Radio Frequency Identification

Elise Marie Moran

University of Tennessee - Knoxville

Follow this and additional works at: http://trace.tennessee.edu/utk_chanhonoproj

Recommended Citation

This is brought to you for free and open access by the University of Tennessee Honors Program at Trace: Tennessee Research and Creative Exchange. It has been accepted for inclusion in University of Tennessee Honors Thesis Projects by an authorized administrator of Trace: Tennessee Research and Creative Exchange. For more information, please contact trace@utk.edu.
Radio Frequency Identification (RFID)

Elise Moran, Author
Dr. Mark Moon, Mentor
Marketing and Logistics Department
Honors Senior Project
July 22, 2005
Radio Frequency Identification (RFID): Abstract

I chose the topic of RFID because it is a very hot topic in business today. For my project, I immersed myself in the information available about RFID, its background, implementation, and effects on the supply chain. I wanted to see how it is going to affect marketing, logistics, and the supply chain as a whole. I explored what RFID implementation means as far as channel relationships are concerned and any issues that surfaced. If RFID provides information, and information represents power within the supply chain, then who is going to be in control if power is diffused among all channel partners? My research reveals anticipated implications for both consumers and companies. This is an important topic to me because it focuses an important intersection between marketing and logistics.

Once I gathered all relevant information, I conducted an interview with an individual directly involved in the process of RFID implementation. I uncovered some original information, and revealed whether or not there is resounding support for this technology. This interview was a first hand revelation of the benefits of RFID as well as cost and any obstacles.
Radio Frequency Identification (RFID): Research

My research is on Radio Frequency Identification (RFID) within the supply chain. According to the RFID Journal, Radio Frequency Identification is a “method of identifying unique items using radio waves. Typically, a reader communicates with a tag, which holds digital information in a microchip.”

RFID is not a new technology. It can be traced back to World War II when radar was first being used to track planes. Pilots discovered that by changing their flight patterns they could create unique frequencies, allowing for controllers to identify which planes belonged to whom. More recently it has been used to track livestock and pets, as well as in military applications. The latest buzz about RFID comes from the advances in technology that are allowing for this concept to become a reality in business.

The concept of radio frequency identification is relatively simple. According to the RFID Journal, the user plants a transponder—which is described as a microchip with an antenna—on the desired product and then a “reader” is used to read data off of the microchip using radio frequencies. When the information that is “read” is passed onto the computer system, value can be added to even the most mundane daily business process. Although the concept seems simple, the difficult part is deciding which kind to use and how to implement it. Because there are so many different RFID technologies, it is suggested that an expert “prescribe” the appropriate RFID system to a company.

There are basically two types of tags—active and passive. Active tags have the capacity to hold more information than passive tags and have much longer ranges from which it can be read. Passive tags—unlike active tags—have no internal power source, and therefore hold less information. These tags also have a shorter range than active tags.
What we are going to see in most business situations are passive tags because they hold enough information to complete the task, and are more cost effective. However, some active tags will be used for high-end products. Active tags ensure that the products will not be stolen or copied.

Many people think that RFID is simply a new barcode, and this is an important issue to address. The barcode was first used commercially in 1966, but was not standardized until the UPC was created in 1970. This set of symbols is the same as it was then, and is still used in the United States and Canada. The first product to be scanned using a standardized barcode was a twenty-cent pack of Wrigley’s gum. The rest of the world took a great interest in this new system, eventually leading to the EAN (European Article Numbering) which was introduced in 1976. The two groups (EAN and UPC) could not agree on a standard, so the two remained separate. This caused some difficulty with all of the globalization that is occurring; shipping elsewhere required double labeling. The EAN scanners could read UPC codes, but this did not mean the UPC scanners will be able to read EAN codes.

The Uniform Code Council (UCC) announced that all American and Canadian companies must be able to scan the EAN codes by January 1, 2005. This requirement was announced in 1997 as to give companies ample time to become compliant; it has been successful thus far. During these times of everyone going global, standardization is the key to success, and this was a step in the right direction.
A question to address is: "Are RFID tags better than barcodes?" This is not necessarily a fair comparison because the two are based on different technologies. Some aspects of RFID and barcodes overlap. Both hold useful information that is important to business transactions. The major difference is that the operator must be able to see the actual barcode and line up the scanner with the barcode. On the other hand, an operator can read an RFID tag as long as the scanner is in range, which does not require line of sight. One of the most frequently cited disadvantages of a barcode is that if it is damaged in any way—water damage, peeling, falling off—it cannot be read. Another major disadvantage is the barcode's incapacity to hold any information besides identification of product and manufacturer. For example, egg crate barcodes may identify it as a crate of Kroger eggs; however, RFID could identify which individual unit it is and when its expiration date will pass as compared to other crates. (RFID Journal)

Since some of the advantages and disadvantages have been discussed, the next issue to address is: "Will RFID replace barcodes?" Since there are obvious advantages to using RFID, this is a logical question to ask. Some people feel that completely replacing barcodes with RFID systems at this point would not be feasible. The bar code system has been in place for over 30 years, and has been inexpensive and effective in performing tasks for which it was designed. Experts anticipate that the two systems will coexist for many years. (RFID Journal)

Although thousands of companies are already using RFID, there have been several reasons cited for companies being wary of implementing RFID. First, it is very expensive to integrate RFID into a preexisting network. Secondly, RFID has an
unfavorable image among some companies. The third reason is security issues; many are especially hesitant after recent issues with identity theft and stolen information.

There is no set cost for implementing a fully functional RFID because each company is different—different preexisting systems, different RFID systems, different sizes, and other factors. Most RFID providers are reluctant to give a price quote because prices are not the same based on which application is selected, volume, memory, and other factors. However, the range for tags is 20 to 40 cents for a basic tag; obviously, the more features involved, the more expensive they will be (for example, active versus passive). Readers can cost anywhere from a couple of hundred dollars to thousands of dollars. In order to begin implementation of an RFID system, a company needs to purchase tags, scanners (readers), software to filter data, and hire a systems integrator. In addition, entire departments within the company need to be overhauled (for example, management systems), networks need upgrades, and readers need to be installed. After all of this, everything needs to be integrated into the company-wide system. (RFID Journal)

Implementation of a fully functional system will be expensive. However, since it—like other technologies—enables a company to add a great deal of value. If there is added value, the additional costs will eventually be absorbed. Once the market identifies the advantage, the way in which the cost will be absorbed will be obvious. According to intel.com, “RFID is improving how businesses make decisions, manage production, track inventories, and respond to changing customer needs.” Experts say RFID will reduce supply chain operations costs and make processes more effective and efficient. Intel provides a list of benefits that will add value to a company and its customers. According to their website, RFID provides tracking of assets; visibility at all points along the supply
chain; ability to make more accurate production forecasts; theft and defect detection; reduced costs; and increased productivity. RFID also adds value to the customers by making the check-out process more efficient or removing it entirely; identity theft protection; desired items will be in-stock; providing the freshest products; and the option to customize products. Although this was originally noted as one of the biggest reasons for not adopting RFID, it is actually not an issue because the cost will be absorbed.

The second concerned that will be addressed is the unfavorable image the technology has among companies. The key to overcoming this obstacle is communication among the early adopters. These companies must share their discoveries so that everyone can benefit, and the technology can grow. The reason most people are wary is that they are not fully informed. Not only does the idea need to be “sold” to companies, but the public also needs to become educated on what exactly the technology can and can not do. For example, people are concerned about their information being stolen by having someone “read” them, but the technology is not there yet.

As this technology grows, security issues will need to be addressed, and there is much to learn from the mistakes and mishaps that have occurred with the internet. One option would be to program tags so that only a certain type of reader could access the information. Those responsible for developing RFID feel that “adopters of RFID must look for a balance of security, privacy, trust, value and convenience” (Germain). This should be an ongoing goal for organizations, which will lead to secure systems and added value.

At Microsoft’s TechEd 2005, Senior Vice President of Server Applications, Paul Flessner, announced that the company is introducing a new strategy to make RFID
implementation easier for customers. Microsoft has joined the companies that are making the switch to RFID more streamlined. The company is one of the major proponents for encouraging the widespread adoption of RFID. With their reputation for quality and stability, perhaps others will feel more comfortable with the concept. Microsoft hopes to alleviate previous concerns about complexity, lack of standards, expensive changeover costs, and data filtration. Microsoft’s network will be user-friendly and thoroughly integrated. By making business processes more efficient through this newer technology, a company will ultimately see major cost savings. At the conference, Flessner stated that “Seamless integration of sensor data with applications and business processes through easy-to-use tools at low cost is a big step forward for companies justifying a strategic investment in RFID technologies.” This new technology will be the perfect platform for encouraging small to mid-size companies to adopt RFID because it will be less expensive and easier to integrate; major corporations are no longer the only ones with the capacity to integrate this system.

Logistically speaking, I feel that RFID can affect substitutability. Although the point has been argued that logistics cannot affect substitutability, I think that the level of standardization that RFID can bring to an industry will in fact increase the degree of substitutability (as seen with EDI and other means of standardization). RFID enables substitution at every point along the supply chain, from manufacturing to packaging (particularly labeling). This brings up an interesting concept: postponement. Although the idea of postponement has been around for years, RFID would enable postponement to become an important partner in creating a more efficient supply chain. Postponement allows for a leaner operation. Products can move through the supply chain without
specific labels until an order is processed; therefore, if substitution products are needed elsewhere, there will be a ready supply.

I think RFID can also benefit logistics by alleviating some of the problems the trucking industry is experiencing. Drivers are increasingly unhappy with conditions, and one of problems cited is the amount of time spent away from one’s home, family, and friends. A solution I propose involves a type of dedicated short-distance route. The benefit for drivers is that they will only deliver to locations that would allow them to be home every night. For example, say that a load needed to be taken from Knoxville to Memphis; however that is not a one day round trip for the driver. Loads are run everyday from Knoxville to Memphis and Memphis to Knoxville. Driver A in Knoxville would drive to Nashville to a designated relay point. Driver B in Memphis drives to this same relay point and the two switch loads (drop and hook). Driver A would return to Knoxville with a full load and the same would be true of Driver B. RFID could make this not only possible, but seamless as well (See Appendix A). Complete visibility of assets (trucks, drivers, products) would allow for coordination. This technology would also ensure that the correct party is held accountable for each leg because a quick inventory could be taken to be sure that the load is correct at each point. The benefit for companies is that it would create a leaner system by eliminating wasteful dead-heading and would motivate drivers. If skeptics are concerned with drivers becoming jaded with the same route, drivers could switch off among different routes. A long term effect of this may be better safety records because the drivers would not be overtired and despondent. The pressure to complete an all-night run would be eliminated.
RFID is not limited to the business arena. The Department of Defense has been at the forefront of adopting RFID into every aspect of daily operations. In fact, on July 30, 2004, the DoD developed a strategy for adopting RFID because it will enable them to take advantage of the efficiency brought about by this technology. The strategy on the Department’s website is as follows: “Leveraging this technology to improve our ability to get the customer the right materiel, at the right time, and in the right condition is a critical part of our End-to-End Warfighter Support initiative.” (www.dodrfid.org)

Early this year, the Department of Defense decided to phase-in RFID requirements. According to the website (www.dodrfid.org), the department has “developed a plan for passive RFID tagging that delivers the best value to the warfighting customer.” RFID tags will be required of all Department of Defense suppliers and manufacturers, and must be attached to all individual units, cases of units, and pallets going through depots in Sequenna, Pennsylvania or San Joaquin, California. Within the next two years, the existence of RFID will be much more widespread as more depots are added to that list. (www.dodrfid.org)

During my research, I was privileged to interview an employee who is in charge of implementing RFID at a company that is a major manufacturer of a wide range of health care products. During the interview, we discussed concerns, suggestions, and what is happening presently with the technology. Much of the information I received was similar to what I found in my research; however I was also able to uncover some original information from a person who deals with this technology everyday. Some of the concerns expressed pertain to the drug industry, but others are more universal.
One of the concerns this company has is being able to guarantee to the public that the tag is disabled and cannot be read any longer. This is one of the security issues voiced by consumers. At this stage in the technology, it is very easy to disable the tag—the person just needs to bend it! However, as advancements in tag technology are made, that is something that needs to be addressed.

The company already uses RFID for a high-end drug—which costs $600 to $700 per vile—in order to prevent counterfeiting. The company hopes to use RFID as part of the “cold chain,” which is a type of supply chain that deal with perishable products. With RFID being part of the drug’s makeup, the reader is able to determine the expiration date; they soon hope to be able to determine if the temperature of the drug fell or rose above the necessary temperature at any point. This is particularly important for such an expensive drug, and may be an applicable option for other perishable products. In the future, they also hope to be able to use RFID to determine if the user is taking the drug as prescribed. Two concerns that arise from this application of RFID are: Will it affect the effectiveness of the drug? Can we still read the information in a cold setting? These issues must be addressed as the technology develops.

An important question I wanted answered was: Is there resounding support for RFID implementation throughout the company? When I asked if others within the company felt as positively as the interviewee did, the employee stated that it seemed that everyone was excited about the possibilities. However, the most frequently cited concern is the cost. Also, employees are concerned about the vast amount of information the technology could generate. How will it be controlled? What will be done with the information?
Although cost of implementation is a concern, there are aspects of business that will see reduced costs. Often, the biggest cost to an organization is its employees. It is not simply salaries; there are also benefits and training. RFID can help a company reduce cost by eliminating jobs such as check-out workers, and shifting employees to different areas in which they might be more effective. Companies like Wal-Mart have looked into automatic check-out, in which a customer simply walks out the door and all products bought are automatically scanned and the customer is charged.

A topic I feel is important is Wal-Mart and their role in RFID. Within the supply chain, information is power. RFID will create a diffusion of power among all the supply chain partners, from suppliers to retailers to customers. If information is power and RFID allows everyone access to information, what is to become of the so-called “major players” like Wal-Mart? RFID is an exciting concept for the company because it will enable them to streamline reordering, therefore preventing stock-outs which is imperative to Wal-Mart’s logistics system. In the near future, RFID has the capability of determining if products are in a good position in the store by reading how many times an item is picked up off the shelf. Metro stores in Germany are already attempting this.

Another issue that we discussed in the interview is what Wal-Mart can and cannot dictate to their supply chain partners. Everyone in the supply chain needs to satisfy their customers, and Wal-Mart knows there is a cost associated with this. According to the interviewee—whose company is a supplier of this “giant”—Wal-Mart is not 100% ready for implementation. His boss—who has been in this business for 36 years—says that entities like Wal-Mart and the DoD can make a lot of public statements, but cannot necessarily back them up. Wal-Mart cannot dictate to supply chain partners because
RFID implementation is a group effort because companies must learn from others mistakes and discoveries. There are a lot of checks and balances with this implementation, and no one wants to be a bad corporate citizen by destroying relationships and therefore losing customers. Also, with everything going global these days, Wal-Mart needs to be cautious because they are not the strongest player in Europe.

We have globalization in every aspect of our daily lives, and RFID is no exception. Everyday there are new articles in the trade journals about which countries are adopting which kind of RFID applications and standards—the introduction of RFID into daily business applications is not limited to the United States. Standardization will be the key to the success of RFID implementation. At this point, many business applications have to completely change processes to operate globally. To me, an interesting aspect of RFID is that as the technology is growing, so is the standardization. This is a truly global effort, and standards must be put in place before it can run smoothly.

Consistency in systems will much less expensive. According to the interviewee, there must be different standards within industries (for example, car manufacturers and clothing), but there must be limits on the number of standards in place. There is a theory that, with RFID, there is no need for more than 200-300 worldwide standards. Another aspect that needs to be agreed upon is the range of frequencies used. There probably could not be just one frequency rate due to some sensitive situations (for example, in hospitals because of surgical equipment or pacemakers).

RFID is going to change the way people do business. This technology is not only revolutionizing packaging, but it is also providing cost benefits by optimizing inventory, increasing productivity, and increasing customer satisfaction.
Works Cited

Department of Defense Website. www.dodrfid.org


http://users.pandora.be/worldstandards/barcodes.htm#history

Intel Corporation Website. www.intel.com

RFID Journal. www.rfidjournal.com

Appendix A

Driver A transports Load 1 to designated location and returns with load 2.

Driver B transports Load 2 to designated location and returns with Load 1.
To: mmoon@utk.edu

Dear Mark:
Thanks for serving as faculty mentor for Elise Moran, and monitoring her senior honors project. There's a box on the approval form which, if checked, represents your recommendation that the project be archived with other senior honors projects. The box was not checked, and that's fine of course, but I wanted to verify that this was not simply an oversight. Please let me know when you have a moment, and again thank you for helping Elise and University Honors.
With best wishes,
Mark