



EXECUTIVE SUMMARY

RFID for Manufacturers

How Manufacturers are Improving Processes by Using RFID

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December, 2006

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ChainLink Research, Inc. is a Supply Chain research organization dedicated to helping executives improve business performance and competitiveness through an understanding of real-world implications, obstacles and results for supply-chain practices, processes, and technologies. The ChainLink Inter-Enterprise Model is the basis for our research; a unique, real-world framework that describes the multi-dimensional aspect of links between supply chain partners.

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Executive Summary

We've seen the headlines about the RFID mandates from the DoD, Wal-Mart, and other major retailers. Because it is yet another mandate that suppliers must comply with, you often hear suppliers questioning the value for the suppliers themselves. But that's not the whole story.

Not by a long shot.

While many manufacturers are adopting RFID by force of mandate,¹ even more of them are seeking ways to use the technology to improve their operations. Our survey of 275 manufacturing companies across a wide range of enterprise sizes and industries found that two-thirds of the companies' RFID implementations were driven in part or entirely by process improvement goals, rather than just by customer mandates (See Figure 1 on following page).



Who should read this report:

- Anyone investigating, creating a strategy for, or implementing RFID for a manufacturing company
- Executives deciding whether to invest in RFID solutions
- RFID Consultants to Manufacturing firms
- RFID Solution Providers

^{1.} It should be noted that not all customer mandates are from retailers or the DoD. For example, one respondent said that their customer (a medical device manufacturer) requires RFID chips to be integrated into the molded silicone components built by this supplier.

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Figure 1 - Drivers of RFID Implementations



Some of the key findings of our survey:

- There is a thriving and amazingly rich and diverse set of existing uses of RFID by manufacturers, particularly on the plant floor. Numerous examples, across a wide range of industries and applications, are described in this report.
- Similar companies, in the same industry, often come to radically different decisions about whether RFID is a good investment for them. In many cases, this can be traced to differences in knowledge, understanding, and progressive thinking (or lack thereof).
- Some companies have valid reasons for choosing other priorities over RFID in deciding where to invest. However, in our survey many (if not most) of the reasons cited by those not doing RFID were born out of misinformation. This report helps to clarify the decision process.
- Implementations that are driven primarily by customer mandates, without process improvements, generally do not have a good ROI. In contrast, implementations driven by process improvement goals usually do have a good ROI.

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- ROI was found by focusing on high value or high consequence processes in areas such as:
 - routing of goods in motion
 - choke-points and hand-offs
 - locating things and people
 - expiration and FIFO disciplines
 - chain-of-custody tracking
 - environments where synchronization and sequencing are critical.
- Knowledge of how RFID can be used successfully is key—and is best learned by example and education.
- The survey indicated a healthy increase in spending across the board, with levels more than doubling from 2005 to 2007, with the biggest % increase from 2006 to 2007. While many vendors complain that the market is not meeting their expectations, this is more a sign of unrealistic expectations than a weak market.

The actual and potential uses of RFID are astonishingly wide-ranging and diverse, not unlike the potential uses of the Internet. Not every conceivable use of RFID makes sense, at this time. But, *time* is an important factor. The cost of tags, maturity of solutions, and availability of skilled implementers, is improving dramatically over a short period of time. Ever-increasing numbers of RFID-enabled business process improvements are becoming feasible and cost-justified. Selecting the right approach and timing requires knowledge and creativity.

This report illustrates many different examples of actual implementations, including the goals, and results. It describes survey findings in detail, such as the percentage of companies using RFID for various specific process improvements. By seeing all the different facets of actual implementations, we can begin to recognize the patterns and how they might apply to each of our own companies. One thing is for sure: this journey won't be boring!

How this report is organized:

- Demographics a brief look at who responded to the survey
- Implementation Plans and Drivers who is adopting and why
- **Process Improvements** a deep dive examining the types of process improvements being made using RFID
- Achieving ROI how to identify areas where RFID can achieve ROI
- Conclusion summary of findings
- Appendix A: Why Companies Choose Not to Implement RFID examines the reasons given by the 1/3 of the companies surveyed that have no plans to implement.

Survey Demographics

The 275 companies in our survey covered a range of company sizes as shown in Figure 2.



Figure 3 - Industries of Companies Surveyed

- WIP tracking / e-Kanban—Of this subset implanting RFID in manufacturing processes, 68% said they were doing *closed loop* applications, with reusable RFID tags for tracking WIP—i.e. RFID tags on totes, reusable containers, or temporarily attached to components for uses such as sequence verification, auto-routing, auto-Kanban, or conveyance. 74% said they were also using *non-reusable* RFID tags permanently affixed to components to track WIP through the manufacturing process. Non-reusable tags are frequently shipped with the product, so they may be used for other purposes outside the plant.
- Batch and Lot Tracking/ Process Monitoring and Improvement—RFID is being used by some manufacturers to record a detailed history of the steps and conditions as each batch or lot (or for discrete it may be each item) goes through the manufacturing process. This may be recorded on the tag and/or in an associated database. This is being used for a variety of purposes including process improvements, meeting regulations (e.g. aerospace, Pharma, etc.), and more precise/rapid recall.
- Manufacturing Instructions and Recipes—Some write the actual manufacturing instructions to the tag (or associated database) to be recalled at each step in the manufacturing process to verify and ensure that exact procedures are followed.
- Quality Control and Design Feedback—Use for tracking defects, where every y they occur. Also providing failure feedback to both manufacturing and design engineers to improve future processes and designs.

• Sequencing and Routing - R¹D part be very useful in factories that have stringent sequencing requirements, such as automotive plants where each vehicle is unique and therefore the components coming off feeder lines must stay in precise sequence as the active the main line to be applied to the chassis. RFID can help prevent expensive mistakes and rework. One firm said they were combining RFID with a Vision System to "create a fool-proof system for tracking the manufacturing process in automotive plant."

- **Tool Tracking**—In complex and expensive manufacturing machines, RFID can be used to monitor tool locations and usage. One company said *"We will be able to track tool components more accurately and correlate their lifetime to process outputs."* RFID can be used not only to keep track of tools, but also to aid in predictive maintenance.
- **Product Customization and Configuration** Anywhere there are highly configured products (e.g. high tech, aerospace), RFID can help ensure proper configuration and packing. It is invaluable in aiding making sure highly customized products are built precisely to match the request and delivered to the right customer.

"If we can find an RFID tag that will withstand the rigors of bleaching and dying, we will use it to track inventory by the loom roll through the entire manufacturing process."

Textile Manufacturer

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	Industry/ Company	Application	Technology	Benefits
SA	Food and Agriculture: Paramount Farms World's largest supplier of al- monds and pistachio nuts (60% of US crop) from it's own orchards and network of 400 grower partners	Production is concentrated during 6- week harvest season. As a grower's trailer enters the Paramount scale, a worker reads trailer-mounted tag using hand-held reader and transmits it to the central database. This relays the pre-recorded profile of the trailer back to the reader so that the worker now knows trailer's net weight as well as all the backround information of the grower and trailer. This includes the history and harvest details of the nuts. Information such as this becomes im- portant when considering the longevity of the nuts and the prioritization of which nuts get handled first. Another crucial metric is the turn time, or pe- riod between receiving the nuts until the point when they are processed. Various non-RFID steps follow. The system drives the annual production planning process, thus accurate tata	Grower Re- ceiving Sys- tem. Mobile handheld computers. Ruggedized UHF passive tags and readers— durable for use in dusty and hot con- ditions. Web-based application.	Speeds load processing time by 60%, eliminating need to add expensive scales. Re- duced leased trailer usage by 30%. Accurate crop receipt data ensures that the volume and quality that the company pays for is ex- actly what they receive. Factorial are increases treshness.
	Pharma- ceutical: Wiede Phar- naceutical Pharma manufacturer	Service for the factory to the counter using e-pedigrees. Certificate of authentication that tracks its movement throughout the supply chain. The RFID system matches each medication container with its cor- responding pedigree. Each time the pharmaceutical item changes hands from a manufacturer to a distributor, wholesaler or pharmacy, information is added to the pedigree to document the chain of custody.	UHF tags and readers. Chain of cus- tody tracking software.	Increase con- sumer safety and reduce losses from fraud and grey market.
	Jewelry: Swiss manufacturer	Tag attached to watches to track their location and verify authenticity. Watch factories, distributors and retail stores equipped with readers can check a watch's authenticity, status and regis- tered location by connecting to the central Brand/Product Database.	Item level RFID tagging	Reduction in grey market and sales of counterfeit watches

Table 7 - Chain of Custody Uses of RFID

WHO IS GETTING THE ROI FOR RFID?

Our research shows very robust implementation plans for RFID across a broad range of processes. However, anecdotally (independent of this survey) many manufacturers have been heard to complain that "there's no ROI for us in RFID." When asked whether there is an ROI, we found it's still early for the vast majority of manufacturers deploying RFID, as highlighted by the 71% who say it's too soon to project ROI. Many are still figuring out where and how to use RFID to make real improvements.



Here we see that Mandate-driven companies are somewhat more likely to have already made up their mind about ROI.

Appendix: Why Companies Choose Not to Implement RFID

What about the third of companies that have no plans to implement RFID? We asked them why they are not pursuing RFID. We found the majority fell into four categories:

- Cost/Insufficient ROI
- Lack of Knowledge and Understanding
- Maturity of the Company
- Perceived Maturity of the Technology/Marketplace

COST / INSUFFICIENT ROI

By far the most common reason cited for not doing RFID was cost and/or lack of ROI. Responses varied from absolutist positions like "*No ROI - too expensive*" to more reasoned "*RFID has a lower projected ROI than other more pressing business needs*". However, other companies from the same industries reached a different conclusion and the rorging ahead. Achieving sufficient ROI requires an understanding of what RFID is good at (*and* its limitations). It also requires the creativity, willpower and knowledge needed to isolate and identify key processes and improvement poen as where RFID is effective and there are high value opportunities.

States into the heard from respondents such as "No economic value, no market advanite, *RFID* will not grow our top or bottom line for the foreseeable future or possibly ever," reflect a regrettably widespread negative reaction to the hype, rather than a rational, factbased assessment. For sure there are those who over-promise what RFID can do (and *when* it can do it). However this report illustrates myriad applications across virtually all industries where companies have decided they will make improvements using RFID.

"LACK OF KNOWLEDGE AND UNDERSTANDING

Another sizeable group of respondents recognized the lack of knowledge or "attention units" within their own organizations as the key reasons for not moving forward. One responded said "We are still struggling to get a handle on basic computer literacy. RFID is black magic to our executives at this point. They therefore do not see the ROI." Another said, "We have no plans to implement RFID because the Director in charge did not have the experience, knowledge, or time to see the benefits." And here was a quote that highlights the respondent's lack of knowledge "RFID will pay for itself only when it becomes as ubiquitous as Bar Codes" This highlights the critical need for education.



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