Aberdeen*Group*

RFID in the Consumer Industries

Being a Winner, Not a Follower

March 2004

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Executive Summary

Key Takeaways

- Mandate fixation.
- Manufacturers place too much focus on compliance cost and not enough on business value.
- There is no time to sit on the sidelines and wait for the technology to mature.
- Manufacturers should start now to mitigate the risks and ensure their successful compliance.
- Enterprises need to turn this from "cost of doing business" into an opportunity to drive operational efficiencies and customer service.

The benefits of implementing radio frequency identification (RFID) tags in products promise to go well beyond those already achieved with bar codes. Because RFID systems can identify the individual instance of a product (not just its stock-keeping unit, or SKU), as well as "watch" when a product physically moves via continuous monitoring, they bring a new level of detail to product tracking. Accordingly, RFID adoption will drive improved inventory management, process efficiencies, data accuracy, enhanced asset utilization, and reduced leakage.

New mandates from Wal-Mart and the U.S. Department of Defense require leading manufacturers to be RFID enabled by 2005.

These potential benefits and the initial RFID mandates focused on retail supply chains have created a sense of urgency for many companies — particularly those in the consumer industries — to understand, assess, and deploy RFID systems. Unfortunately, the results for the few pilot projects that have been executed indicate that the maturity of RFID technologies lags industry requirements. Retailer channel masters will be the early beneficiaries of the RFID movement. Manufacturers, particularly those producing low-value items, understand that they are the ones making the financial commitments to enable RFID-driven benefits for the retailers. Although manufacturers understand the potential benefits of RFID systems, they are concerned about what the financial demands (RFID project and recurring tag costs) will do to their bottom lines. They are focused on executing the minimum to be compliant first and foremost.

Those manufacturers driven by retail mandates for 2005 need to act now to ensure compliance. Because this kind of RFID is new in scale and scope, manufacturers must be willing to work through the

challenges of a new technology, anticipate setbacks, and manage roadblocks. A strategy of waiting for others to solve early deployment problems will leave little room for meeting the compliance schedules.

Because of the deployment and unit cost increases, manufacturers implementing RFID must quickly get beyond compliance to more than recoup their costs by reaping the operational efficiencies and customer service improvements that this technology can deliver. Early adopters should learn from the retailers' RFID best practices and attack their own distribution networks and then look to extend the technology throughout their own supply chains.

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Chapter One:
Issues at Hand

Key Takeaways

- The real value has gotten lost in the compliance drumbeat.
- The technology required by the mandates is evolving and not as proven as the bar-code technologies it is replacing/ supplementing.
- Mandates require an aggressive timeline for the entire industry.
- Industry standards for both hardware and data content are still evolving.

RFID Technology Fits Two Value Chain Business Needs

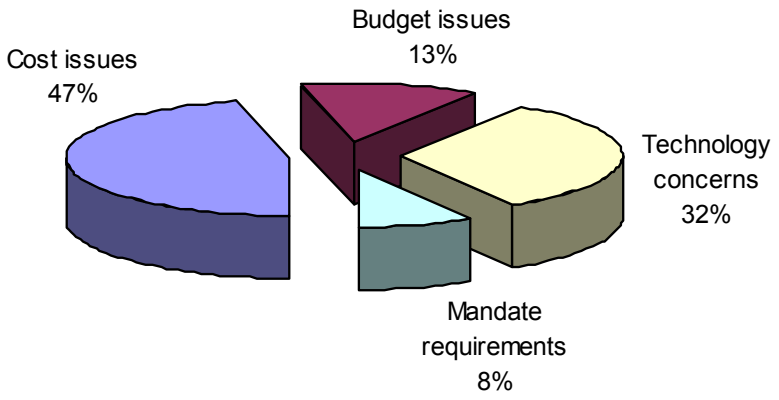
RFID technology enables two separate applications focused at solving two different supply chain problems:

- *For monitoring supply chain velocity (i.e., tracking high-volume/low-value items),* enterprises can use a solution that monitors high volumes of inventory (low-value items) in their one-way flow from the manufacturer to the retailer. This application, the principal focus of this benchmark study, is characterized by a broad inclusion of trading partners, initially competes with established mechanisms (bar-coded cases and pallets coupled with EDI transactions), and uses limited-capability, low-cost passive tags.
- *For asset management (i.e., tracking low-volume/high-value items),* enterprises can use a solution that tracks and manages assets used in tightly coupled supply chains. This solution has the greatest deployment experience and is characterized by high-value items at relatively low volumes, limited trading partners, and/or assets used in a captive environment within one enterprise. The classic examples are the tagging of bins used to move parts from a manufacturer to an assembler (parts bins from OEMs to assembly lines in the auto industry), tracking containers in a transportation environment (rail cars in North America, overseas shipping containers), or tagging containers that are reused (beer kegs, spare parts/components containers, portable shelving). Aberdeen's survey indicates that 6.1% of the respondents have RFID systems and that 53% of those implementations are asset management focused. In addition, 90% of these projects are pilot systems. Aberdeen Group will be conducting an additional benchmark survey later in 2004 that will be focused on these RFID applications.

The Real Value Has Got Lost in the Compliance Drumbeat

The benchmark results indicate that the manufacturer's principal focus is retention of the mandating customers and the associated costs, rather than achieving operating efficiencies and improved customer service (Figure 1). Manufacturers are acutely aware of the unit cost increases ranging from $0.50 to $0.75 per case today that will erode margins. Manufacturers also incur significant project costs to enable them to tag their goods. These costs range from $15,000 per tagging station to more than $150,000 per shipping facility. Without changes to warehousing and transportation processes, manufacturers will not recognize any immediate gain because they already have processes in place that apply traditional bar codes.

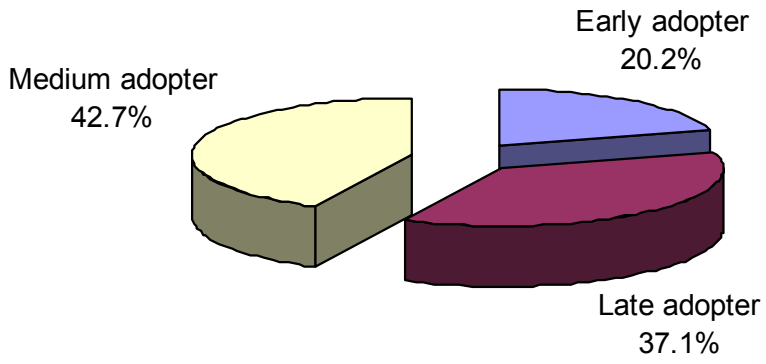
Figure 1: Respondents' Concerns about RFID Adoption



Source: Aberdeen Group, March 2004

The mandates are putting tremendous pressure on companies that do not have histories of early adoption of technology and experience preparing for the risk associated with those new technologies. In Aberdeen's survey, respondents described themselves as technology neutral or a late adopter of technology, waiting for technology to be proven and widely adopted before adopting it themselves (Figure 2). Although these companies would prefer to wait for the technology to further mature, the compliance timelines make waiting a greater risk for a number of reasons, such as a shortage of experienced resources and still evolving technology over the next 18 months. Instead, manufacturers must change their technology deployment strategy — at least for RFID compliance and understand that there will be "bumps in the road" as they roll out their solutions.

Figure 2: Respondents' Perceptions of Their Companies' Approaches to Technology Adoption

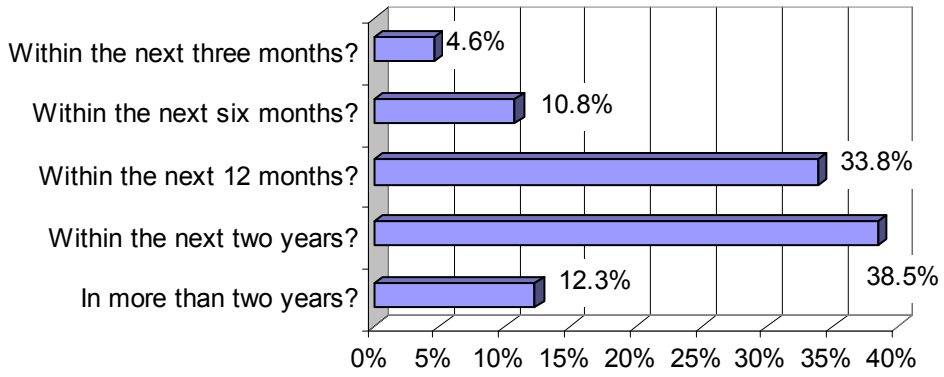


Source: Aberdeen Group, March 2004

Manufacturers indicated clearly that they understand where the business value for RFID implementations is, but not necessarily that they know how to proceed. They recognize how their customer will benefit from the technology in improved productivity, asset management, and inventory accuracy improvements. They understand that to receive the same benefits they need to extend their implementation beyond the "slap-and-ship," minimal installations planned, and they need to get their manufacturers (where appropriate) to provide tagged product/materials to them in the same way that they are for their customers.

They do not necessarily understand how all the hardware and software components come together for RFID implementation, what modifications to their processes will be necessary to take advantage of the technology, what changes to their existing systems will be necessary, and who is well positioned — based on domain expertise and previous project success — to actually provide them with the help they need to make their project successful. Not surprisingly, the benchmark group points to plans that are limited to pilot actions or minimal, slap-and-ship implementations, as only 46% plan on doing anything, and of these, 90% of the contemplated projects are pilots. A significant portion of the group is holding off as long as they can (Figure 3). When asked to indicate directly the priority RFID compliance has compared with other technology and company initiatives, only 28% of the respondents indicated that it was a high priority. More than half of the respondents (54%) indicated that it was a medium priority, whereas 18% indicated that it was of low importance.

Figure 3: RFID Implementation Plans of Respondents' Companies



Source: Aberdeen Group, March 2004

Aberdeen believes that "the-minimal-effort-to-comply" approach is self-defeating. Its intent is to defer capital expenditure until the business and implementation risks are reduced (e.g., Wal-Mart does not change the scope of the requirements, the standards are confirmed, the technology solves its performance and reliability issues, and so on). This direction presumes that all these things will be resolved in time for the mandates to be met. It ignores the enterprise's own need for time to work out the usual implementation issues in its own organization. Time is clearly the big enemy here, and the minimalist view just bakes in reduced margins. Failure to proceed aggressively in parallel with industry events/actions could result in a failed compliance effort, no way to recover incremental operating costs, and potential loss of revenue or increased charge backs.

Excelling Despite RFID Limitations

The testing activities and pilot operations that have been executed to date have identified operational issues (e.g., read success rate, scanning speeds, and read range) that need to be resolved as manufacturers roll out the technology. First, the scanning process requires significant attention to tuning during installation and monitoring effectiveness as a maintenance function to equal the read success rates for bar codes (98%). Second, the scanning speed can be much slower if not addressed during implementation design. This issue could add two to five seconds per scan. Third, the effective scanning distance of an RFID tag is affected, often dramatically, by the material to which it is attached. The latter issue underscores one of the most significant reasons why manufacturers must understand their own RFID environments now. For example, high-moisture material or metal will reduce scanning distance by as much as 50%. In some of

these situations, a tag on a case in the middle of a pallet will probably not be scannable. Wooden pallets, especially those made of green wood, have high-moisture content. A study conducted by Virginia Tech indicated that attaching an RFID tag directly to a pallet without providing at least 5/16 of an inch for standoff from the pallet cut read distance in half. They also learned that high-impact plastic resins (the material often used for reusable pallets) absorb the RF energy almost as much as green wood. Manufacturers must plan to slog through these issues to ensure at least timely compliance, if not gain additional benefits from their investments.

Mandates' Deadlines Force Aggressive Timelines

The advent of the mandates, especially Wal-Mart's, is forcing the industry to meet some very aggressive timelines. RFID technology in logistics functions, with the exception of expensive hardened tags in use by North American railroads, has never had a broad-scale, industry wide implementation. For compliance by January 2005 for Wal-Mart and the DoD alone, the number of manufacturers that must be ready to attach "one-way" tags to cases and pallets is 250 or more and represents approximately 1,000 sites during 2004. Aberdeen expects this number to escalate in 2005 to 25,000 vendors at 50,000 sites, given the current plans of Wal-Mart, the DoD, the FDA, Target, and others. Aberdeen expects that any one of the mandating companies and organizations will have some degree of setback, given the technology's immaturity. However, playing "wait and see" could be a deadly game for those vendors that have to act in 2005 because RFID domain expertise will be in very short supply.

Where to Turn for Help

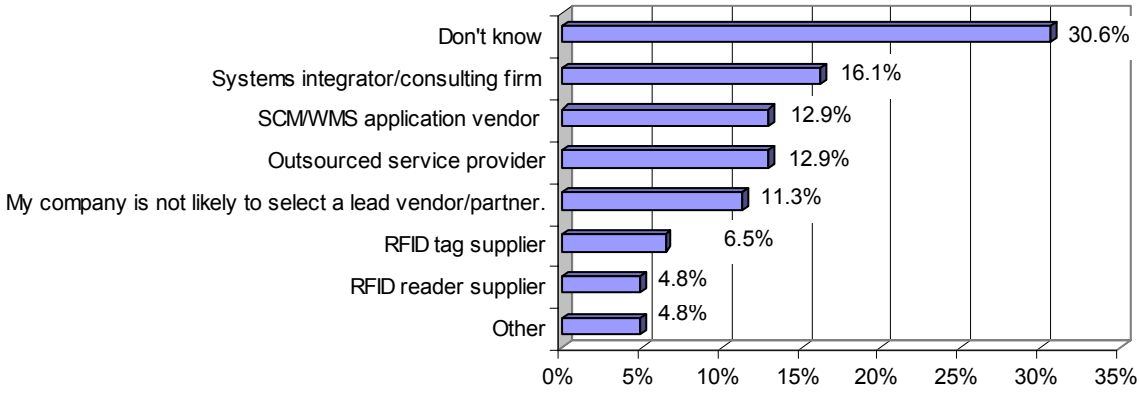
Manufacturers are struggling with selecting partners to help them with their RFID implementations; for example, the largest number of respondents (30%) indicated that they had "no idea" of which ones to use (Figure 4). Having an experienced partner will go a long way to mitigating the risks associated with this evolving technology.

However, "evolving" is the operative word because the number of experienced resources is limited. Manufacturers need to consider more than hardware providers because business process changes and supporting applications are required to get the business benefits. Evaluating RFID reader, programmer/printer, or tag suppliers for project guidance is acceptable if all that is needed is added technical skill with the RF physics and hardware-related installations. Going alone, as some companies are planning, is acceptable only if the company is willing to commit the resources now and feels that it has the wherewithal to learn how to manage all the technology (hardware, software, and integration) issues.

Using a third-party logistics (3PL) provider or outsourced service provider is a sound strategy if the compliance-related business is a

minimal part of the enterprise's total revenue and profit and if the 3PL has a good track record with other manufacturers selling to the same or similar retailers. Using a managed services approach is acceptable if what is needed is quick infrastructure placement, monitoring of transactions, and reduced immediate implementation capital expenditures. Application vendors can be a sound choice for companies if these vendors have demonstrated a track record of successfully implementing total solutions, including software, business practice, and hardware changes. Finally, systems integrators or consulting firms are also strong candidates for those companies that have highly customized or heterogeneous technology environments.

Figure 4: Lead Implementation Partners for Companies' RFID Initiatives



Source: Aberdeen Group, March 2004

Industry Standards — A Moving Target

Furthermore, the standards for data content and structure, as well as the RF communications technology, have not been finalized or accepted within the consumer goods/retail industry. The good news is that the mandates (Wal-Mart, Target, DoD, and FDA) agree on the same EPC standard. The bad news is that the exact content to be on the tag, including its format, is still being negotiated. The possible result could be a change in the amount of data on the tag, driving a change in the memory requirements for the tag, impacting the unit cost of each tag. Also to be consolidated are the global RF standards.

Initially, the North American standards — Classes 0 and 1 — have been used in the pilot projects that have been executed. However, until recently, no manufacturer had successfully complied with Europe's requirements with Class 0 or 1 equipment. Only the UHF Generation 2 standard, a superset of Classes 0 and 1, promises to

win global acceptance and will not be officially ratified until Q3 2004. UHF 2 is also an early stage technology. Manufacturers that do not plan on shipping products outside of North America can adopt a wait-and-see attitude for the next two years with respect to the adoption of Generation 2 equipment and tags. The lessons here are that manufacturers should have flexibility in their standards, technology, and deployment adoption strategies to address the evolving standards.

Chapter Two:
Key Business Value Findings

Key Takeaways

- Getting beyond the mandates is important for manufacturers to improve operational efficiencies.
- Finding the right value levers will enable manufacturers to reap benefits.
- Properly implemented RFID can improve the internal efficiencies of fulfillment operations and facilitate communication between trading partners.

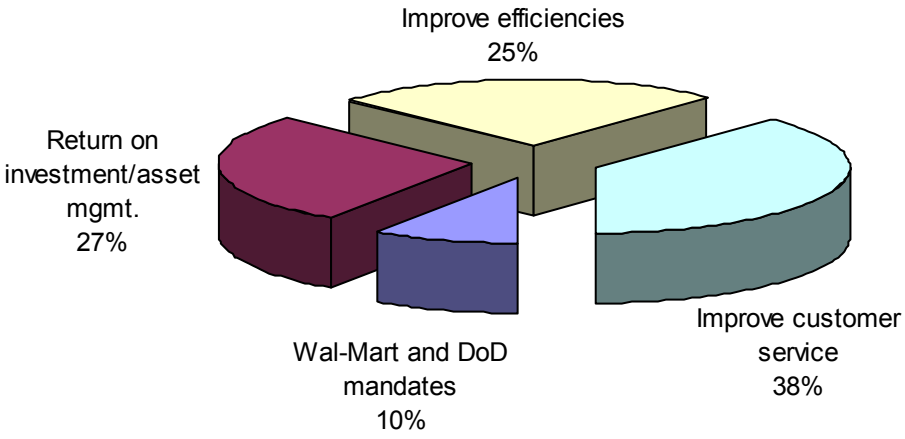
Getting Beyond the Mandates

Mandates aside, manufacturers are looking for improved customer service (38%); improvements in asset management or return on invested capital (27%); and improved operational efficiencies (25%). They expect operational improvements to come from reduced leakage/theft, reduced labor costs, and faster processing time. Reduction in labor will come about only if manufacturers get beyond the compliance approach that most are contemplating now.

Furthermore, manufacturers will not reap any labor benefits until they optimize tag placement in their production processes and then utilize the tags in their own operations. Improvements in customer service are expected from improvements in inventory availability and reduced stockouts, as well as streamlined shipping and advanced shipment notification (ASN) processes and improved responsiveness to customer needs. Again, manufacturers will not realize these improvements until they incorporate the capabilities of RFID into the distribution centers and customer communications aspect of their operations. Also, reduced stockouts require greater collaboration with the retailers to understand what their consumption patterns are so that the manufacturer can anticipate them accordingly.

Finally, improvements in asset management and return on invested capital are all derived from greater visibility to inventory and shipments while in transit. This benefit requires that trading partners, especially carriers and transportation providers, improve their infrastructures to capture this information and then make it available to the manufacturers and retailers. See Figure 5 for the detailed breakout of manufacturers' motivations.

Figure 5: Factors That Influence Companies' Decisions to Invest in RFID Initiatives

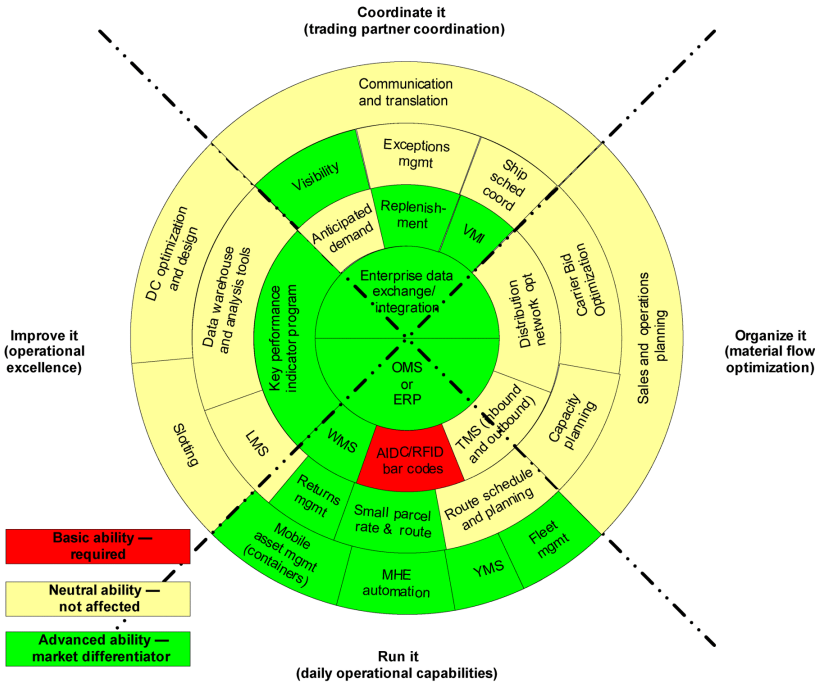


Source: Aberdeen Group, March 2004

Finding the Right Value Levers

Aberdeen developed the Fulfillment Solutions Framework to help manufacturers understand where RFID can add the most value and decide how to view their investments (Figure 6).

Figure 6: A Fulfillment Solutions Framework (RFID)



Source: Aberdeen Group, March 2004

The Fulfillment Solutions Framework lays out the possible fulfillment solutions into four areas of emphasis: trading partner coordination (coordinate it), material flow optimization (organize it), daily operational capabilities (run it), and operational excellence (improve it).

Trading partner coordination functions deal with the coordination of communications with the enterprise's supply chain trading partners (e.g., customers, manufacturers, and regulatory agencies).

Material flow optimization represents those functions within the enterprise that help the enterprise examine, evaluate, and optimize the organization and its utilization of supply chain assets.

Daily operational capabilities focus on those functional areas that most affect the daily execution and management of supply chain transactions.

Operational excellence focuses on those solutions and/or practices that are used to monitor, analyze, and improve the operational capabilities of the supply chain.

The color coding in Figure 6 indicates the impact that RFID provides to the enterprise. Red indicates an area that is basic to an RFID implementation that is focused on meeting the demands of the mandates from Wal-Mart and the DoD. Green indicates solutions that

provide differentiating capabilities or greater business value to the enterprise when RFID technology is incorporated into their usage or processes. Yellow indicates a solution that has limited or no additional impact to the enterprise because of RFID.

Basic compliance ability (the red color code in Figure 6) is found strictly in the capability to place a compliant, appropriately programmed RFID tag at the prescribed location on the items to be shipped. In the context of today's mandates, this compliance means the ability to affix RFID tags to each carton/case and to every pallet of tagged cartons/cases being shipped to the retailer. For manufacturers, this capability is a direct duplication of existing usages of Automatic Identification and Data Capture (AIDC) technologies, such as bar codes.

Differentiated ability (the green color code in Figure 6) is found in those functions that represent a "winner's" approach to RFID implementation. These manufacturers will aggressively pursue the alteration of existing processes, procedures, and technologies to minimize the cost of business associated with compliance. In addition, these manufacturers will use the capabilities to improve their own operations in a fashion similar to those enterprises that have issued the mandates. Altering warehouse operations to receive RFID-tagged products and streamline their disposition within the distribution center (DC) is one example (a warehouse management system [WMS] in the chart). Other examples of how manufacturers improve their operations include utilizing the tag information to improve customer returns management; carton sortation; freight rating and routing for small parcels; and carton location and management in the rail or truck yards associated with the DC.

Tracking product or carton movement within the facility and feeding that information into a key performance indicator (KPI) management application is a way that RFID would add greater detail to the KPI program without adding a data collection and posting burden.

Utilizing the RFID tag information to populate advanced shipment notifications in order to track product usage and then drive replenishment plans or vendor management inventory (VMI) programs is an excellent example of RFID enhancing the coordination aspects of order fulfillment operations. Finally, using the RFID information in conjunction with trading partners' (especially carriers') infrastructure improvements can radically alter the frequency and richness of visibility-related information as the product moves through the supply chain.

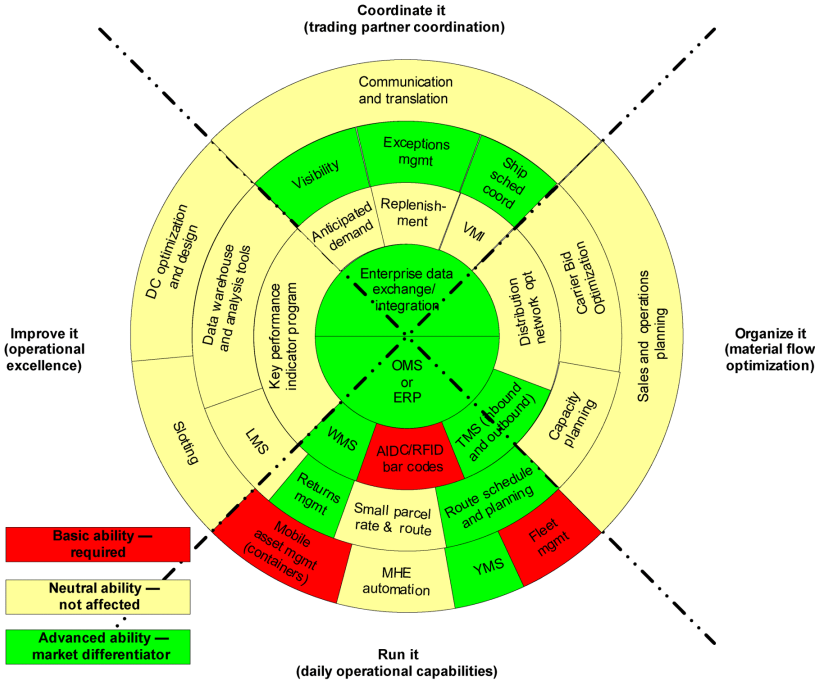
More Benefits from Finding the Right Value Levers

As Aberdeen mentioned above, another application of RFID focuses on asset management and is not within the scope of this report. Aberdeen plans on executing a study specifically targeted at asset man-

agement, tracking low-volume/high-value items and the value that RFID brings to that task. The survey for that report indicates that 6.1% of the respondents have RFID systems and that 53% of those implementations are asset management focused.

After examining the Fulfillment Solutions Framework in this context, Aberdeen sees a different range of impacts for those applications that are characterized by high-value items at relatively low volumes, limited trading partners, and/or assets used in a captive environment within one enterprise (Figure 7). Aberdeen will examine this situation in more detail in its subsequent benchmark study on logistics asset management strategies.

Figure 7: A Fulfillment Solutions Framework (Logistics Asset Management)



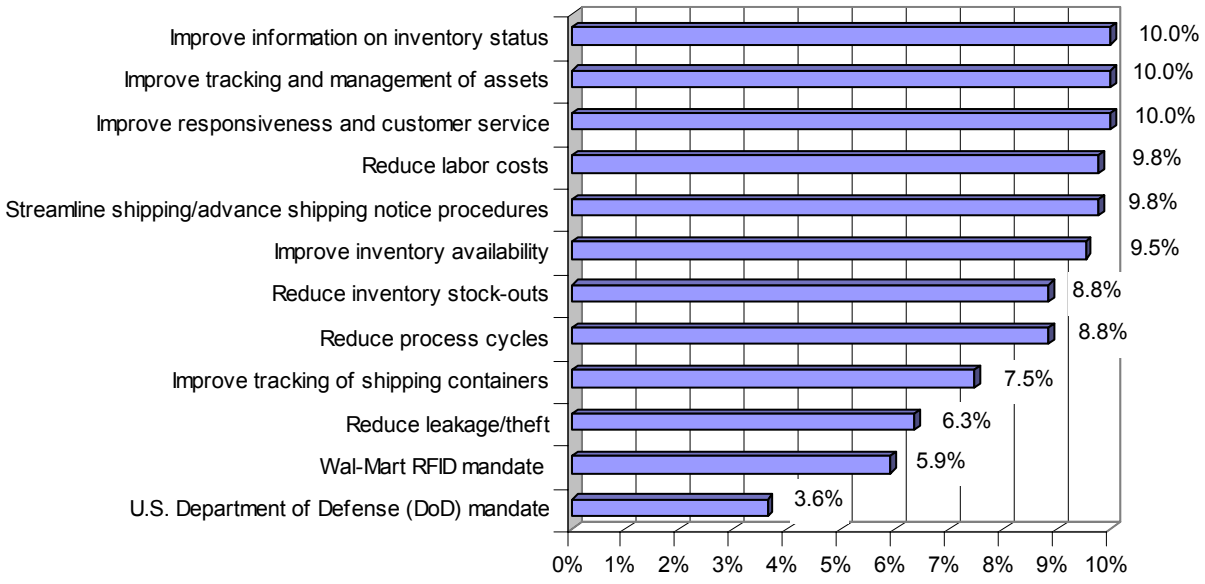
Source: Aberdeen Group, March 2004

Chapter Three:
Implications and Analysis

Getting Past Compliance Costs to Realize True Enterprise Value

Moving the discussion from compliance to value is the key to success. Compliance represents a small percentage of the total RFID benefit for manufacturers (Figure 8).

Figure 8: Companies' Anticipated Benefits for RFID



Source: Aberdeen Group, March 2004

Enterprises that change processes to take advantage of the technology's promise can leverage RFID's breakthrough capabilities. The following are examples of scenarios in which RFID will or will not add significant value to manufacturers:

- *Manufacturers of high-volume cased goods: high value* — Because of the need for case-level information, manufacturers can produce the cases and palletize them already tagged. This step eliminates the need to tear the pallet apart in shipping to apply the tag and avoids the added labor and coordination expense. Additionally, the manufacturers' own distribution centers can receive the tagged product from their plants in much the same way that the retailers' DCs will function. High-volume con-

sumer packaged goods (CPG) manufacturers like Procter and Gamble, Kimberly Clark, and Lever Brothers are all classic examples of this scenario.

- *Manufacturers of high-value products that need to be protected or controlled: high value* — One of the more promising application areas is for manufacturers of high-value products that ship in relatively low volumes, as well as where products are subject to counterfeiting, theft, recall, or FDA regulatory control. Pharmaceutical distribution is a great example of this scenario. An additional benefit is that the cost of the infrastructure to apply smart shelves and other RFID scanning devices into a pharmacy unit of a retailer is much lower than it will be to outfit the entire store location.
- *Retailers creating mixed SKU pallets: high value* — Those distributors/retailers providing high-volume builds of single-case picks onto mixed SKU pallets to ship to their own stores or stores of the customers can gain incredible productivity and picking/shipping confirmation of the pallets. Grocery picking for stores is a perfect example of this scenario.
- *Distribution centers receiving mixed SKU pallets: no value* — Those distribution centers that received mixed SKU pallets in high volumes and have an automated sortation system based on bar-code labels applied by the manufacturer will have no added value. This type of system is common for retailers or garment manufacturers receiving cases of garments in mixed color, size, and style lots in irregular cartons shipped on mixed SKU pallets.

Where Does Your Company Stand?

In this section Aberdeen provides a framework to assist enterprises in determining where they are with RFID and how they can proceed to the next level of value. For this specific situation, the scenario is for a company providing products that need to comply with the DoD mandate or any retailer mandate, such as that issued by Wal-Mart.

Using the framework is quite simple. In each row, find the description of performance that most clearly matches operations at your organization. If that description is in the *industry norm* column, a manufacturer is positioned to meet the most common aspects of the existing mandates. If you are to the left of that center column, your company is at significant risk of losing business and has real work to do. If you are to the right of the *industry norm* column, you are leveraging RFID in some ways to differentiate your company from your competition. Remember, *industry norm* is a break-even, non-differentiating position.

Table 1: Competitive Framework for RFID

	Behind	Below Norm	Industry Norm	Above Norm	Best of Breed	Emerging
Process Complexity	• Processes are simple, limited, and manual or have minimal system support; works to reduce complexity even at the cost of loss of capability to support mass customization.	• Basically reactive to compliance demands; processes are too simple to support RFID compliance.	• The introduction of RFID for compliance purposes is making the fulfillment operations more complex; manual element of the "slap-and-ship" stand-alone systems is the source of the complications.	• The extension of RFID to more customers is adding to complexity, but the integration of RFID capabilities into other systems is offsetting this effect.	• Incorporation of RFID into more of the processes within the warehouse and transportation operations is adding efficiencies that were not possible before.	• RFID is a part of everyday operational life; it does not add to or detract from the current state of operational complexity.
Operational Visibility	• RFID is not a subject of interest.	• RFID requirements are contemplated, but no plans exist to use it for operational visibility.	• RFID-based information is generated for select customers, but is not a part of providing visibility of operations.	• RFID-based information is providing feedback from the customers on the effectiveness of the fulfillment operation.	• RFID information and its synchronization with electronic information exchange are used to provide visibility of inbound materials.	• RFID-based data is an integral source of some of the operational information used in managing fulfillment operations.
Resource Effectiveness	• Compliance documentation is produced for only the most demanding customer — it is a disruption to normal operations; RFID is not a consideration, nor a capability.	• Compliance documents to include bar-code labels on pallets/cases are produced with significant manual assistance; RFID is viewed as something that may need to be added.	• Compliance documents to include bar-code labels and shipping papers are produced with some additional labor beyond what the warehouse systems produce. RFID compliance is accomplished with significant manual assistance.	• Compliance documents require little intervention to produce and apply; RFID compliance has been extended to additional customers and requires additional labor to execute.	• Compliance documents require little intervention to produce and apply; RFID compliance requires little intervention to implement and apply. RFID compliance is being mandated to the enterprises' manufacturers.	• Outbound compliance is not an issue; inbound RFID compliance is being met by the manufacturers, and internal processes and applications are modified to take advantage of this at receiving and put away.
Technology Demands	• Any form of compliance is beyond in-house systems; compliance labels and documents are executed by a stand-alone system.	• Paper-based compliance demands do not seriously stress systems; RFID is still out of reach.	• Demand for RFID compliance is beyond the capability of in-house systems; a stand-alone "slap-and-ship" system is used to provide minimal compliance capabilities.	• RFID compliance has been extended to other customers, and the application is integrated into the warehousing systems to improve the efficiency of the operation. Integration and consistency of RFID and EDI data are now required.	• RFID has been extended to manufacturers, and internal processes are being modified to take advantage of the receipt of RFID tagged products.	• RFID-related demands are a nonissue; systems are capable and integrated.
Financial Focus	• Focus on avoiding the additional costs incurred to execute paper-based compliance.	• Focus on containing the additional costs incurred to execute paper-based compliance.	• Focus on containing the additional costs incurred to execute RFID compliance.	• Focus is still on cost control of compliance requirements. but investigation of technology benefits of RFID has begun.	• Focus on RFID technology has shifted to one of gaining competitive differentiation and extending cost savings within the enterprise.	• RFID technologies are a competitive differentiator that has allowed significant internal efficiencies as well.
Internal/ External Collaboration	• *Internal systems:* Compliance capabilities are stand-alone and label or paper focused. • *External systems:* No information sharing with partners; RFID is not contemplated.	• *Internal systems:* Compliance capabilities are focused on labels and paperwork; these are integrated with the warehousing systems. RFID is being contemplated • *External systems:* RFID compliance is expected in the future, but not executed now.	• *Internal systems:* RFID compliance is mostly a stand-alone system ("slap and ship") with minimal integration to the warehousing systems in the DC. • *External systems:* RFID compliance is outbound focused.	• *Internal systems:* RFID compliance is accomplished via tight integration with warehousing systems; "slap-and-ship" systems are used only in the simplest of DC environments • *External systems:* RFID compliance is still outbound focused; it is coordinated with EDI-type communications like ASNs.	• *Internal systems:* Internal systems and processes have been modified to take advantage of inbound RFID tags; receiving has been improved. • *External systems:* RFID has been extended to manufacturers, at least at the tag level.	• *Internal systems:* RFID technology is just another form of product marking and data collection; it is integral to the fulfillment operations. • *External systems:* RFID compliance is an inbound and outbound issue and is integrated with electronic communications with manufacturers and customers.

Source: Aberdeen Group, March 2004

Chapter Four:
Recommendations for Action

Breaking Down the Strategies

Manufacturers should consider a logical progression to realizing true enterprise value. Aberdeen recommends the following steps described in this chapter.

Compliance

Compliance is not so straightforward as it seems. Manufacturers should determine the best way to attach a tag and the best place to insert this production step into their workflow. Manufacturers of a high volume of cases shipped in single SKU pallets will probably want to attach the tags in manufacturing, probably at the point upstream of pallet formation. To accommodate a mixed RFID-compliant and noncompliance environment, the manufacturer will probably want to create a "parallel SKU" that separates RFID-compliant packaging from noncompliant packaging. Based on the evolution of the costs of tags, manufacturers will discover that it is probably more cost-effective to manage the two SKUs than it will be to tag all production and eat the cost for the non-mandating customers.

The other end of the spectrum would be the distributor that ships cartons where each carton is a mixed SKU container. In this environment, a slap-and-ship application station at the end of the picking process (similar to a small parcel scale and shipping label station) may be the best approach.

In either extreme, minimal compliance needs to include integration with the existing enterprise resource planning (ERP) system or WMS. This integration will ensure that the tag content is in sync with the appropriate order and inventory systems and that the data these systems package into ASN messages to the customers will also be consistent with the tag.

Specific project execution strategies will vary based on the enterprises' internal understanding of the technology and their own domain expertise in managing complex technology implementations. Make no mistake; this is a complex project. Truly integrated solutions are still evolving. The chipmakers want to manufacture and sell RFID-compliant tags. The hardware manufacturers are focused on readers and programmers. The ERP and best-of-breed specialist software vendors are focused on accommodating the additional process steps necessary for RFID into their solutions workflow.

Finally, the major integrators are looking more to the business process changes than the technology. If enterprises do not have or want to make the necessary leadership investment, they should seek out a solutions provider that has demonstrated the complete spectrum of RFID implementation successfully (no such provider exists today). If manufacturers/distributors wish to minimize their capital investments in RFID infrastructure, they should look to third-party logistics providers that are executing the RFID compliance functions for other manufacturers of the manufacturer's or distributor's mandating customer.

Extension

Extension is the process by which the compliant RFID technology is infiltrated into more of the manufacturer's business processes. High-volume single-SKU pallet manufacturers should look to mimicking the retailer's methodologies in their own distribution centers. For those shipments that do not go direct to the retailer, they can learn how to receive and distribute the tagged product.

Transformation

Transformation is the process by which the compliant technology is utilized in more processes than just order fulfillment. The integration of the data collection to inform KPI programs, the application of tag information to facilitate visibility across the supply chain, and the extension of the consumption and resupply information to enhance the effectiveness of a VMI program are all examples. The green-coded processes/applications in Figure 6 detail the possibilities that can be pursued as a part of this transformation. The enterprise should prioritize these opportunities and pursue them methodically as a part of a continuous improvement program.

Cohabitation

Cohabitation with the retailers really starts at the compliance and extension stages. In this stage, cohabitation extends more deliberately to the enterprise's manufacturers and their transportation agents. The intents here are twofold:

1. Pass along the mandate to your manufacturers so that you can have the same benefits as the retailers on the inbound side of both your manufacturing and distribution sites
2. Mandate that your transportation providers have an infrastructure that will feed the tag and shipment data into your visibility systems.

The former will help distribute the costs of tagging while extending the opportunity for benefits. The latter will help the enterprise be

more aware of and responsive to disruptions in the flow of goods and thus provide better overall service to its customers.

Linking RFID to Business Drivers

To help manufacturers understand how to correctly translate RFID technology into business value, Aberdeen applied its DSET (drivers, strategies, enablers, and technology) framework. Aberdeen's definitions for drivers, strategies, enablers, and technologies as Aberdeen applied them in the DSET frameworks are as follows:

- Drivers — external forces that impact an organization's market position, competitiveness, or business operations (e.g., economic, political and regulatory, technology, changing customer preferences, and competitive)
- Strategies — the approaches an organization takes in response to industry drivers (These approaches align the corporate business model to leverage industry opportunities. Examples include a product/service strategy, target markets, financial strategy, go-to-market, and sales strategy.)
- Enablers — the business process competencies required to execute corporate strategy (e.g., skilled people, brand, market positioning, viable products/services, ecosystem partners, and financing)
- Technologies — the key functionality of technology solutions required to support the organization's enabling business practices (e.g., development platform, applications, data cleansing, network connectivity, user interface, training and support, and partner interface)

Table 2: DSET Framework for RFID in Distribution Operations

Priorities	Drivers	Strategies	Enablers	Technologies
1	Compliance with retailer mandates (e.g., Wal-Mart and DoD)	Maintain business relationship with mandating customers	Incorporation of available data into an RFID-enabled case/pallet label	Targeted RFID applications (slap and ship) or relationship with 3PL that has that capability
2	Improve operations performance	Extend technology investment to lever the capabilities within the enterprise to realize the same gains expected by the retailers	Alteration of existing processes and business applications (e.g., WMS or TMS) to leverage the data available from the tags and the ability to read without seeing the cartons	Extended use of initial investment to modify or integrate with existing business applications
3	Costs for compliance that cannot be passed through	Gain operational efficiencies internally and with manufacturers	Require compliance from manufacturers that will assist in meeting mandates, focus on the best point in the process to apply the tags, and make the trade-offs in your business that will mitigate the costs	Warehousing and transportation systems, extensions of electronic integration with manufacturers and customers (e.g., ASNs)

Aberdeen Group, March 2004

Featured Sponsors

BT Syntegra plays a key role in BT's Information and Communications Technology (ICT) strategy as its expert in business transformation and change management. BT Syntegra helps organizations transform the way that they operate by applying business knowledge and technology to make possible new and better ways of working.

The company's Auto-ID services include business case development around RFID, a pilot program with an advisory board of clients, and a hosted event management system that uses data captured from RFID and related technologies to support collaboration and optimize business processes. Solution implementation and support can be at the client's site or at a BT Syntegra data center.

As part of BT Group, BT Syntegra employs more than 5,000 business and technical professionals worldwide and has revenue of around $1 billion. Its primary activity is the provision of consultancy and systems integration services, including business consultancy, complex program management and custom systems design, development, and operation.

To complement its own specialization BT Syntegra, where needed, is able to call upon skill and expertise from other parts of BT.

For more information about BT Syntegra's Auto-ID services or the Message Management Platform, visit www.btsyntegra.com.

As the leader in providing integrated supply chain execution (SCE) solutions, Manhattan Associates has more than 900 clients with solutions installed in more than 1,400 facilities worldwide. Designed with customers' existing technology applications in mind, its solutions have been successfully integrated with in excess of 100 external packaged and homegrown systems.

The first supply chain software provider to join the Auto-ID Center (now EPCglobal), Manhattan Associates has used this knowledge to become an early adopter of EPC-compliant technology and develop partnerships with best-in-class RFID suppliers.

Manhattan Associates' comprehensive RFID in a Box™ solution, which provides all of the components and services required to successfully deploy RFID in a customer's facility, was named *IndustryWeek's* Technology of the Year for 2003. As RFID continues to evolve, Manhattan Associates is committed to being a leader in both technology development and education in the marketplace.

PeopleSoft

PeopleSoft's new RFID solutions will allow organizations to comply with recent mandates announced by Wal-Mart and the Department of Defense for outbound shipments.

PeopleSoft's RFID solutions enable companies to increase supply chain visibility and better respond to market volatility by providing the status and location of products and materials across the entire supply chain. This announcement and live demonstration of RFID continue to advance PeopleSoft's industry-leading position in demand-driven manufacturing.

Addressing the Wal-Mart and the Department of Defense mandates, PeopleSoft's RFID solutions create identification tags that are attached to outbound shipments. The tags can include product, place, time, and transaction data, allowing companies receiving shipments to more efficiently route, track, and distribute materials. PeopleSoft RFID enables manufacturers to meet their customers' RFID requirements as dictated for each ship-to location.

"Emerging RFID requirements are changing the economics of supply chain management," said Les Wyatt, general manager, PeopleSoft EnterpriseOne. "The potential for improved business processes, better control over inventory, cost savings, and efficiencies is significant. PeopleSoft Enterprise and PeopleSoft EnterpriseOne RFID applications give customers more flexible and adaptable solutions to address this evolving industry trend."

PeopleSoft RFID solutions leverage data collection technology provided by partners, including Data Systems International, Manhattan Associates, and HighJump. The new solutions will be generally available beginning Q2 2004.

About PeopleSoft

PeopleSoft (Nasdaq: PSFT) is the world's second largest provider of enterprise application software with 12,100 customers in more than 25 industries and 150 countries. For more information, visit us at www.peoplesoft.com.

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Tom Ryan is an information technology and logistics professional with more than 25 years of experience in warehouse and transportation operations and systems, enterprise integration technology architecture, and supply chain collaboration enablement through the application of technology. His experiences also include warehouse management, manufacturing maintenance management, fleet maintenance management, manufacturing information systems, material handling engineering design, and supply chain execution, distribution, and logistics systems.

Previously, he was the director of an integration services consulting group and the practice leader for a supply chain and enterprise integration (SCEI) consulting practice. The SCEI practice focused on assisting enterprises with the difficult task of implementing the technologies necessary to support collaborative supply chain business models. He has also been the director of technology for a third-party logistics company, where he implemented in a green field environment the enabling technologies for the collaborative supply chain business model. Ryan was a research director at the Gartner Group, an information technology research advisory and analysis firm. In this capacity, he had specific responsibilities in Gartner's Integrated Logistics Strategies service for warehouse management and transportation management applications and technologies. Prior to joining Gartner Group, Ryan was a distribution consultant, project/account manager, and applications designer for several warehouse management systems providers. He has also managed warehouse operations for a Fortune 50 CPG manufacturer. His first employment after graduation from the United States Military Academy was as a commissioned officer in the United States Army serving in airborne and armored units in the U.S. and in Europe.

About Aberdeen Group

Aberdeen*Group*

Founded in 1988, Aberdeen Group is the trusted advisor to the Global 5000 for value chain strategies and technology advice. Through its continued benchmarking and analysis of value chain practices, Aberdeen offers a unique mix of research, tools, and services to help G5000 executives assess their value chain performance, develop improvement strategies, and select solution partners.

Aberdeen's Value Chain Research team provides advice and direct recommendations for solving current and looming value chain operational problems. Our premier on-line community for supply chain professionals, Supply Chain Access (www.supplychainaccess.com), provides the community members with supply chain intelligence, strategies, and advice as well as discussion and analysis of important industry trends.

The firm also helps clients to identify new market opportunities, enter those markets successfully, and accelerate the adoption of new technologies. Headquartered in Boston, Aberdeen has research and consulting divisions in Palo Alto, CA, and Fort Collins, CO. Aberdeen's research is accessible via the Web at www.aberdeen.com.

Appendix A:
Research Methodology

Between November 2003 and January 2004, Aberdeen Group, *Logistics Management*, and *Modern Materials Handling* magazines examined the RFID solutions and providers, experiences, and intentions of more than 200 enterprises in CPG (11%), retail (9%), manufacturing (14%), distribution (16%), and other industries.

Responding supply chain, logistics, and operations executives completed an online survey that included questions designed to determine the following:

- The degree to which RFID initiatives impact corporate strategies, operations, and financial results
- The degree to which the mandates of Wal-Mart and DoD are driving the application of RFID
- Current and planned use of RFID
- The benefits, if any, that have been derived from RFID
- The obstacles, if any, standing in the way of the rapid and broad acceptance of RFID

The study aimed to identify emerging best practices for use of RFID technologies and provide a framework by which readers could assess their own capabilities.

Responding enterprises included the following:

- *Job title/function* — The research sample included respondents with senior-level responsibilities; 30 % were senior-level executives, including vice presidents and CEOs. Additionally, 33% were line warehouse operations managers. These individuals have responsibilities that include operations (41%), broader logistics areas (26%), and supply chain and procurement responsibilities (16%).
- *Industry* — The research sample indicated that 56% of respondents distributed high volumes of low-cost goods (e.g., dry groceries), and 44% distributed lower volumes of higher cost goods (e.g., electronics and OTC drugs). The CPG (11%), retail (9%), manufacturing (14%), distribution (16%), and other industries were included in the survey responses.
- *Geography* — Many of the respondents indicated an international nature to their supply chain operations. Only 37% limited

distribution of their products to North America, whereas 36% distributed in up to 50 countries.

- *Company size* — Fourteen percent of the respondents worked for tier-one companies with revenue of more than $1 billion. Another 59% came from companies with less than $250 million in revenue, whereas only 14% had revenue greater than $250 million and less than $1 billion.

Solution providers recognized as sponsors of this report were solicited after the fact and had no substantive influence on the direction of the *RFID in the Consumer Industries Benchmark Report*. Their sponsorship has made it possible for Aberdeen Group, *Logistics Management*, and *Modern Materials Handling* to make these findings available to readers at no charge.

Appendix B:
Lexicon of Acronyms and Abbreviations

3PL	Third-party logistics provider — outsource service providers of logistics services to include transportation management, warehouse management, and services; these organizations often have their own assets that they use to provide these services.
4PL	Fourth-party logistics provider — similar to a 3PL except that they include the management of 3PLs in their offerings; these firms typically do not own the assets they are managing.
AIDC	Automatic identification capture — a system used to create and or capture identification marks, typically bar codes, for cases and pallets of product in warehouse, DC, or shipment.
ANSI	American National Standards Institute
ASN	Advanced shipment notification — notification from a shipper to their customer of what will be included in a shipment
CPG	Consumer packaged goods — an industry designation for a series of manufacturers that produce packaged products (e.g., toilet paper, health and beauty products, soap and laundry products, etc.) for consumers. Procter and Gamble, Kimberly Clark, Clorox, and Lever Brothers are all examples.
DC	Distribution center — a warehouse that is typically in a stand alone situation, not attached to a manufacturing operation
DoD	United States Department of Defense
DSET	Drivers, strategies, enablers, and technologies — a diagnostic model used by the Aberdeen Group
EDI	Electronic data interchange — a method of exchanging information between enterprises and business applications; the standards associated with this method of integration are defined by several standards bodies and include ANSI X12 and EDI FACT

EDI FACT	United Nations-based standards body
ERP	Enterprise resource planning — a software suite that often includes OMS capability along with inventory management and financial modules
FDA	United States Food and Drug Administration
KPI	Key performance indicator — a measurement tracked within a metrics or performance management system/program
LMS	Labor management system — a program or software solution used to evaluate and track the performance of labor assets within an enterprise
MHE	Material handling equipment — any device or machine that is used to move product or material either independently or as an aid to a human operator
OEM	Original equipment manufacturer
OMS	Order management system — a software application typically used to capture a customer order and manage its fulfillment
RF	Radio frequency — the radio waves used with wireless devices to include handheld data terminals, wireless devices, and RFID tags
RFID	Radio frequency identification — technology used to identify cases, pallets, eaches, containers, totes, etc., with a unique identifying number that can then be scanned without having to be seen
SKU	Stock-keeping unit, often synonymous with part number, item number
TMS	Transportation management system — a software solution used to manage the flow of shipments, the carriers, and the contracts to/from a manufacturer, DC, or other enterprise. It is typically an execution system, not a planning system.
UHF	Ultra-High Frequency — a band of RF used for RFID and other wireless devices
VMI	Vendor-managed inventory — a program whereby the vendor manages a dedicated amount of inventory on behalf of the customer; the inventory is in the vendor's control and has not been shipped to the customer.
WMS	Warehouse management system — a software application focused and controlling and managing

	the activities within the "four walls" of a warehouse or distribution center
YMS	Yard management system — a software application used to manage the placement and movement of containers, trailers, or railcars in the yard of a DC, warehouse, or manufacturing operation. This management often includes dock scheduling.

Appendix C:
Related Aberdeen Research

Aberdeen Group has produced several publications that provide complementary market research and strategic market information relating directly to RFID:

- *Supply Chain Planning Benchmark Report: Unlocking Predictability in the Supply Chain* (June 2003)
- *Service Parts Management: Unlocking Value and Profits in the Supply Chain* (September 2003)
- *Best Practices in Warehouse Management* (forthcoming)
- *Reverse Logistics in the Consumer Industries* (forthcoming)
- *The Fulfillment Solutions Framework: Charting a Path to Success* (forthcoming)

Information on these and any other Aberdeen publications can be found at www.aberdeen.com or by e-mail at inquiry@aberdeen.com.

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This research study is the result of research performed by Aberdeen Group.

Aberdeen Group performs specific projects for a select group of domestic and international clients. Each project requires a combination of strategic advice and pragmatic, experience-based action plans. Assignments range from corporate and product positioning and organizational planning to in-depth market segment research. Aberdeen consults on mergers and acquisitions, corporate positioning and investor relations, and transaction-processing benchmarks; in addition, it offers special expertise in software and midrange computer markets.

In carrying out assignments, Aberdeen uses a proprietary, comprehensive, analytical framework providing fresh insight into the complex future of computing and communications, both from technological and market-dynamics perspectives. Aberdeen also offers retainer-fee programs to a group of continuing clients.

Aberdeen principals and staff are recognized industry figures with hundreds of years of combined high-tech industry, research, and financial community experience among them. They are quoted extensively in industry trade and business publications. Each staff member is a frequent conference and seminar speaker.

In addition to client-related research and consulting, Aberdeen publishes several periodicals, Aberdeen Viewpoints, and Profiles, which summarize its analysis and research findings.

To provide us with your feedback on this research, please go to www.aberdeen.com/feedback.

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