

The Electronic Product Code: Transforming the Shopping Experience

Executive Summary and Introduction

In 2003, the Massachusetts Institute of Technology (MIT) rolled out the electronic product code (EPC) with support from the food and consumer products industry. The code was integrated into technology that promises to dramatically streamline product distribution and transform the entire shopping experience for supermarket customers.

The EPC is a unique serial number embedded in a microchip or tag attached to each individual product, case, pallet or other item. Using a proven technology called radio frequency identification (RFID), the code can be read by sensors over short distances. EPC numbers identify items with pinpoint accuracy and remarkable detail. With an EPC, each individual box of corn flakes or coffee filters, for example, becomes identifiable and distinct from the next. Among the benefits as the technology is refined:

- Checkout lines will move much faster as EPC readers capture the entire contents of a shopping cart in seconds and, with the shopper's consent, debit his or her bank account.
- Consumers will seldom find products out of stock since the technology can signal retailers when shelves need to be replenished.
- Product freshness and quality will be enhanced as EPC systems alert retailers when sell-by or use-by dates expire. The same protection can be extended to medications.
- EPC-driven recalls can quickly identify every single product affected, enabling companies to remove them from the market and notify customers not to consume them and return the items for refunds.
- The technology can sharply curtail shoplifting and counterfeiting of foods, drugs, DVDs, computers and other valuable consumer goods, improving product integrity and reducing costs.
- Retailers, wholesalers and suppliers will learn quickly and exactly which products are selling, which are not and at what rate, enabling them to meet consumer demand with unprecedented speed and precision. This knowledge will increase sales and eliminate billions in inventory waste — a multibillion-dollar benefit for industry and consumers.
- Years from now, EPCs could become the foundation for smart kitchens. For example, microwaving a pasta dish may require no more effort than placing the package in the oven and closing the door. The EPC will instruct the oven how to rotate the dish, how long to cook it and ding when the meal is ready.

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Food Marketing Institute (FMI) conducts programs in research, education, industry relations and public affairs on behalf of its 2,300 member companies — food retailers and wholesalers — in the United States and around the world. FMI's U.S. members operate approximately 26,000 retail food stores with a combined annual sales volume of \$340 billion — three-quarters of all food retail store sales in the United States. FMI's retail membership is composed of large multi-store chains, regional firms and independent supermarkets. Its international membership includes 200 companies from 60 countries.



655 15th Street, N.W., Washington, DC 20005
202.452.8444 fax: 202.429.4519
fmi@fmi.org ■ www.fmi.org

Food manufacturers, wholesalers and retailers, as well as nonfood industries and the U.S. Postal Service and Department of Defense, believe this technology will trigger a quantum leap forward in their ongoing efforts to wring costs out of their distribution systems.

Amid such tantalizing predictions, however, some voices are expressing concerns that EPC applications may pose a pervasive threat to consumer privacy. Some critics claim that the technology, if used improperly, has the potential to reduce or eliminate purchasing anonymity and threaten civil liberties. Proponents say such concerns are premature since individually tagged items are not expected to be widespread on supermarket shelves for years.

Retailers and manufacturers have begun testing warehouse and distribution applications of the technology, such as attaching EPC tags to pallets and cases. Industry experts believe that within 10 years, food marketing — from the manufacturing plant to the store shelf — will be totally changed, with the EPC leading the transformation.

RFID — The Enabling Technology

The basic technology of radio frequency identification has been around since the invention of radar during World War II. Today, RFID tags attached to cars and trucks enable drivers to pass through tollbooths quickly and purchase gasoline at pumps without using cash or credit cards. The EPC allows much more information to be stored within the microchips. Reader-enabled Internet links make the memory capacity virtually limitless.

EPC-based tags come in a variety of shapes and sizes — some as small as a grain of salt. They can be affixed to clothing, pallets and, eventually, to packaging of thousands of food and nonfood items available at every retail store.

What's held back broader use so far is the cost of the tags holding unique EPCs. Chipmakers are aggressively working to drop these costs to less than a nickel each — the point at which widespread applications will be affordable. The cost hurdle is not a barrier for using the technology on product pallets, cases, large bags of pet food and relatively high-cost items such as nondisposable razors, CDs, DVDs and computers.

But before EPC-tagged items reach the retail aisle on a widespread scale — along with the smart shelves and checkout technology able to scan them — major hurdles must be overcome, including agreement on global technology standards, lower capital investment costs and new systems to manage the EPC data files. In addition, strong busi-

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Glossary

Electronic product code (EPC): Embedded in a microchip, this code can uniquely identify an individual item and provide far more information than a Universal Product Code (U.P.C.).

Radio frequency identification (RFID): This technology, in use since the 1940s, uses radio waves to read information. Unlike U.P.C. scanners, RFID systems do not require line-of-sight and can read large numbers of EPCs at short distances.

Tags: Attached to packages, cases or pallets, these contain the EPC microchip and a means to communicate with an RFID reader. Active tags use a battery to power the microchip and communicate with the reader. Passive tags draw energy from radio waves created by the reader.

ness cases must be developed that the substantial investments required will be offset by the benefits to businesses and consumers.

The highest hurdle, however, could well be the privacy issue, which some observers believe has the potential to delay the widespread use of EPC technology.

Privacy advocates worry that, without safeguards, the EPC will enable the industry to track purchased items all the way to the shopper's pantry, refrigerator or medicine chest — thus providing a detailed glimpse of household shopping habits. A related concern: who will monitor and protect the huge amounts of EPC data produced to ensure that personalized information isn't released?

Businesses eager to embrace the EPC take the privacy issue seriously. Retailers point out that the experience they gained in successfully addressing privacy concerns during the introduction of bar code scanning and, more recently, frequent shopper card programs will be invaluable in developing privacy guidelines as EPC systems are developed. In addition, retail pharmacists have developed extensive safeguards to protect the privacy of information about prescriptions dispensed to consumers.

Moreover, since the widespread use of individually tagged items is still years away, the industry has time to adopt strict standards that address consumer concerns. In fact, industry-sponsored privacy initiatives are already being discussed.

Consumers and the EPC

Less than 25 percent of consumers have even heard of radio frequency identification technology, according to a recent survey of U.S. consumers by the Cap Gemini Ernst & Young Group (CGEY).¹ The reason is largely due to the fact this technology using the EPC is currently being used to streamline industry distribution and logistics. The industry is attaching EPC microchips to product cases and pallets and tracking their movement with readers placed throughout the supply chain. This will remain the predominant application in the near future.

Although public awareness is low, the CGEY survey indicates that privacy issues are a top-of-mind consumer concern. From a list of issues that hold the potential to make respondents feel "extremely concerned," the three most frequently identified in the survey were (1) the use of consumer data by a third party, (2) an increase in targeted direct marketing and (3) the potential for tracking consumers via their product purchases.

Another recent survey by Forrester Research found consumers are willing to share information if they receive value in return, but many companies are reluctant to gather personal data out of respect for shopper privacy.²

Forrester's survey of 4,061 U.S. consumers revealed that most would share basic data if it saves them time or money. For example, slightly more than half the respondents said they would give their location in return for discounts on nearby products when they are shopping.

On the other hand, companies in the survey said they would be reluctant to collect personal information about their customers. The main

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reason cited was fear of invading their privacy (47 percent), followed by the cost of collecting the data (45 percent).

Forrester is advising clients to understand which data they can collect within the confines of the law and which data their consumers are prepared to share, and to then adopt a code of conduct and be very transparent about it. Customers should know which data is being collected and how it will be used, the research firm concludes.

EPC supporters say that these research results suggest the need for a broad, long-term consumer education effort. Mark Roberti, editor of the online *RFID Journal* and a strong supporter of the technology, has written that education programs must describe the benefits consumers will derive from the technology and, at the same time, indicate how and where RFID- and EPC-generated data will be stored, who can access it, and how retailers will respond to consumer privacy concerns.

Roberti and others also advocate the adoption of the consumer opt-in strategy for RFID/EPC use that retailers use in marketing shopper loyalty cards. In a typical opt-in program, consumers sign a statement indicating their decision to participate. If they choose not to opt in, their individual purchasing data is not gathered.

Some privacy advocates are calling for a voluntary moratorium on item-level EPC tagging of products pending a formal technology assessment involving all stakeholders — including consumers. A consortium of organizations interested in privacy is demanding the development of principles of fair information practice in which consumers control EPC implementation.

Summary and Conclusions

EPC-driven technology is in the rapidly accelerating stage of testing and implementation. Issues such as cost, data management and customer privacy could slow its adoption. The technology shows clear potential as a transforming tool that could remove costs from the supply chain, improve the entire customer shopping experience, protect the integrity of food and drug items (thus adding another measure of consumer safety), and enhance the industry's ability to meet the needs of their customers for food, medicines and other household items.

Critical to the technology's ultimate success is how quickly consumers attain a level of comfort that the EPC will create tangible benefits without threatening their personal privacy. That level of acceptance, in turn, depends upon a meaningful dialogue between businesses and consumers about the uses of EPC technology, the benefits to consumers and the safeguards being put into place to prevent its misuse.

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¹ *RFID and Consumers, Understanding Their Mindset*. To review the Executive Summary of this survey report, visit the following Web site: http://www.us.cgey.com/DownloadLibrary/files/CPRD_RFID_mindset_ES.pdf.

² The Forrester Research report is available only to clients. To review a synopsis, visit <http://www.rfidjournal.com/article/articleview/723/1/1/>.