

The ROI of RFID in the Supply Chain

Although RFID implementations are not without costs and risks, a number of companies in manufacturing, warehousing and distribution and retailing have achieved a 200 percent return on investment.

By Thomas Pisello

Aug. 21, 2006—Many organizations that produce, distribute, handle or sell goods are researching what RFID can do to improve operating efficiency, reduce business risk and drive additional revenue opportunities. According to [Alinean Research](#), these early RFID projects could cut supply chain costs by 3 to 5 percent and achieve a 2 to 7 percent increase in revenue, thanks to the better visibility and accuracy RFID provides.

Alinean studies show that on average, more than 90 percent of projects require a formal business case justification in order to gain approval. For an organization considering RFID projects that might require significant up-front investment, how can these general early adopter guidelines and case studies be used to ensure that individual programs generate positive business benefits and a tangible ROI? Most importantly, does the value of RFID tagging exceed the implementation costs?

RFID Defined

RFID is being implemented, along with key business-process improvements in many industries, to reliably track goods of all kinds—from cases, pallets and individual items in manufacturing, wholesale distribution and retail applications, to equipment and supplies in government applications, to overnight mail packages and passenger luggage in transportation and shipping. Many of these early adopters have experienced the benefits of bar codes, but realize that RFID can take supply-chain management to the next level. The network effects of a synchronized supply chain will result in numerous benefits, including improved scan reliability, process automation and real-time information access.

RFID provides persistent, real-time identification information with minimal human intervention, allowing more frequent data collection and greater information capture. With RFID, a dock door, conveyor, forklift or workstation becomes an important data-collection instrument that can read and help reconcile the location and status of goods in the supply chain. Armed with RFID, businesses benefit from more accurate insight and improved decision-making capabilities.

The key to an effective RFID business case is to find applications and processes where bar-code scanning efficiency can be increased. The capture of information on products and assets in motion, reduction of human errors from manual scanning operations and improvement of integrity and security are some of the incremental benefits RFID can provide over existing systems.

How Does RFID Drive Tangible Benefits?

RFID technology as a key component of an enterprise mobility solution, combined with appropriate business-process improvements, can result in clear benefits in the following key areas:

- **Automation**—reducing manual processes through automated scanning and data entry improves productivity, thus allowing resources to be reallocated to higher value activities.
- **Integrity**—improving the integrity of real-time supply-chain information, with increased authentication and security and tracking capabilities, thereby reducing errors, shrinkage and counterfeiting while improving customer satisfaction.
- **Velocity** -minimizing the time spent finding and tracking needed assets, in turn increasing product flow and handling speeds.
- **Insight**—providing the real-time information needed to make faster, better-informed decisions and the ability to be more responsive to the customer.
- **Capability**—providing new applications and quality to meet supply-chain partner demands and enhance customer experiences.

How Are The Benefits Realized?

RFID can deliver tangible benefits for many types of enterprise businesses:

- **Warehouse and Distribution Productivity**—Companies can replace the point-and-read, labor-intensive process of tracking pallets, cases, cartons and individual products with an RFID process. RFID sensors can track these items as they move from various key locations. Because the process is automated, labor costs can be reduced, improving productivity, and enabling the reallocation of resources for more strategic tasks and better scale operations. Productivity improvements can be significant, delivering realized labor costs reductions of 7.5 percent or more in warehouse applications, and 5 to 40 percent in regional distribution centers. For example, as cited in an article appearing in *World Trade Magazine* ("RFID: Taking Stock of the Wal-Mart Pilot," by N. Shister), Wal-Mart experienced a dramatic reduction of pallet-build from an existing 90 seconds to an even faster 11 seconds—a reduction of almost 90 percent.
- **Retail and Point-of-Sale Productivity**—The use of RFID at the product level can help retailers reduce the labor costs and service fees of regular stock management and store-shelf inventory. As one example, handling out-of-stock restocking and replenishment tasks can be reduced by 15 percent to 20 percent with RFID.
- **Out-Of-Stocks**—When an item is out-of-stock, 20 percent of the time the customer either does not buy it or else buys a competitive product (according to Jon C. Stine, *Intel Retail Consumer Package Goods: Industry Field Primer*, Oct. 28, 2005). In grocery stores, as much as 8.3 percent of revenue is lost each year due to out-of-stock conditions, according to the Food Business Forum, the Food Marketing Institute and the Grocery Manufacturers of America. In broader studies of the retail marketplace, the overall economic impact is estimated to be \$69 billion in lost revenue due to out-of-stocks (Emory University, the University of St. Gallen and the University Of Colorado, "Retail Out of Stocks: A Worldwide Examination of Extent, Causes and Consumer Response"). Eliminating out-of-stock conditions via better RFID product tracking, inventory visibility and forecasting can have an immediate impact on top-line revenue by retaining lost sales and recapturing lost market share. AMR Research, of Boston, suggests item-level RFID tagging can yield significant benefits today if managed correctly. When targeted at specific consumer goods categories, item-level tagging can yield an astounding 50 percent improvement in stock availability (see "RFID and Retail: Little Return for Case and Pallet Tagging" by Scott Langdoc and Kara Romanow). And the benefits are not isolated just to select consumer goods. RFID is proven to deliver an average 16 percent reduction in product out-of-stocks (see EPC Reduces Out-of-Stocks at Wal-Mart). If an out-of stock does occur, RFID enables a retailer to restock three times faster than non-tagged items are restocked within the same store. At the retail level, out-of-stock savings can yield a 3 to 4 percent increase/recapture of sales, according to a 2003 Ernst & Young report, "Study of Retail Loss Prevention."

- **Inventory Management**—Inventory accuracy is important to help improve visibility and insight into what specific raw materials have arrived, helping to assure the right materials are available and to better manage just-in-time production models, track work-in-process and speed finished goods through the supply chain. The use of RFID improves these processes and helps minimize costly inventory errors, reducing production delays and lowering production reconfiguration costs that often result from material or demand-planning issues. Additionally, visibility can be improved into distribution and retail channels to track delivered goods more accurately and in real time, and to manage and match demand better. Accurate and real-time visibility throughout the supply chain helps to improve inventory forecasting, manage just-in-time workflow and eliminate excess inventory. Savings are realized by reducing required inventory via lower safety stock requirements, a net 10 to 30 percent savings, according to a 2003 [Accenture](#) report, "Auto-ID on Demand: The Value of Auto-ID Technology in Consumer Packaged Goods Demand Planning." Better inventory management also leads to proportional reductions in out-of-stock, lower inventory carry costs and reduced write-downs on obsolete inventory.
- **Shrinkage**—Losses due to theft are estimated to cost retailers over \$30 billion per year, and are estimated conservatively at 1.7 percent of overall sales, according to Ernst & Young. With RFID, pallets, cartons and individual products can be tracked through the supply chain to pinpoint product location and eliminate inventory errors that can cause shipments to go missing. Better yet, it enables one to find where in the process the product was lost. AMR Research's Langdoc and Romanow estimate an 18 percent average reduction in shrinkage using RFID.
- **Supply Chain Errors**—By replacing manual bar-code scanning with automated RFID information capture, one can eliminate data-entry errors, reducing not only inventory and tracking mistakes, but also the costly labor required to resolve such mistakes. Additionally, because RFID automates data entry, more collection and tracking can occur throughout the process, helping to pinpoint asset location and workflow more specifically. And not just labor costs are driven higher by mistakes—retailers and manufacturers each lose \$2 million for every \$1 billion in sales due to bad data. The prediction is that eliminating bad data could save \$10 billion per year, according to 2003 report by [A.T. Kearney](#) ("RFID/EPC: Managing the Transition").
- **Capital Asset-Tracking and Management**—In many businesses, important assets such as shop equipment and containers are often difficult to track, maintain and secure. RFID can be used effectively to locate movable assets better, ease maintenance scheduling and assure maintenance performance, as well as help prevent loss. In applications such as warehousing and distribution, where containers and tugs need to be tracked, scheduled and maintained, workflow can be optimized by 20 percent or more and losses prevented, according to studies by Alinean.
- **Counterfeiting and Improve Security**—In many industries, counterfeit or non-secure goods introduced into the supply chain cause large direct losses of revenue. RFID increases brand protection and helps mitigate safety, security, regulatory and liability risks. Improved tracking using RFID can identify and isolate issues more efficiently and effectively than manual bar-code scanning by introducing automated and more frequent checks and balances.
- **Accounts Receivable**—With more accurate and real-time tracking of what has shipped, the accounts-receivable process can become much more efficient, with shorter billing and payment cycles. For example, RFID allows vendors to produce customer invoices automatically as soon as items are shipped. It also enables payment automation. This helps reduce the time to collect, while the improved accuracy and elimination of manual data entry or tracking errors helps reduce AR disputes. The results surveyed include a dramatic reduction in accounts receivable, down from 30 to 45 days to just minutes.
- **Market Mandates and Revenue Opportunities**—Many industry leaders have set the stage by mandating RFID functionality and compliance in order to participate in their ecosystem. RFID can help meet these mandatory requirements, or provide an advantage for those who proactively implement the technology over those that are struggling to meet these new market demands. Longer-term, RFID can help create new revenue generating applications and innovation to help grow

market share. In many cases, RFID is not just a business benefit, but a requirement for doing business.

- **Customer Experience**—RFID can help to improve the overall customer experience. First, RFID enables better management of inventory; ensures proper deliveries and shipments; improves demand forecasts, promotions management and new product introductions; and reduces out-of-stock conditions. Elimination of supply-chain issues and product availability results in customers getting what they want, when they want it. In one case, a documented 29 percent increase in promotional execution resulted in a projected 20 to 60 percent increase in sales.

RFID Costs and Considerations

RFID is a significant business investment for most organizations, requiring a commitment to a particular solution and the dedication of resources and funding to implement the project. There are several considerations for RFID solutions today, including:

- **Tags**—The cost per RFID tag has come down significantly over the past several years, reaching 10 cents per tag in 2006 versus 25 to 30 cents per tag in 2004. The good news is that with demand increasing—yielding economies of scale—and production costs declining, tag prices are expected to reach even lower levels over the next few years. For the short term, it typically makes sense to place the tags only at the packaged product level (pallet or carton) and on high-margin products, with the current standard being where the tag represents less than 1 percent of the total cost of good sold.
- **Readers**—Reader costs are modest, between \$2,000 and \$3,000 per reader, including installation and accessories such as repeaters, multiplexers and networking costs.
- **Tag and Reader Survivability**—Many warehouse, distribution and retail environments are hostile and can result in damaged tags or readers. These damaged systems might fail to work as expected. Error-detection and repair budgets should be in place to help minimize the impact and costs of downtime. The most resilient RFID solutions should be purchased from RFID suppliers with proven reliability. Over time, dealing with equipment failures or errors on the back end will be more expensive than making the proper up-front investments in reliable equipment and solutions.
- **Software and Integration**—The cost for software and integration is higher, averaging \$500,000 for a small deployment to \$2 million or more for a large installation. An additional 18 to 20 percent should be budgeted for ongoing maintenance and support. Special customization can drive the initial costs higher, depending on the complexity of the application development and integration project.
- **Data Warehousing**—Many organizations may not be ready to transmit, store, process, interpret or integrate with current supply-chain management and enterprise systems, or the mountains of real-time data that RFID will produce—the location of pallets, cases, cartons, totes and individual products in the supply chain; the activities of picking, packing and shipping; and the tracking of expiration dates and recalls are just a few examples. An investment in RFID requires modification investments in data warehouse and database systems, as well as the business intelligence applications and dashboard systems they support, in order to analyze the metrics to turn data into information.
- **Business Processes and Systems Integration**—The business processes around data collection and information processing are often not in place, and key systems need to be connected and integrated with the collection and database systems. The process changes and integration need to be developed in order to take advantage of many of the benefits.
- **Edge Computing Power**—At the distributor or retail level, most remote systems are not powerful enough or configured to handle the data and information workload required to make RFID effective at the product level. In order to reap the rewards, a large investment in computing power, bandwidth, storage, IT operations and administration per location will need to be made.
- **Redundancy With Existing Bar-code Systems**—Often, the RFID solution does not replace current bar-code systems, requiring that companies maintain both data-collection systems and processes. In some applications, RFID will eventually supersede the bar-code system. In others, the investment will

be maintained. It is important not to overstate the system cost avoidance or current bar-code scanning labor savings if both systems are still maintained.

The Bottom Line

The competitive advantage and bottom-line business benefits are significant to the supply chain that implements RFID to its advantage. Early estimates indicate that a comprehensive RFID solution can generate an additional 2 to 7 percent increase in revenue, improve handling productivity by 20 to 30 percent, reduce operating expenses by 2 to 5 percent and reduce days in inventory by 1 to 2 percent. Financial improvements such as these are significant, and it is for this reason that many companies are moving forward with RFID, sooner than later.

Although RFID implementations are not without costs and risks, typical companies in manufacturing, warehousing and distribution and retail have been known to achieve 200 percent ROI (net benefits divided by costs) or more from these projects. What this means is that for every dollar invested in RFID, companies are getting back \$2 in incremental benefits (the original dollar invested, plus two more). The high ROI and relatively short payback periods provide the fuel to move from having RFID as a project under consideration, to one where a pilot program is mandatory.

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