EXECUTIVE SUMMARY

RFID Checklist:

RFID Markets and Solutions for 2008

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About ChainLink Research

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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Table of Contents Of Entire Report

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Executive Summary

RFID technology, implementation experience, and value realization have evolved quickly in the last few years. With global standards—not just for hardware, but also data—the confidence of the user community should be high. Read range issues and assurance of reliability are behind us. Today's obstacles in implementation are merely a lack of imagination. Particularly in closed loop applications, companies are experiencing project success and value from these implementations. However, since the market is still young, the question arises: are they buying and applying the right technologies, paying the right prices for hardware, approaching their projects in the most skillful way onto the fast lane to results? The use cases on RFID are fascinating. In 2008 this trend should continue, with more firms providing implementation services, and more end-users not just shopping for solutions, but who are really diving in. Our research has shown a trend towards RFID budgets increasing year by year.

So what will happen in 2008? What do I need to know now? This paper will address these questions. This is not designed to be a bombastic vision document on how RFID will change the world ten years from now—but what you must know *now* for successful purchase and deployment between now and the end of 2008. What are your choices now? How should you truly think through your options, focusing on the most appropriate technologies to create a real solution? In this report we will address these questions based on research from the user community, as well as insights into emerging product categories. We will also provide a market outlook to understand the context of where we are now, and where we are going *next.* This is useful, since, in spite of some opinions, we are moving at a faster pace than many have stated. Being prepared can make a huge difference in success.

In this paper we will discuss:

- **Market Outlook:** We will focus on the RFID passive market[1].
- **Evolution of the RFID products for 2008:** Here we will discuss the RFID passive hardware market and applications driven by RFID. Today there are significant changes in form factors and versatility in packaging and application use. What are those changes? What is that technology? What is the market outlook based on revised categories of technology?

1. For information on the Active market, read the *ACTIVE RFID* report, August 2007: www.chainlinkresearch.com/research/detail.cfm?guid=1A6F1E1B-3048-785E-31DE-8547E5D8C93A

- **RFID Business Solutions:** What do those changes mean in terms of business solutions? What can you do now with this more powerful, more mobile, less expensive technology?
- **RFID Checklist:** How to go about making the right selections. Simple ways to navigate forward with the rich selection of features in tags and readers.
- **Value Now:** There are stages of value realization that the user community is experiencing. Most users now are using RFID for internal process improvements vs. mandates. We will review these as a model for positioning ROI.
- **Conclusions:** Getting Started in 2008. What steps your organization should take in solution, project management, etc. in order to have a successful implementation.

This report is the culmination of research studies that we have done in the last year with over 1,500 end-user firms on their RFID plans and experiences, in several industries and sectors. Here we will cull out what is most relevant for evaluating and qualifying RFID between now and the end of 2008.

Introduction: RFID Market Outlook

You know that when every industry magazine you pick up has an article on RFID—from games and entertainment, to food safety—that you're onto a big market! The RFID market continues to grow at a healthy clip with sales increasing by $1.2B and growth rates of over 23% (see figure 1). The road to the ubiquitous market penetration will, like most technologies, take some hard lessons, twists and turns, with the end products in use today making the stuff we used in the beginning look antiquated—old clunkers, if you will.

If we look at the continuum of so many technologies—the path from large fixed platforms to smaller form factors; and mobility is the path forward—mainframes to *ipaqs,* EightTrack to MP3; then RFID is no different. We have need for all sizes. Just as in the computer industry we have big enterprise servers, mainframes, all the way down to sub-laptops—the RFID market has grown up and now provides all these choices.

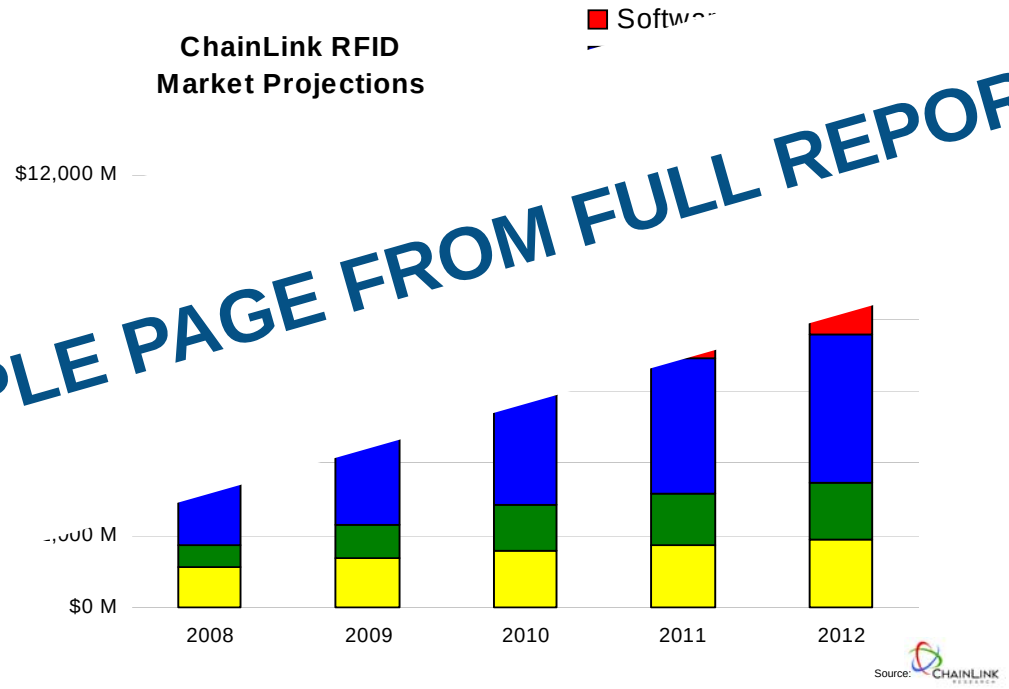

Figure 1: RFID Overall Market

In addition, the versatility of business applications is the real story. Globalization of the production process has created serious issues for consumers who are now demanding traceability (already the law in EU countries), safety, authentication, etc. And our global leverage of wireless continues unabated, creating a plethora of applications from consumer to industrial. Each of these market categories, though slivers in the total RFID market today, will be, in their own right, large markets tomorrow. And the customers are the ones taking those innovative steps forward.

New Views of the Market

So let's look at how these new technologies impact the market. Each of the five categories below is differentiated by a few key factors that focus on the 'job' they perform, serving within a facility/enterprise or outside the enterprise—their physical and technical attributes; their network and software backbone; and price. (See table 1, next page *Hardware Categories)*

- **Enterprise One:** This is the traditional market that we all know. Here we have a rich range of readers for manufacturing, large sites, supply chain, using fixed readers, trucks and dock portals to track large items within warehouses, etc. These readers do their job with 'stability' within an enterprise and are designed for a single location that can be fixed, vehicle mounted (forklift, kiosk, cart, rack,), wall mounted, or are large and expensive handhelds. This is the high-end market. Their communication backbone is through RF and wifi, through enterprise routers and middleware. The readers in this category range from $2,000 to $3,000 for fixed readers, with handhelds as expensive as $3,500.
- **Enterprise Two (Mid Tier):** This categorization is new[8], taking advantage of the
  form factors and embedded options which are light and can service
  applications still serving the enterprise, but more focused on
  inter-office, such as from lawyers to courthouses
  other in-building solutions. Design and
  readers will be below $1,500 do
  volumes go up, the pric
  as well as mo
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tion and RFID used in so many
apping RFID into the mobile device just
ace this in our emerging market.

Today we have mobile readers in use in many environments. Why we differentiated between an Enterprise[9] Two, for example, and Mobility is the overall platform application. A mobility application is most often inter-enterprise, leveraging public infrastructure (cell, specifically). Today there are programmable Mobile devices for RFID, and their charter expands into areas like home healthcare services, logistics, etc.

- **Mobile Two:** Here we address the Consumer market. Two models will be most prominent. The Cell phone (Near Field Communications[10]) is an ewallet/contactless payment system (HF) for shopping, self-checkout; the other will be a variety of consumer applications (UHF) in which the consumer interfaces with service provider institutions, as well as an array of home applications, from utilities to home entertainment, with embedded or attached options.
- **Embedded:** Here the tags and reader boards are embedded in other products. This area will grow in the future, no doubt, but examples are here today, most notably with car clickers.

8. We have seen smaller palm devices in the market for several years, but have not segmented these from the heavyweight brethren up until now.
9. New models from Alien, Motorola, etc.
10. High Frequency

tionship between these—a yard will have a certain size and number of assets, and you will need so many readers at such a range to locate/read your items. Open environments, on the other hand, will gauge reader sales by range from read points to items—items flashing by on high speed conveyors, or cataloguing or identifying a document or vile of drugs. Once read points (gates, self-checkout, or desk for reading documents) are in place, thousands or millions of reads can take place from one read point.

Business Solutions View

So what kind of solution for business applications will be hot in 2008? Table 4 on next page provides these solutions, by industry. There are so many we have surely excluded some. We are differentiating between already in production vs. pilot vs. being introduced. There are organizations that might have gone from intro to full production, but it might not be large enough to hit the threshold to make a market report such as this.

The industry view shows 'who's buying'. Not too many industries are left out. Beyond industry, company size is a more important element, since for every Fortune 500 company there are hundreds of mid-sized companies. One myth worth debunking right here is that RFID is a solution for only the rich. Cost is always in relation to value, we feel. But even ChainLink was surprised at the number of mid-sized firms that are implementing or plan to implement RFID.

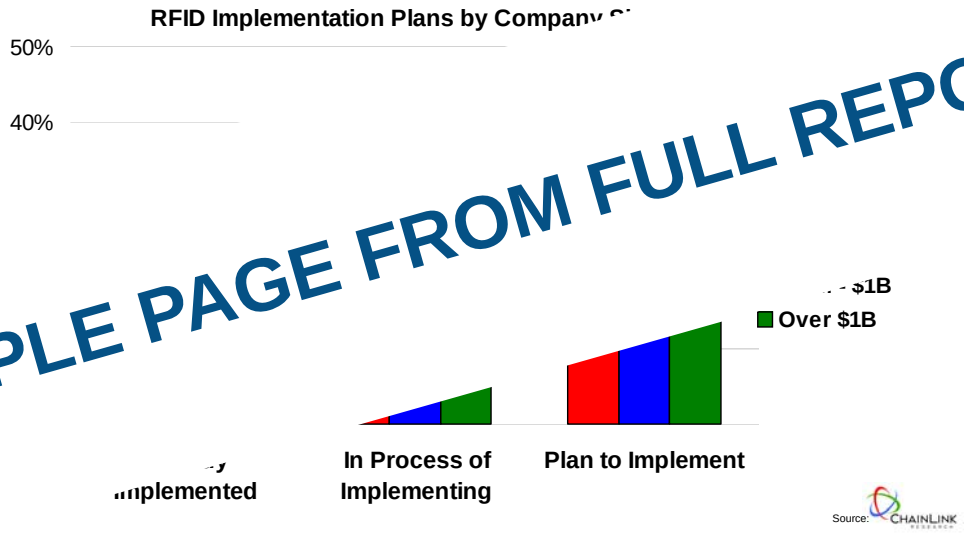

Figure 4: Company Size

This mid-sized view, which tends to be a price sensitive market, bodes well for the Enterprise Two market growth. Smaller solutions footprints, at a more attractive price point, will obviously be well received by all sizes of companies, but many just can't get in until those price drops become available to the masses—not just for the large volume buyers. 2008 will see this change.

RFID 2008 Checklist

Understanding your solution requirements and selecting the right technology does not have to be that complex. Issues around function/fit and price become key in all discussions, as we have discussed earlier.

Here we would like to offer an approach to selecting the right fit in terms of tags and readers. There are so many applications that one can't name them all in these roadmap diagrams. But we are providing an approach to ensure that you are thinking in a logical way to get that right fit, the right solution.

On figure 5 (following page spread) we have created a path to **2008 decision making**[21]. Simply stated, you really only have a few hard questions to ask. (Refer to the chart as we walk through this).

Selecting the Hardware Solution:

- Where will the reading be done? If
  need a mobile solution, C
  into the RFID
  it's

…ouse worker or an office
…agged design that can sport multiple
…ed more at low volume design and office type
…reflects this. We have heard of cases already where users,
…ight price', were quickly disappointed by the lack of ruggedness. After
…pping these a few times, the reason for the price differential can become apparent.

- What will be tagged? Here there is, at times, a relationship to the reader, such as in frequencies, of course[22]. But the *item* is the key. What is the purpose of tagging—tickets and hang tags for retail, or sensor+ for temperature, light, etc.? Will the item traveling international routes, (requiring world tags) be wide band? Like readers, as we have said earlier—there is a price for everything—but if you don't need the features, why pay more?

21. As the mobile RFID market grows this approach may change.
22. For a discussion on frequencies, please read *RFID Hardware - What You Must Know:* www.chainlinkresearch.com/research/detail.cfm?guid=B03A8206-CA4F-0362-4645-7DF02068244F

Value Now: ROI for RFID

The above solutions are quite varied. RFID is a very versatile solution. But discussion about compliance and mandates still persists in the press, although research has shown that the main drivers for RFID use is based on the organization's own value proposition[24]. In our research, over 66% of respondents (see figure 7) stated that they were process/improvement driven vs. mandate driven. And there was a strong corollary between those respondents and the ones who declared an ROI. What is also interesting is the year by year increase in spending for RFID, as well as the percent planned for RFID projects in the coming year.

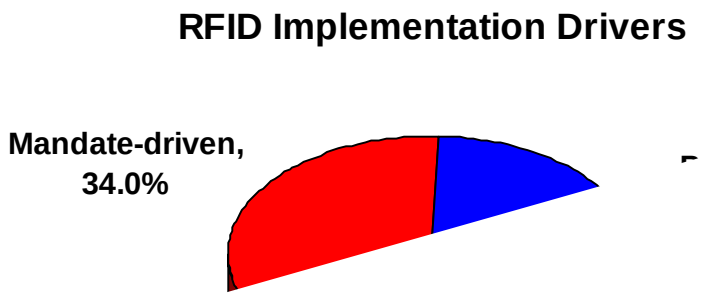

Figure 7: RFID Implementation Drivers

In our discussion here on value, we are going to describe what is actually happening now, and what is driving the enterprises' interest, therefore creating the momentum for the next few years.

Based on organizational drivers, firms quantify strategic as well as tangible value for RFID. These strategic areas represent risk factors for firms, which do manifest in huge costs and losses such as recalls, but again are harder to quantify, vs. reduction in costs or improvement in in-store inventory, time savings, etc. Long term, the strategic goals do net the value, but project sponsors need hard numbers to sell their programs.

24. For example, Griva SpA ,Vicaima, P&G, Navy, Astra Zeneca, Toyota, etc. all using RFID to help drive time to market and reduce cost of manufacturing/asset tracking in their business today.

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