



In today's **challenging** business environment, manufacturers and retailers need to build supply chains that are **fast, responsive,** and flexible. To deliver **value** to the end consumer, **CIOs** now struggle with the notion that systems must be **capable** of sensing, deciding, and responding to external **supply-chain** events.

RFID Report Card:

Evaluating the Enterprise

AS THE RANKS OF MAJOR enterprises, including Wal-Mart and the U.S. Department of Defense (DoD), turn to Radio Frequency Identification (RFID) for help to continue to grow, understanding the potential of RFID as a transformational IT technology is essential for any business struggling with supply-chain issues.

With new momentum for RFID coming from the ratification of second-generation (Gen2) EPC protocols as global standards, *Performance* takes a look at how RFID impacts business operations and transforms business strategy.

REAL-TIME ENTERPRISE EVOLUTION

For a global-brand owner, the name of the game is survival. The goals are to gain control over manufacturing and the supply chain and make both more responsive to market demands. Success in reaching those goals can be measured in lower downward price pressures and elevated profit margins.

Meeting these goals requires businesses to become agile organizations that can sense, decide, and respond to real-time internal and external events. In the process, the successful enterprise will evolve into a Real-Time Enterprise (RTE), which Gartner defines as “an enterprise that competes by using up-to-date information to progressively remove delays to the management and execution of its critical business processes.” In other words, an RTE uses automation to derive a competitive advantage.

The first step to Darwinian nirvana is accepting change as inevitable and not preventable. The final step introduces decision-making algorithms to respond strategically, as well as tactically, to change. To avoid extinction, businesses must implement strategies that enable a successful traversing of the evolutionary gap between these two steps. Today, many corporations use a transactional Enterprise Resource Planning (ERP) software system, such as SAP or Oracle. These ERP

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—Charles Darwin



systems almost always serve as the “corporate system of record.”

Nonetheless, what ERP—or any other system of record—cannot do is drive operational excellence. ERP systems lack visibility to real-time market events needed to accelerate the kinds of key business processes that could factor into a competitive advantage in the marketplace. As a result, any system intended to drive operational excellence will need to be integrated with the ERP system of record.

THE NEW GENERATION OF RFID

With the recent introduction of second-generation (Gen2) RFID technology, many industry analysts see greater momentum for RFID applications as the market moves toward globally unified standards for ultra high frequency (UHF) RFID. As Gartner sees it, “the

capabilities of Gen2 technology are largely comparable to those of the current generation of products, but they offer incrementally improved performance in all areas.” Nonetheless, there are other analysts who would quibble with Gartner’s characterization of some changes as “incremental.”

Gen1 RFID tags were conceived as electronic versions of bar codes. Moore’s law, however, affects microprocessor-based RFID tags just as it does PCs, making it possible to increase the memory capacity of an RFID tag without impacting its cost. As a result, the mindset behind Gen2 tags went beyond the static notion of a bar code and included bidirectional communication.

Reading a Gen2 tag hardly scratches the surface of its capabilities. You can lock it, kill it, or write new data to it. Nancy Mitchell, national product manager, RFID and Linerless Labels, at Moore Wallace, explains, “Gen2 provides enhanced features and improved performance, including global interoperability, superior tag throughput, multiple read/write capability, enhanced security, and the ability to operate in dense reader environments.”

Such added functionality has many analysts and users wondering how long it will take to transition from Gen1 to Gen2



of RFID. One of the chief architects of the EPCglobal Gen2 specification is Chris Diorio, the cofounder and chairman of Impinj, a semiconductor company that makes RFID chips and readers. As Diorio sees it, Gen1 systems were used for pilot projects so that end users could obtain practical experience with RFID while they waited for Gen2 to do a full-scale deployment. With Gen2 products becoming available, he believes the transition will be rapid. Kevin Franz, director, Strategic Alliances, PEAK Technologies, agrees with Diorio. "It is anticipated that the availability of Gen2 will act as a catalyst to drive rapid RFID adoption. During this time, companies will need to begin project planning, building a budget, and ordering equipment so that they will be at the front of the curve when the tags and equipment are available," Franz says.

Mike Fisher, senior RFID business development manager at Intermec, has a very similar outlook. He finds that most users for the last two years have been involved in small pilot projects in which they tried to figure out how the technology works. Fisher says, "They've been focused on questions like: How do I tag items? How do I hook up readers? What are my benefits?" For Fisher, a critical new driver for RFID is the ratification of the EPCglobal Gen2 air-interface protocol as the technology behind the ISO 18000-6C standard.



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That protocol addresses how a reader and tag communicate, which will make RFID tags globally interoperable. Readers, however, will need to be set to the specific frequencies and power levels designated by the appropriate wireless regulatory authorities—the FCC in the United States and European Telecommunications Standards Institute (ETSI). "Tag interoperability combined with multiple emerging sources of supply should spur a measurable growth in RFID projects as early as next year," adds Fisher.

"A lot of customers who were hesitating in anticipation of a new generation of products will quickly begin their pilot projects, and those who have implemented pilot projects using Gen1 will begin to transition into a Gen2 production environment next year," Fisher concludes.

Vendors are working hard to make this transition a relatively painless process. PEAK's Franz notes that, "most of the companies who supplied RFID hardware and tags for Gen1 technology have or are developing equipment/tags in support of Gen2. What's more, these vendors will have firmware upgrades available for their Gen1 devices in late Q4 2005."

Despite these rosy outlooks, there are a number of operational issues for sites to resolve when implementing an RFID project. These issues include tag orientation, reader coordination, multiple standards, range, customer concerns, and the search for an ROI metric.

OPERATIONAL CHALLENGES

With Gen2, a number of innovations, including dense-reader mode, which allows many readers to operate in close proximity of each other without causing reader-to-reader RF interference, provide the technological underpinnings needed to move from pallet-level tagging to case-level tagging.

This exacerbates a tag signal reception issue: A reader cannot communicate effectively with a tag that is oriented perpendicular to the reader's antenna. Since the tagged cases cannot be reoriented, it will be necessary to attack the problem from the perspective of the reader.

One approach is to use many readers that have a diversity of orientations relative to the read area and to sequence through them performing multiple scans from different directions. The read results can then be merged, providing a much greater chance of identifying all of the tags present.

An alternative approach gaining considerable traction is to use portable readers mounted on forklifts to supplement or even replace portal readers. "Our customers are very interested in a forklift-mounted reader that can stand up to the punishment that a forklift can inflict. We're seeing a shift in interest away from loading-dock portals and onto forklifts by suppliers as a way these companies can enable their own internal operations in a highly efficient manner," explains Mike Smith, RFID business development manager at LXE. Strictly from a provisioning standpoint, many distribution centers will have

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many more loading dock doors than forklifts servicing those doors. As a result, it will be cheaper to put more expensive and rugged readers on each forklift than a fixed portal reader at each loading dock.

Another problem arises from the nature of the packaging. Once printed, a bar code label is independent of the package to which it is attached. That is not the case with RFID tags. Certain types of packaging, such as ferrous metals, can dramatically interfere with the ability of a tag's RF circuits to receive an inquiry signal. The simple answer is to change the packaging, however with specific packaging requirements which might include airtight shipping or protection from hazardous materials, it may be impossible to change shipping material.

Lack of consistency with label performance is one of the most common problems cited by end users, says John Rommell,

sure we can make it work consistently over time, so you can depend on it."

Perhaps the most difficult issue is non-technical: consumer fear and apprehension. The social reaction to the growing use of RFID has often been over the top. Privacy groups claimed that RFID embedded in clothes could be used to provide directed marketing targeted at people as they walked through a store.

Such fanciful ideas may be technologically ludicrous, but perception is reality, and this must be dealt with to avoid customer pushback. Fortunately, the EPCglobal standard anticipated these types of issues and defines a built-in "kill-switch" that can disable a tag at the point of sale to allay consumer fears.

THE EPC GLOBAL VILLAGE

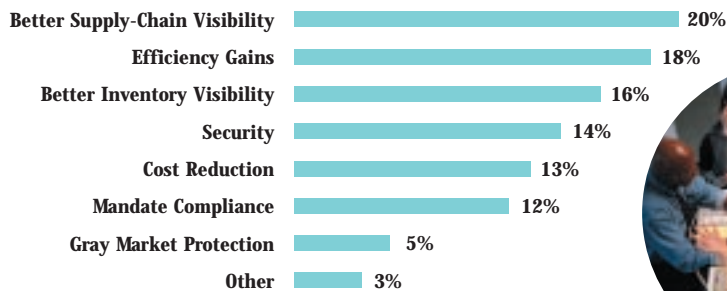
For the future of RFID, all roads lead to the EPCglobal Network. The goal of the EPCglobal Network is to provide companies with the means to leverage their internal RFID structures by sharing real-time business information with trading partners to achieve total asset visibility. Using open standardized EPC interfaces, this framework enables immediate, automatic identification and sharing of information on items in the supply chain.



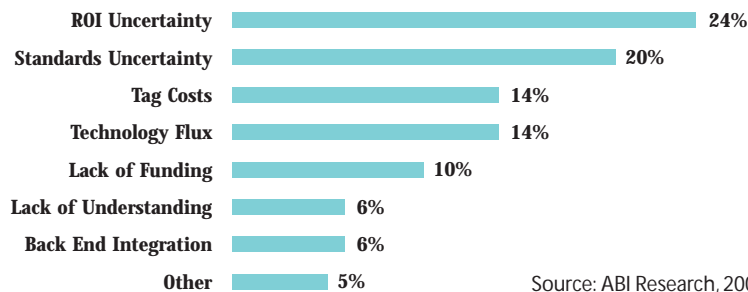
It is the EPCglobal Network, and not slap-and-ship RFID tagging, that will make corporations more efficient through information that will redefine visibility into the supply chain. To provide for immediate, automatic identification and location of any item in the supply chain of any company, in any industry, the EPCglobal Network is built on a central collection of fundamental elements, including the Electronic Product Code (EPC), the ID System, Middleware, EPC Information Services (EPC-IS), Discovery Services, and the Physical Markup Language (PML). All of these efforts within EPCglobal help to expand use of RFID tagging technology on a global scale.

This conjures up the potential of multidimensional data mining for the tag data. That potential could transform the EPC data into a highly valuable strategic asset and render moot any question of ROI in regards to the operational value of RFID. That's because the real value of RFID has little to do with compliance to mandates by trading partners and everything to

>> What Is Your Organization's Primary Motivation in Installing RFID?



>> What Stops Your Organization From Widespread RFID Deployment?



Source: ABI Research, 2004

RFID technology specialist at Symbol Technologies. "Whether it is tag performance or interoperability across different products, end users want the systems to perform at a certain level, which is understandable. That seems to be the primary focus of most suppliers today. We've proved RFID can work, and when it works it can save you money. Now we need to make

do with increased business intelligence based on the movement of products through the supply chain and out to the consumer. “It will take time to implement RFID to achieve maximum benefits, but suppliers who move tagging upstream and re-engineer their business processes to take advantage of RFID and automatic data collection will gain the largest benefit,” notes LXE’s Smith.

MINING EFFICIENCIES IN RFID

An increasing number of major enterprises are turning to RFID as one way to gain critical visibility into real-time supply-chain events. Matt Ream, senior manager, RFID Systems, Zebra Technologies, notes, “In healthcare there is a lot going on in patient wrist banding and lab sample tracking.

Aerospace in particular is heating up as well. RFID has been recently introduced for parts identification in certain applications. There are a number of benefits that RFID technology will bring. The ability to read part information without direct line of site will be very useful for parts of the oxygen system, which are stored in the overhead bins. Airline personnel would be able to check expiration without having to open the bin.”

Using “smart tags” applied to components, finished products, or products packaged at the item-, case-, or pallet-level, RFID provides a self-identification mechanism to gain visibility into the supply chain. When integrated in a closed loop with business processes and applications, RFID promises to transform the way manufacturers and retailers plan demand, manage inventory, handle distribution, deal with supply-chain partners, and market to consumers. “What is most encouraging is that many firms are starting to *use* RFID versus playing with it. Many companies are finding value in the technology and are moving beyond pilot phase into more robust deployments,” says Symbol’s Rommell.

A survey of RFID end users conducted in the third quarter of 2004 by ABI Research documented a widespread consensus among 20% of end users that the most important reason for implementing RFID projects is indeed to gain supply-chain visibility. On the other hand, 48% of the survey’s respondents cited internal efficiency gains, inventory visibility, and improved inventory security as the primary reason for implementing RFID. (See survey results on page 8.)

Those efficiency gains typically are thought to come through better inventory management control, which can greatly reduce

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out of stock situations and stock picking errors. Labor costs can be reduced through the elimination of physical scans and inventory counts. In addition, RFID can rapidly identify areas of stock shrinkage and theft.

RFID AS BUSINESS STRATEGY, NOT TACTIC

As companies struggle to unlock the ROI around RFID initiatives, the creation of a best practices framework to enable real-time information sharing is becoming a fundamental construct for any RFID project. This sharing of data not only encompasses the enterprise applications within the four walls of a corporation, but also the business processes that span the extended enterprise.

According to Professor Raj Veeramani—who leads the University of Wisconsin-Madison’s RFID Industry Workgroup, which includes more than 40 leading companies from various industries—businesses seeking to derive maximum value from RFID deployment must develop a clear understanding of how RFID affects supply-chain dynamics and be willing to change the way supply-chain planning and execution is done. “As suppliers begin to implement RFID technology into their business and manufacturing processes, the ROI will become more achievable,” says PEAK’s Franz.

The challenge for C-level management is to create a next-generation supply-chain that uses XML and Web services technologies to work together to improve the velocity and flow of funds, goods, and information throughout a complex global supply-chain, while reducing production, distribution, and inventory costs. Within this context, Metcalf’s law—the “value” or “power” of a network increases in proportion to the square of the number of nodes on the network—dramatically changes the prospects for the ROI value proposition of an RFID project.

LXE’s Smith concludes, “RFID has tremendous potential to enable a more efficient supply-chain that allows improved visibility and increased velocity throughout all the steps in the process. However, today most manufacturers are at the ‘Tag@Ship’ (a.k.a. ‘slap and ship’) level of RFID deployment typically observed as pure incremental cost. When suppliers are able to move tagging upstream and leverage RFID within their own internal operations, significant benefits can be realized.”