the early 2000s when Wal-Mart as the world’s largest retailer and the Department of Defense as the world’s largest supply chain operator began mandating their suppliers to use RFIDs for their product shipments. This mandate caused the economy of scale for RFIDs to decrease prices, and also led to an industry technology standard to use EPCglobal’s Electronic Product Code (EPC) standard (Guido, Mainetti, & Patrono, 2012; Wamba, Lefebvre, Bendavid, & Lefebvre, 2008). Previously, the technology was stifled by a lack of uniformity between different RFID manufacturers’ software platform causing customers to acquire different receivers to detect and use different RFIDs. These advances are expected to continue the growth of the use of RFIDs across industries. Das and Harrop (2014) at IDTechEx find that the total RFID market in 2014 is worth \$8.89 billion, up from \$7.77 billion in 2013 and \$6.96 billion in 2012. This includes tags, readers and software/services for RFID cards, labels, fobs and all other form factors. IDTechEx forecast that to rise to \$27.31 billion in 2024. Thus, we can see the adoption of

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RFIDs in businesses is increased significantly in the past three years. It is expected to continue to grow significantly, so that someday it will be more prevalent than bar codes (Hunt, Puglia, & Puglia, 2007).

Businesses are demanding that their suppliers use RFIDs to track incoming shipments as it allows the organizations to make real-time decisions for inventory management and control. When businesses can project what time their supplies will arrive, they can coordinate to make business decisions based on projected inventory. The implementation of RFIDs helps things such as manufacturing scheduling, floor layouts, and even sales. For instances, whenever there is a projected big shipment arriving, that room must be made available in the warehouse (Sharifi, et al., 2013; Wamba & Chatfield, 2011).

RFIDs were first used in 1956, and have been most popular since then with suppliers for the procedure in tracking shipments of items at the level of the transporting vessel (Dobkin, 2013). This includes each shipment container traveling by highway truck, train cart, or overseas ship. Military has used RFID to track equipment and vehicles being moved across the world into combat zones. Being able to track and plan for when critical resupplies would arrive greatly assisted in making operational decisions based on projected future capabilities. The technology served as a combat multiplier so that ground troops could plan convoys to pick up critical repair parts for vehicles and systems without having to wait for the typical lag time at the receiving point. Traditionally, items were normally received and processed before the notification would be sent that the item was ready for pickup (Jones, 2006; Xiao, Boulet, & Gibbons, 2007).

RFIDs are also commonly used in tracking individual objects that are high value enough to warrant the additional expense of a tag. In a Tennessee hospital, instead of relying on nurses to scan barcodes of high value implantable surgical devices or catheter bags prior to using them in a patient, the use of RFIDs on the products has helped save over \$500,000 annually in wasted items, preventing theft, and avoiding incorrect billing due to incorrectly tracked items that patients did not receive (Swedberg, 2009). It is very common now that expensive, pilferage-able, or items with a high theft rate in a store such as expensive liquors, electronics, pharmaceuticals, and jewelry have RFIDs included in the packaging to prevent theft and retain profits (Kumar, Livermont, & Mckewan, 2010).

Instead of tracking shipments and products, another application of RFID is tracking animal stocks. Cows are high value items to ranchers that are commonly stolen or escape when they are allowed to graze over large pasture land. In the US, Canada, and Australia, the beef industries are actively encouraging the use of RFID to track cows. This RFID tag allows for individual tracking of large herds of animals to keep an accurate count. It automates the detection of moving animals, their locations, and ages. It provides farmers an effective tool to identify specific cows at the optimum time for slaughter and ensure no loss of accountability (Dobkin, 2013; Voulodimos, et al., 2010). Additionally, researchers have been tagging various wild animals so that they can further their studies of things such as migration patterns, lifespan, and even establish protection zones for the animals or even people. In the case of whales, knowing their locations by RFID allows protection groups to set up boundaries so that ships do not get too close and harm the animals. In the case of sharks that have been tagged, RFIDs allow protection groups to keep out swimmers when they are in the area to protect humans (Wang & Loui, 2009).

RFIDs can even be used for tracking humans. They are commonly used in prisoner bracelets as a way of maintaining accountability of the prisoners. Even some resorts and theme parks sell RFID tracking brackets that can be worn by children so that their parents can always track their whereabouts (Dobkin, 2013). RFIDs are becoming commonplace for use to get quickly through toll booths to debit a user's account when they pass through a toll area. The US Government uses RFID chips in their passports so that "Customs and Border Protection inspectors will be able to access photographs and other biographical information stored in secure government databases as the traveler approaches an inspection station" (U.S. Department of State, 2014).

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