2005

RFID: Revolutionizing inventory management across the supply chain

Jack Cook

Laura Cook

Recommended Citation
APICS International Conference. September, 2005.

Jack S. Cook, CFPIM, CSQE and Laura Cook

RFID: Revolutionizing Inventory Management Across the Supply Chain

ABSTRACT

Radio frequency identification (RFID) is revolutionizing asset tracking, inventory management, and supply chain execution. RFID has the ability to track inventory with almost no human intervention, thus offering enormous potential for better inventory management across the supply chain. This paper discusses the application of RFID within four settings: (1) healthcare facilities, specifically hospitals; (2) tracking pharmaceuticals from manufacturing throughout distribution; (3) managing retail supply chains; and (4) tracking personnel, assets, and inventory in the military.

INTRODUCTION

RFID potentially could completely revolutionize supply chain management practices. Imagine being on the battlefield in desperate need of ammunition. Supplies are scarce. You can only order what is absolutely necessary. Knowing the exact location of your supplies is crucial to your decision. Once requisitioned, knowing where ordered supplies are located within the supply chain is vital. Your life depends on it. RFID can locate and identify critical battlefield supplies within the supply chain.

The supply chain refers to the flow of materials, information, and services from raw material suppliers through factories and warehouses to the end customers. (Turban and Aronson, 2001, p. 323.) The supply chain includes many activities and processes, including purchasing, materials handling, production planning and control, manufacturing, logistics, warehousing, inventory control, and distribution of the product or service to the customer. (Turban and Aronson, 2001.) The goal of the supply chain is to reduce the uncertainty and risks associated with customer service, inventory levels, processes, and cycle time in an effort to contribute to increased profitability and competitiveness. (Turban and Aronson, 2001.)

IMPORTANT SUPPLY CHAIN ISSUES

Tan (2002) surveyed managers on supply chain management (SCM) practices. The survey results (see **Table 1**) led to a couple of general conclusions. (Tan, 2002, p. 49.) First, practices deemed most significant by managers were positively related to performance and, therefore, most likely to impact it. Secondly, managers should focus on these practices to improve performance, especially the practices that are strongly correlated to all three dimensions of performance. (Tan, 2002.) Interestingly, four of the five highest-ranked practices were all time sensitive and could be positively impacted by the implementation of RFID. (Tan, 2002.) Apparently, these managers placed a great deal of emphasis on timing and speed within their processes, and so, logically, advances in technology such as RFID would be crucial.

PHYSICAL INFRASTRUCTURE

Passive tags: Passive tags consist of a memory circuit and antenna. A passive tag uses the energy absorbed from an RFID reader through its antenna to transmit stored data back to the reader. (Caton, 2004.) Passive tags are dormant until scanned. In comparison to active tags, passive tags are cheap, typically costing from 40 cents to $10. Furthermore, passive tags can be printed onto a label for slap and ship capability. Passive tags will streamline material movement through warehouses and depots, increase inventory accuracy, and generate productivity improvements.

Active tags: Structurally, active RFID tags differ substantially from passive RFID. Active tags transmit information directly to readers using their own power supply. (Caton, 2004.) Hence, active tags have a much greater read range and hold larger quantities of data as compared to passive tags. However, these capabilities come at an expense. Active tags currently cost approximately $100 each. Whereas passive tags are useful for inventory management, active RFID tags are used to track assets. Passive and active tags are complementary; combining the two greatly improves visibility and velocity within the supply chain.

RFID USE IN HEALTHCARE

Hospitals and service industries in general often underutilize technology in logistics applications.

		PERFORMANCE MEASURES		
		PRODUCT	CUSTOMER	COMPETITIVE
SCM ACTIVITIES	MEAN	QUALITY	SERVICE	POSITION
Determining customer's future needs	4.41	0.105†	0.155*	0.168*
Reducing response time across the supply chain	4.51	0.121*	0.150*	0.148*
On-time delivery directly to your firm's points of use	4.28	0.123	0.171*	0.128*
On-time delivery directly to customers' points of use	4.24	0.118	0.158*	0.154*
Improving the integration of activities across your SC	4.16	0.202*	0.156*	0.207*
Searching for new ways to integrate SCM activities	3.99	0.061	0.115†	0.131*
Creating a greater level of trust among SC members	3.97	0.148*	0.224*	0.097
Communicating your firm's future strategic needs	3.90	0.176*	0.242*	0.129*
Establishing more frequent contact with SC members	3.83	0.058	0.079	0.048
Contacting the end users to get feedback	3.81	0.106†	0.158*	0.108†
Increasing your firm's Just-in-Time (JIT) capability	3.70	0.115†	0.048	0.082
Communicating customers' future strategic needs	3.68	0.082	0.099	0.101
Use of formal information sharing agreements	3.65	0.154*	0.141*	0.185*
Creating a compatible information system	3.61	0.111†	0.122*	0.145*
Use of informal information sharing	3.60	0.049	0.056	0.095
Aiding suppliers to increase their JIT capability	3.47	0.175*	0.162*	0.108†
Involving SC in your product/service/marketing plans	3.41	0.108†	0.168*	0.169*
Identifying additional SC	3.31	0.080	0.111†	0.129*
Creating SCM teams to include different companies	2.95	0.095	0.100	0.082
Participating in the marketing efforts of customers	2.88	0.055	0.080	0.096
Participating in the sourcing decisions of suppliers	2.85	0.183*	0.055	0.135*
Extending SC beyond immediate suppliers/customers	2.83	0.057	0.093	0.122*
Locating closer to your customers	2.40	-0.026	0.027	0.051
Requiring suppliers to locate closer to your firm	2.18	0.043	0.030	-0.012
Use of a third-party SCM specialist	2.18	-0.052	-0.068	-0.085
* significant at $\alpha \leq 5$ percent				
† significant at $\alpha = 10$ percent				

Table 1. Correlation of SCM Practices vs. Performance

This leads to confusion, inefficiencies, and sometimes, unfortunately, the mistreatment of patients. The adoption of RFID tracking systems in hospitals can greatly decrease surgical errors and lost equipment and increase patient flow and the quality of patient care.

DRUG TRACKING IN THE PHARMACEUTICAL INDUSTRY

Drug counterfeiting is becoming increasingly common. As reported on the Food & Drug Administration's (FDA) Web site, in 1998 there were only four pending counterfeit drug cases, but this number increased 550 percent in 2002 (see **Table 2**.). In July 2003, FDA commissioner Mark McClellan formed a counterfeiting drug task force to study how to deter counterfeiters. (Anonymous, 2004.) The group's specifically mentions RFID. It states that RFID technology will make the copying of medications either extremely difficult or unprofitable. (Anonymous, 2004)

1997	6
1998	4
1999	6
2000	6
2001	20
2002	22

Source: U.S. Food and Drug Administration (fda.gov)

Table 2. Counterfeit Drug Cases are on the Rise (Number of Open FDA Cases)

Pharmaceutical products are excellent candidates for RFID. The technology assist manufacturers in combating major supply chain issues such as parallel trade, product recalls, and counterfeit drugs. Michael Canton explains, "counterfeiting, theft, and product recalls present a considerable risks for drug producers, distributors, and pharmacies as drugs move from production to consumers." (Canton, 2004, p.48.) Approximately 10 percent of all drugs are counterfeit.

Counterfeiting not only poses a problem to pharmacies but also places individuals at risk. Internet prescription sites and drugs coming across our borders from neighboring countries do not help. By implementing RFID and pedigrees, retailers will be able to tell if a drug is counterfeit. Many drugs are exported out of the United States, only to be re-imported. Medications could be tracked from the manufacturing facility to the patient's bedside if RFID were used. It would be possible to determine where the drug traveled and perhaps where counterfeiting occurred. Another benefit is that with RFID, each individual item is given a unique code, whereas bar codes are unique only to the product level. In addition, bar codes are easily duplicated as compared to RFID tags.

RFID IN RETAIL ESTABLISHMENTS

Retailers will implement RFID because of the widespread benefits. RFID help retailers cater to customer expectations, decrease shrinkage, and improve logistics. (Ward, 2004.) Retailers will lower cost because the supply chain is more efficient using RFID. (Blanchard, 2003.) Decreasing shrinkage is important; RFID can help. In January 2005, the U.S. Commerce Department released data showing $1.291 trillion in inventories of retailers that are all at risk. (Dunham, 2005.) Shrinkage rates in the U.S. average 1.7 percent, which led to an annual $31.3 billion loss for retailers in 2001. ("National Survey," 2004.) RFID will prevent shrinkage while transporting goods to retail outlets and can prevent shoplifting within retail stores. Shoplifting "accounted for 32 percent of retail theft in 2001, or about $10 billion." ("National Survey," 2004.) Further, "RFID will help combat theft and counterfeiting, problems that cost businesses $500 billion a year." (Foroohar, 2004, p. 74.)

Retailers such as Wal-Mart, Tesco, and Best Buy are leading the RFID revolution to run more efficient retail operations. These retailers find that RFID helps to reduce labor by 20 percent, cuts inventory by 25 percent, and helps increase sales up to four percent. (Ward, 2004.) Specifically, Wal-Mart believes RFID implementation leads to a four percent increase in sales. (Wood, 2004.) In return, this translates into increased revenue of $10.25 billion. (Wood, 2004.) Further, RFID is becoming a huge industry in itself—by 2007, retailers will be spending $4.6 billion on RFID technology to improve the way business is done. (Ward, 2004.) The big question for retailers is, "What are they going to do with all the data that are collected?"

MILITARY USE OF RFID

Inventory tracking: The military uses RFID for controlling the flow of replenishments to units stationed in Iraq. Achieving visibility in the field makes the military's supply chain more efficient. Col. Mark Nixon explained that RFID-enabled tracking "allow commanders to reduce how many parts they order because they are no longer afraid that they're not going to get what they need. In the past, we've found examples where a crucial part or needed supplies were ordered a dozen times because the commander in the field had no visibility." (Roberti, 2005.)

"Department of Defense (DOD) officials will use passive RFID tags next year on cargo containers holding food, clothing, hygienics, and parts from two distribution sites in Pennsylvania and California. They also will use passive tags in 2006 on containers holding ammunition, construction materials, pharmaceuticals, and petroleum products from 32 shipping locations, the policy states." (Tiboni, 2004.)

Asset tracking: The military is using active tags on vehicles and tanks. For example, "When the Marine Corps went to Iraq, some units had active tags—not just on pallets, but on vehicles. RFID readers were set up at a distribution center in Kuwait, at the Iraq-Kuwaiti border, and at checkpoints along the main arteries into Iraq. When trucks passed the readers, the location of the goods they were carrying was updated in the U.S. DOD's in-transit visibility network database. That enabled commanders on the ground to see the precise location of replenishments needed to sustain operations." (Tiboni, 2004.)

Personnel tracking: The military is also experimenting with RFID-enabled dog tags. These tags will carry vital information about a soldier such as blood type, allergies, name, and social security number.

CONCLUSION

The benefits of RFID include improved customer satisfaction (Cudahy, 2004), improved efficiency and convenience in inventory tracking (Gecker, 2004), and streamlining through time-savings (Murphy, 2003). The list of possible applications is nearly endless, including areas such as asset management, anti-counterfeiting, entertainment, security, and proof of ownership. (Cudahy, 2004.)

There are also some important negative aspects related to RFID. Some individuals are concerned about privacy issues. Others are concerned about the cost of implementation. A bar code costs about one penny a piece whereas RFID is much more expensive. (Atkinson, 2003.) Despite these obstacles, RFID will profoundly revolutionize inventory management across the supply chain.

REFERENCES

Anonymous, (2004, March). FDA Speaks on RFID and Bar Codes for Drug Packages. *Food & Drug Packaging, 68*(3), 11.

Atkinson, H. (2003, September). The Tags that Knew Too Much. *DC Velocity, 1*(9), 30-34.

Blanchard, D. (2003, July). Fears of "Big Brother" Sidetrack Benetton's Smart Tag Initiative. *Transportation & Distribution, 44*(7), 20.

Canton, M. (2004, April 19). Drug Companies Look to RFID. *eWeek, 21*(16), 48.

Cudahy, G. (2004, May). RFID: Creating Adaptive Supply Networks. *Inside Supply Management, 15*(5), 38-40.

Dunham, D. (2005, March 16). Retail Sales Rise 0.5% on Strength in Array of Sectors, *Wall Street Journal*, p. B3.

Foroohar, R. (2004, June 7). The Future of Shopping; Tiny Silicon Identity Chips being put in Everyday Objects and even Implanted under the Skin are Changing the Way We Consume. Will they also Invade our Privacy?, *Newsweek*, 74.

Gecker, R. (2004, March). A Walk on the Wireless Side. *Inbound Logistics*, 62-72.

Murphy, J. (2003, September) Get ready! Wal-Mart Mandate Puts RFID, Smart Tags on Fast Track. *Global Logistics & Supply Chain Strategies*, 32-41.

National survey (2004, January 26). National Survey Shows Employee Theft at a Record High. *Home Channel News, 30*(2), 4-5.

Roberti, M (2005, February 21). *RFID Aided Marines in Iraq.* Retrieved March 13th from http://www.rfidjournal.com/article/articleview/1414/1/65/

Tan, K. C. (2002, February). Supply Chain Management: Practices, Concerns, and Performance Issues. The Journal of Supply Chain Management, 38(1), 42-53.

Tiboni, F (2004, August 11). *Military Poised for RFID.* Retrieved March 15th from http://www.fcw.com/fcw/articles/2004/0809/web-rfid-08-11-04.asp

Turban E. & Aronson J. (2001). *Decision Support Systems and Intelligent Systems*. New Jersey: Prentice-Hall

Ward, S. (2004, May 31). Making Waves Radio-Frequency Identification could be the Next Big Thing in Technology, Barron's. 84(22), 31-32.

Wood, L. (2004, October). Retail's Biggest RFID Project. *Chain Store Age. 47*(12), 11A-15A. Retrieved December 21, 2004, from ProQuest.

ABOUT THE AUTHORS

Jack Cook, Ph.D., CFPIM, CSQE, is a professor, speaker, author, and consultant who has an entertaining and engaging approach and is known for bringing theories to life.

Laura Cook works as a technology support professional for the computing and information technology department that supports SUNY-Geneseo.