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The ROI Of RFID For Supply Chain Visibility

by Roy C. Wildeman and Patrick M. Connaughton
for Business Process & Applications Professionals

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A Total Economic Impact™ Analysis Links Gains To Depth Of Systems Integration

This is the first document in the “ROI Of RFID” series.

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EXECUTIVE SUMMARY

Among the various applications of radio frequency identification (RFID), employing the technology for supply chain visibility has generated particular enthusiasm and controversy for manufacturers and distributors across a variety of industries. Amid the hype, the business value of deploying RFID technology across these trading partners has been blurred by questions about costs, benefits, and scope whose answers are elusive. A Total Economic Impact™ (TEI) analysis of RFID for item-level visibility across manufacturing and distribution operations shows that investment with minimal systems integration is not likely to produce a return on investment (ROI) — at least not at today’s prices. However, combining RFID-generated event data with the right business context from enterprise apps will produce a modest ROI and positive business benefits in a typical manufacturing and distribution supply chain.

TABLE OF CONTENTS

- 2 The Business Value Of RFID-Driven Supply Chains Remains Elusive**
- 2 Three Factors Determine The ROI Of RFID For Supply Chain Visibility**
 - Key Benefits: Top-Line Opportunities Are The Primary Value; Efficiency Gains Are Secondary
 - Key Costs: Systems Integrations Drive Starting Costs, While Tags Dominate Recurring Costs
 - Risk Analysis: Coordination, Systems Integrations, And Technology Change Issues Loom
- 7 Calculating ROI For Item-Level Visibility Across Manufacturing, Distribution**
- 11 RFID For Supply Chain Visibility Only Pays Off With Full Systems Integration**
- RECOMMENDATIONS
- 14 Focus On Value To Align And Mobilize Supply Chain Stakeholders**
- 15 Supplemental Material**

NOTES & RESOURCES

Forrester interviewed 13 vendor companies and systems integrators: Acsis, AeroScout, Alien Technology, Capgemini, Clarkston Consulting, Ekahau, IBM, Intermec Technologies, ITC Infotech, Motorola, OATSystems, SAP, and Zebra Technologies.

Related Research Documents

- “[Making Sense Of Sensor Data](#)”
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- “[Manufacturers Embark On The X Internet Voyage](#)”
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THE BUSINESS VALUE OF RFID-DRIVEN SUPPLY CHAINS REMAINS ELUSIVE

Over the past several years, radio frequency identification (RFID) technology has matured beyond experimental lab testing into a technically viable solution for tracking the physical location of products, assets, and even people in a wide variety of operating environments. Among these various applications, employing RFID for supply chain visibility has generated particular excitement as business process and applications professionals envision the technology's potential to transform how products move from factories to warehouses and finally into customer stores. But amid the hype, one question has remained unanswered: Does deploying RFID for supply chain visibility actually make business sense? Firms facing this question often wrestle with a few industry-centric parameters that can widely affect the business viability of their initiative, including:

- **Scope of the required tagging level.** Both the startup and ongoing costs of an RFID system depend upon the number of tags and readers required — costs that can grow as tagging granularity progresses from pallets to cases to individual merchandise. So while a pharmaceutical manufacturer may seek item-level tagging to satisfy serialization and ePedigree mandates, a consumer products distributor may target only case-level visibility to drive the majority of its visibility gains.
- **Economics of tag cost relative to item value.** All else being equal, products with a higher average selling price will have tag costs that are a lower percentage of the overall price seen by the customer. This means that firms often struggle to decide which product categories make sense to tag — all of them or just the high-ticket items?
- **Position and relationship in the supply chain.** Manufacturers, distributors, and retailers have markedly different perspectives — as well as mutual dependence — on the value from the RFID-enabled visibility. These varying perspectives can make the financial outlook of each organization's individual costs, benefits, and risks very blurry.

THREE FACTORS DETERMINE THE ROI OF RFID FOR SUPPLY CHAIN VISIBILITY

With these tremendous variations in scope, economics, and supply chain perspectives, it is imperative that business process and applications professionals objectively evaluate the financial impact on the business when considering the adoption of RFID for supply chain visibility as opposed to older systems such as bar codes. How? Companies can use a simplified version of Forrester's Total Economic Impact™ (TEI) model to systematically consider:

1. **Benefits.** How will your company benefit from RFID-driven visibility across the supply chain?
2. **Costs.** How will your company pay, both in hard costs and resources, for RFID-driven visibility?
3. **Risks.** How do uncertainties change the total impact of RFID-driven visibility on your supply chain?

Key Benefits: Top-Line Opportunities Are The Primary Value; Efficiency Gains Are Secondary

Organizations implementing RFID for supply chain visibility will likely need to justify the investment with a number of expected improvements. Naturally, the types of benefits will vary depending on the level of tagging (i.e., pallet-, case-, and/or item-level tags) and supply chain stage. The scale, timing, and duration of these benefits can be estimated by considering one or more key metrics and the value of improving those metrics over time (see Figure 1). Benefits include:

- **Reduction in recalls and returns.** Tagging individual items allows manufacturers to keep track of which merchandise is sent to specific customers — enabling recall efforts to be very targeted and preventing return of nonrecalled items. Similarly, firms may also see benefits from identifying and reducing payouts for products being returned that are deemed invalid because of origination or counterfeiting.
- **Reduction in shipping errors.** If a firm incorrectly ships a different product in place of the product ordered, the incorrect product is not always returned (particularly if the transportation cost is relatively high). While we included the top-line benefit of reducing these lost sales in our analysis, we did not include the associated reduction in time and resources required to process claims since this later area represents relatively small savings.
- **Improved financial accuracy of order terms.** Discrepancies in shipping claims or contract pricing to downstream customers represent a significant source of false chargebacks for manufacturers in industries like consumer goods and pharmaceuticals. Assuming RFID event data is integrated with a firm's order management or contract administration systems, the number of incidents of invalid chargebacks could be identified and the associated lost revenue could be reclaimed.
- **Direct labor savings.** Distributors may be able to improve receiving, shipping, and storage operations through increased automation and visibility because RFID doesn't require line-of-sight reads to record product location (unlike legacy bar code systems). Firms distributing a large variety of products from many suppliers (or shipments from a single supplier containing multiple products) are likely to benefit the most because counting and tracking product is more time-consuming when pallets or cases contain different materials.
- **Reduction in inventory shrinkage.** Distributors can also expect RFID tagging to reduce inventory shrinkage due to theft or unexplained reasons through better cycle counting and faster identification of problems. Like other distribution efficiency gains, the incremental benefit from item-level tagging (versus case-level) will depend on SKU mix and storage modes.
- **Reduced losses due to expiration or spoilage.** Unsaleables — products that expire or spoil in the warehouse or are returned after customer receipt and inspection — represent a significant source of waste in industries like pharmaceuticals and food and beverage. Assuming integration

with inventory management applications or original manufacturing systems of record, distributors may expect to reduce these losses on an ongoing basis by combining real-time access to an item's original lot number and expiration date alongside automated picking processes.

- **Reduced stock-outs.** Distributors who gain more accurate and real-time information on inventory levels, locations, and replenishments from item-level tagging can also expect top-level benefits from reduced stocks-outs — although the profit impact will depend on the current percentage that result in an actual loss of sale (since many stocks-outs are simply filled late).
- **Inventory cost savings.** Similar to stock-outs, more accurate and real-time information on inventory levels and inbound replenishments should improve inventory efficiency. Assuming a high degree of integration between RFID event data and a distributor's inventory management systems, firms can plan for a significant one-time reduction in inventory and claim the annual savings from the costs to hold that inventory, including physical operating costs (e.g., security, lighting, and heating or cooling the storage) as well as financial opportunity costs (e.g., the forgone return on the funds invested in inventory rather than in alternative projects).

Figure 1 Key Benefits Of RFID For Supply Chain Visibility

Dimension	RFID for supply chain visibility helps by . . .
Recapturing top-line revenues	<ul style="list-style-type: none"> • Reducing payouts for recalled or returned product • Reducing lost product and sales from shipping errors • Reconciling invalid order claims or chargebacks • Reducing lost sales from stock-outs
Improving bottom-line efficiencies	<ul style="list-style-type: none"> • Saving direct labor required to receive, ship, and store product • Reducing inventory shrinkage • Reducing losses due to product expiry or spoilage • Reducing inventory levels and associated holding costs

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Source: Forrester Research, Inc.

Key Costs: Systems Integrations Drive Starting Costs, While Tags Dominate Recurring Costs

Organizations implementing RFID for supply chain visibility can expect different costs — although the bulk of starting costs usually comes from systems integration services (see Figure 2):

- **Initial planning and pilot.** Firms investigating RFID for the first time will need upfront time and resources to understand the technology and justify the visibility initiative.¹ As part of this initial stage, many firms will conduct a pilot on a single packaging line or distribution area to understand the physics of RFID in their own operating environment and prove readability.
- **Reader costs.** Operations responsible for originally applying RFID tags will need a handful of fixed readers to commission and validate the tags at the case and potentially item levels, while

downstream operations will generally require many more readers on doorways, forklifts, and handheld readers substituting the role of legacy bar code scanners.

- **Tag costs.** “One-way” tags make up the largest component of recurring costs but can vary significantly by technology type (i.e., UHF or HF passive tags), tagging granularity (i.e., pallets, cases, or individual merchandise), and purchasing volumes. Tag defect rates, expected cost decreases, and tagging ramp-up schedules are important additional factors that must be accounted for in projecting tag costs.
- **Software and server costs.** At a minimum, each operating site will need to purchase a license for RFID middleware to orchestrate data capture across devices and an event information server to help store and securely share data across departments and trading partners. Some firms will need to invest in additional applications like ePedigree or supply chain event management (SCEM) software to automate specific visibility processes depending on industry and process maturity.
- **Equipment installation and commissioning.** Firms whose product volumes are capacity-constrained should account for any lost revenue from installation downtime or lower line speeds that commonly occur during conversion — opportunity costs that vary directly with product price. Other equipment costs can include labelers (either newly purchased or retrofitted to handle RFID), conveyor or floor space extensions, and general infrastructure costs like running new power lines and network connections.
- **Systems integration services.** The largest component of startup costs includes the implementation labor to design, configure, test, and deploy the software systems needed to manage the volumes of RFID-generated event data. Importantly, these costs can vary significantly based on the level of integration to legacy systems. For example, a manufacturing department may choose a basic “integration-light” approach to extract a minimum number of master data fields like lot number and expiration date from host manufacturing execution systems (MES) during tag commissioning, while distribution may opt to fully integrate event data with existing warehouse management (WMS) or enterprise resource planning (ERP) systems to improve inventory management and order claims processing.
- **Ongoing productivity costs.** Three factors contribute to ongoing productivity costs: increased machine or equipment setup times, additional operational downtime, and post-implementation support staff required as production crews and warehouse operators familiarize themselves with RFID-enabled operations.

Figure 2 Key Costs Of RFID For Supply Chain Visibility

Project phase	Key costs
Initial planning	<ul style="list-style-type: none"> • Scope definition and justification work • Small-scale pilot
Implementation	<ul style="list-style-type: none"> • Readers (fixed and mobile) • RFID middleware and application software • Equipment installation and commissioning • Systems integration services
Ongoing expenses	<ul style="list-style-type: none"> • Passive UHF or HF tags • Ongoing productivity costs • Software maintenance • Reader maintenance

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Source: Forrester Research, Inc.

Risk Analysis: Coordination, Systems Integrations, And Technology Change Issues Loom

No change — or avoidance of change — is without risk. Factoring this uncertainty into the analysis converts an optimistic, and potentially unachievable, plan into one with higher accuracy. Initial estimates can be refined by factoring in three key risks:

- **Cross-functional dependencies can create weak links.** Manufacturing and distribution have mutual dependence on the value from RFID-enabled visibility; oftentimes a plant will front product tag costs trusting that valuable downstream information will be shared, while a distribution center will build out its RFID infrastructure and plan on automation benefits assuming product will arrive fully tagged from its suppliers. Given this dependence, technology ramp-up schedules, specifications, and level of data sharing all must be clearly coordinated and committed to by each organization.²
- **Systems integration costs can spiral out of control.** Most of the major top-line benefits — such as improved shipping accuracy, inventory efficiency, and financial reconciliations — depend on integrating RFID-generated event data into legacy applications. As with any systems integration, this is an expensive line item notorious for unexpected programming and interface issues that can drain the development budget. After go-live, systems mishaps can also lead to unexpected downtime and jeopardize revenues from production or operational throughput.
- **RFID technology and standards continue to evolve.** On the hardware side, both RFID tags and readers aren't foolproof yet, although Gen 2 technology has helped decrease both reader and tag collisions.³ Despite these advances, the UHF versus HF tag technology debate remains wide open, and event data standards like EPC Global continue to evolve — two uncertainties that increase the risk of higher support costs as readers and software must be kept up-to-date.⁴

CALCULATING ROI FOR ITEM-LEVEL VISIBILITY ACROSS MANUFACTURING, DISTRIBUTION

To arrive at a quantitative assessment of the economic implications of RFID for supply chain visibility, Forrester evaluated the key drivers of benefits, costs, and risks for a hypothetical manufacturer and distributor with:

- **Typical systems, equipment, and labor.** Our sample manufacturing company currently operates 40 packaging lines across five manufacturing plants generating \$10 billion in sales annually. In this scenario, we assumed each site is running industry-standard enterprise applications such as ERP and MES as well as automated equipment to label and package finished goods. Our sample distribution company has 20 distribution centers supporting \$10 billion worth of sales annually. In this scenario, we also assumed each site has standard enterprise apps such as ERP and WMS, bar code systems as the legacy mode of product tracking, and a staffing size of 20 operators on the average shift. Notably, our distributor processes a variety of products in both case- and item-level quantities — not just whole pallets containing the same material.
- **Item-level track and trace requirements.** Firms in industries such as consumer products, food and beverage, and pharmaceuticals face regulatory or business requirements to track the flow of individual products across the supply chain and provide traceability on each product's chain of custody. In this scenario, we've assumed such industry requirements dictate that RFID-enabled visibility extend down to the individual item level for 80% of the business' product volume. Notably, we've also assumed RFID investments across manufacturing and distribution would match in terms of ramp-up schedules, technology specifications, and level of data sharing.

Company Baselines And Assumptions

For the purposes of conducting the analysis, we established a set of baseline values and assumptions based on conversations with numerous end users and technology vendors that can be adapted to match individual manufacturing or distribution organizations. Based on these conversations, we chose to use the following parameters as the major inputs to the model:

- **A five-year window for the analysis.** Our sample supply chain, based on current systems, changing industry requirements, and potentially changing RFID technologies, evaluated an RFID investment scenario over a five-year period. During this analysis period, the first year is spent planning and implementing the solution across sites, with the solution in use globally for the remaining 48 months.
- **Reader costs that vary by type and location.** For each packaging line applying RFID tags, manufacturing will need fixed readers to commission and validate the tags at the case and item levels. Depending on readability and accuracy requirements, manufacturing firms may also need an additional handheld reader as a dedicated QA station. Distribution sites will each

require many more readers, including one or two fixed readers per warehouse doorway (priced at \$1,000 each), 15 forklift readers (priced at \$8,000 each), and 15 handheld readers (priced at \$4,000 each).

- **Use of UHF tags per readability requirements.** Gen 2 UHF products have been proven to operate at read ranges and read rates that match most operating requirements without sacrificing readability — although some supply chains may gravitate to HF given specific product characteristics and RF interactions. For this scenario, we assumed UHF tags would be used with a \$0.17-per-tag cost, a 3% tag defect rate, and a 2% projected cost decrease year over year given our understanding of the level of current tag prices relative to tag suppliers' cost structures.⁵
- **Software and server costs priced by site.** We priced licenses for RFID middleware to be \$80,000 per site, event data servers to be approximately \$40,000 per site, and any additional application licenses to be approximately \$20,000 per site (as well as ongoing maintenance service fees of 15% license costs).

Some of our baseline values and assumptions vary significantly between manufacturers and distributors:

- **Manufacturers will incur modest equipment installation and commissioning costs.** We assumed manufacturers would spend a one-time cost of \$45,000 to modify the existing labeling equipment on each packaging line to handle RFID. Also, the average manufacturer will incur some marginal lost revenue from the downtime and lower line speeds required to commission the new equipment but would not require extensive conveyor extensions or other large-scale changes to current infrastructure.⁶
- **Software reuse will differ for manufacturing versus distribution.** Manufacturers' systems implementations are likely to be very different for each site based on the variations in operating characteristics and application topologies — leading us to limit efficiencies from reusing design, configuration, and development code beyond the first site to 20%. Conversely, distribution sites typically have more standardized processes and applications that should be able to enable the reuse of 80% of the first site's systems code across sites.
- **Manufacturers see significant recalls, invalid order claims, or chargebacks.** Based on our conversations, we assumed our manufacturer recalls 0.1% of its sales annually. Similarly, we assumed lost revenue through invalid claims or chargebacks represented 0.25% of a manufacturer's current sales.
- **Distributors get more product returns.** We assumed manufacturing sees 5% of its volume returned, whereas distribution sees 10% returns given the larger flow of item returns from retailers.

- **Shipping errors will differ for manufacturers versus distributors.** We assumed the average manufacturer currently sees 1% of its shipments being inaccurate, but only 10% of these errors result in lost product due to the relatively low cost of return shipping from the distributor. Conversely, we assumed the average distributor sees only 0.15% of its shipments being inaccurate, but 50% of these errors result in lost product due to the relatively high cost of return shipping from the retailer.
- **Distributors see a significant level of inventory expiration, stock-outs, and holding costs.** Based on our conversations, we assumed our distributor turns its inventory over 10 times a year and experiences an annual inventory loss of 0.4% due to product expiring or spoiling. Additionally, we assumed distribution sees an average fill rate of 95%, a gross margin of 2%, and that one out of every 10 stock-outs results in a lost sale (rather than just being filled late). Lastly, we assumed the physical plus financial costs of holding inventory to be 8.5%.

Evaluation Time Frame

This analysis assumes that the RFID visibility initiative begins on January 1 of Year 1 and continues until December 31 of Year 5. Based on reports from organizations initiating this type of project, the following phases will likely occur:

- **Initial planning phase.** During the first 90 days, each organization will work to establish the scope of the program, justify the investment, and conduct a pilot on a representative part of its product line to prove RFID readability in its manufacturing or distribution operating environments. While organizations are certainly gaining important education on RFID during this time, we have assumed no financial benefits during this initial phase.
- **Implementation rollout phase.** This phase, lasting up to a full year, sees the bulk of the spending required to deliver the project across manufacturing plants and distribution centers. This phase includes purchasing readers, servers, and software licenses; installing the hardware at each site; and designing, developing, and integrating the RFID middleware software with new and legacy applications.
- **Ongoing benefits and support phase.** During Years 2 to 5, organizations will begin to realize benefits from their projects, subject to the risk factors defined. For the purpose of this analysis, benefits start immediately in Year 2 alongside ongoing operational costs such as tag purchases, reader and software maintenance, and productivity costs.

Scenario 1: Minimum Integration Of RFID Event Data To Enterprise Applications

In this scenario, our manufacturer and distributor implement RFID for supply chain visibility with minimum integration of location event data into their enterprise applications. In this scenario, we assume:

- **Lower systems integrations and support costs.** We've assessed the effort required to perform basic systems integration between RFID middleware and enterprise applications to be 270 implementation days with five FTEs being billed at \$100 per hour and working 8-hour days.⁷ For manufacturers, this only enables required fields like lot number and the expiration date to be automatically extracted from host systems (e.g., ERP, MES) to establish and store the master data context for each item's unique identifier. For distributors, this only allows RFID identification events to be captured in the legacy systems just as bar code scans are equivalently captured today. With this minimum level of integration, we've assumed system support costs to occupy 50% of an FTE's time per site.
- **Full gains from returns, direct labor savings, and inventory shrinkage.** With this level of integration, we assumed both manufacturing and distribution would be able to better authenticate the percentage of products returned and reduce payouts for invalid items (assumed to be 0.5% of all returns) through direct query of their RFID event database. Similarly, we assumed distribution would see a 90% reduction in direct labor required to cycle count inventory, a 5% reduction in labor required to receive and ship products, and a 75% reduction in inventory shrinkage from more automated warehousing operations.
- **Marginal gains in shipping errors and financial reconciliation.** Although systems integration is minimal, we assumed RFID automation would lead to some modest improvement in shipping and claims processing by reducing the number of scanning errors. We assumed a 20% improvement in shipping errors for both manufacturing and distribution, as well as an associated 20% improvement in the financial accuracy of order terms.
- **Zero gains in recalls, expiration control, stock-outs, and inventory efficiency.** In order to execute more targeted recalls, manufacturers need to be able to securely connect to downstream event data (either via a local trading partner registry or discovery service), which is outside the scope of our minimum integration assumptions. Similarly, distribution would need to combine event data with its inventory management and demand management applications in order to see benefits in reduced spoilage, stock-outs, and inventory holding costs.

Scenario 2: Full Integration Of RFID Event Data To Enterprise Applications

In this scenario, our manufacturer and distributor implement RFID for supply chain visibility with complete integration of location event data into enterprise applications in order to receive full expected benefits. In this scenario, we assume:

- **Double the systems integrations and support costs.** In this scenario, we've assumed systems integration and associated support to require double the number of FTE's. This additional investment will connect enterprise applications to the RFID-generated event repository so that basic location events can be correlated with business contexts such as a purchase order

and invoice from an ERP system, expiration dates and location information from a warehouse management system, and shipping details from a transportation system. Additionally, we've assumed event data can be securely shared between organizations either via a local trading partner registry or discovery service as a result of this full integration effort.

- **Full benefits from improved shipping and financial reconciliation.** With full systems integration, we assumed both firms can expect to reduce shipping errors by 80% and recapture this additional lost revenue. Additionally, we assumed manufacturers would be able to reconcile 80% of invalid claim and chargebacks through improved visibility to their trading partner's event data.
- **Full benefits in recalls, expiration control, stock-outs, and inventory efficiency.** With direct connection to downstream event data, we assumed manufacturers can reduce the amount of their recalled volumes by 50%. Similarly, distribution should be able to leverage the combination of its event data with the business context of its inventory management and demand management applications in order to reduce spoilage by 50%, reduce its stock-outs by 80%, and claim a one-time inventory reduction of 0.1%.

RFID FOR SUPPLY CHAIN VISIBILITY ONLY PAYS OFF WITH FULL SYSTEMS INTEGRATION


In our sample supply chain, implementing RFID for supply chain visibility with minimal systems integrations produced an expected ROI of -56% and a net present value (NPV) of approximately -\$54.8 million (see Figure 3). However, the additional investment in full systems integration produces a modest return on investment of 13% and an additional NPV of \$13.9 million (see Figure 4).

To implement RFID for supply chain visibility with minimal systems integration, as described in Scenario 1, our sample manufacturer will invest approximately \$7.5 million for the systems and infrastructure required to tag products but would fail to recoup this outlay with recurring negative cash flows stemming largely from ongoing tag costs. The picture is somewhat better for our sample distributor, who will invest \$11 million in upfront infrastructure but recoup this investment between Years 3 and 4 as expected business benefits exceed ongoing costs.

Increasing the level of systems integration, as described in Scenario 2, increases the costs during the investment phase for manufacturing and distribution by 70% and 45%, respectively. However, these additional investments, coupled with the ongoing operational costs, will be fully paid back by the expected benefits in 4.2 years for manufacturing and in 2.8 years for distribution (see Figure 5-1 and see Figure 5-2).

Notably, these ROI conclusions are dependent on the volume of products tagged with RFID. By assuming a relatively high level of 80% of products tagged, the economic returns are greater as fixed costs are amortized over more benefits (see Figure 6).

Figure 3 Model: Total Economic Impact Analysis Summary — Minimal Systems Integration


 The spreadsheet detailing this model is available online.

	Year 1	Year 2	Year 3	Year 4	Year 5	Total	Present value (PV)
Benefit	\$0	\$13,929,022	\$13,929,022	\$13,929,022	\$13,929,022	\$55,716,087	\$42,717,303
Cost	\$18,615,467	\$26,183,973	\$26,183,973	\$26,183,973	\$26,183,973	\$123,351,360	\$97,537,137
Net cash flow	-\$18,615,467	-\$12,254,951	-\$12,254,951	-\$12,254,951	-\$12,254,951	-\$67,635,273	-\$54,819,834
NPV	-\$54,819,834						
ROI	-56%						
Payback	N/A						

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Source: Forrester Research, Inc.

Figure 4 Model: Total Economic Impact Analysis Summary — Full Systems Integration

 The spreadsheet detailing this model is available online.

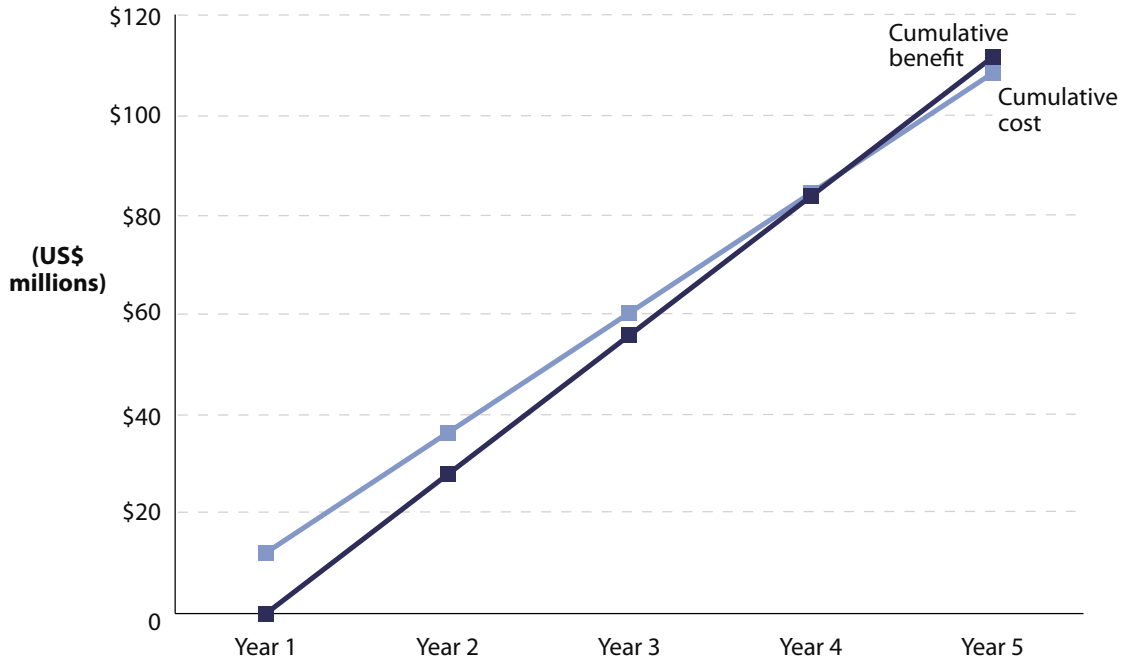
	Year 1	Year 2	Year 3	Year 4	Year 5	Total	Present value (PV)
Benefit	\$0	\$40,306,222	\$40,306,222	\$40,306,222	\$40,306,222	\$161,224,887	\$123,610,481
Cost	\$28,738,667	\$27,097,307	\$27,097,307	\$27,097,307	\$27,097,307	\$137,127,893	\$109,711,466
Net cash flow	-\$28,738,667	\$13,208,915	\$13,208,915	\$13,208,915	\$13,208,915	\$24,096,994	\$13,899,015
NPV	\$13,899,015						
ROI	13%						
Payback	Over 2 years						

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Source: Forrester Research, Inc.

Figure 5 TEI Cost Versus Benefits — Manufacturer And Distributor With Full Systems Integration

5-1 Manufacturer: cost versus benefits



5-2 Distributer: cost versus benefits

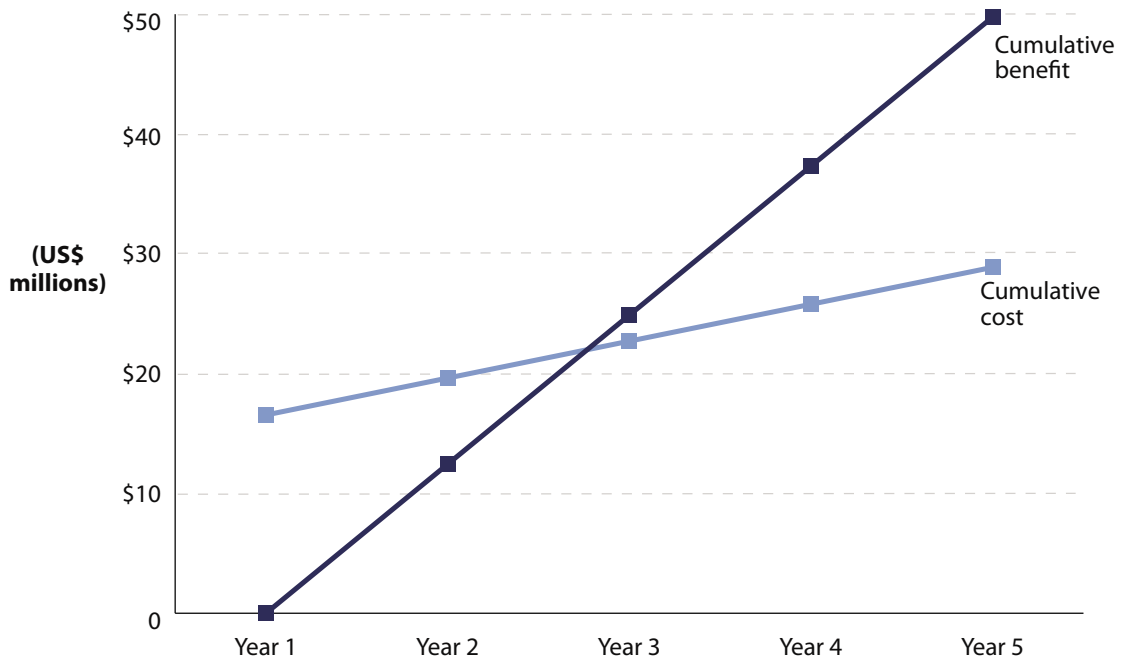
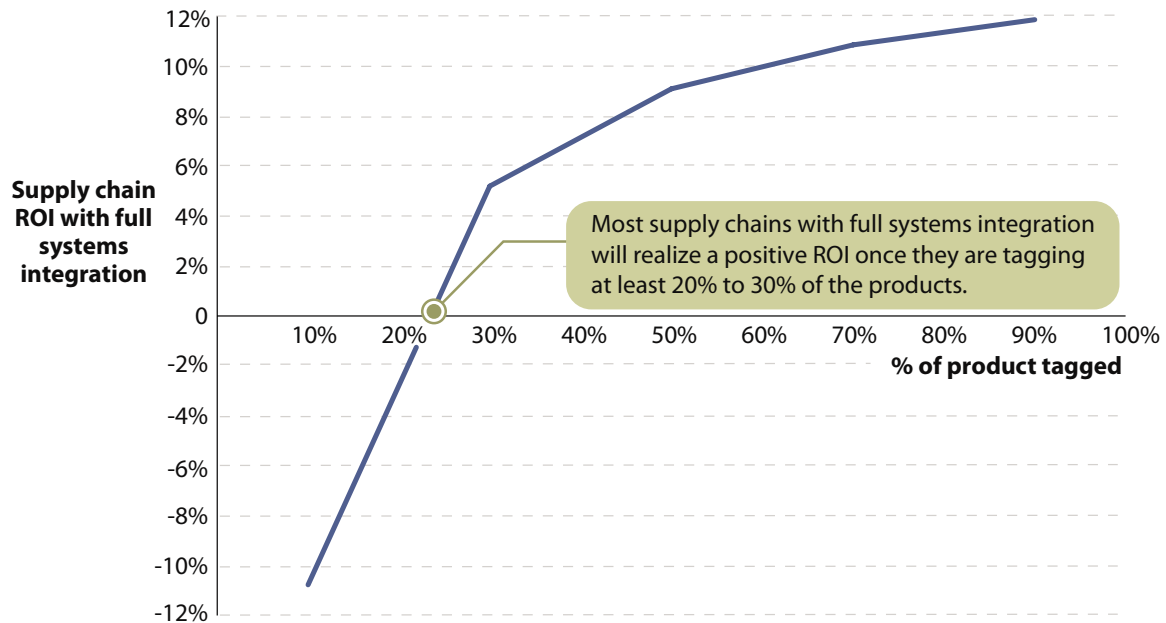


Figure 6 Value Of RFID For Supply Chain Visibility Varies By Percentage Of Products Tagged



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Source: Forrester Research, Inc.

RECOMMENDATIONS

FOCUS ON VALUE TO ALIGN AND MOBILIZE SUPPLY CHAIN STAKEHOLDERS

Given the mutual dependence on investments and benefits, manufacturing and distribution organizations must carefully consider adopting RFID technology in concert — at best a challenge for internal operations and at worst a roadblock for external trading partners. In order to mobilize an RFID visibility project and ensure predictability of results, each stakeholder organization should:

- **Start with rough-cut assumptions from your own operations.** The full economic impact of RFID can vary tremendously depending on a site's unique operating characteristics. Putting even crude assumptions on tagging level, volume of products tagged, and the associated benefit areas into the TEI model can produce quick insight on the overall viability across your supply chain.
- **Prioritize the right products by expected benefits.** Upfront diagnostics showing how your current product mix maps to these expected benefits (e.g., propensity for shipping errors, expiration, returns, etc.) can help hone the business case and determine which products are the best candidates for initial rollouts.
- **Be clear and vigilant on your systems integration.** As the focal point of major costs and benefits, business process and applications professionals will need to be maniacal about the

scope and deployment risks of the systems integration activities. Look for top SI vendors like Capgemini and IBM to help provide savvy and implementation continuity over the long haul of multisite deployments.

SUPPLEMENTAL MATERIAL

Methodology

Forrester Research uses a defined methodology for analyzing and evaluating the costs, benefits, and risks of a proposed solution. This methodology, termed Total Economic Impact (TEI), provides a holistic view of the decision by including an analysis of costs, benefits, flexibility, and risk. By including an assessment of risk, TEI provides a realistic view of expected outcomes, rather than one shaded by early optimism and enthusiasm.⁸

Unlike a cost- or technology-based analysis, TEI does not rely on industry averages or factors that are applied to all organizations, but is a methodology for evaluating projects. The TEI methodology forces the determination and quantification of relevant metrics in light of an organization's current state and future goals. Firms can use the TEI model as a proactive and predictive tool.

Companies Interviewed For This Document

Acsis	Intermec Technologies
AeroScout	ITC Infotech
Alien Technology	Motorola
Capgemini	OATSystems
Clarkston Consulting	SAP
Ekahau	Zebra Technologies
IBM	

ENDNOTES

- ¹ If the project scope is "open-loop," these discussions will need to extend to trading partners to establish data sharing and security considerations in advance of implementation.
- ² Additionally, the lack of a single industrywide standard for RFID raises serious problems when information needs to be read, shared, and managed by multiple companies in a supply chain.
- ³ Reader collision occurs when multiple readers attempt to read the same tag at the same time, whereas tag collisions occur when one reader receiving signals from multiple tags at the same time.
- ⁴ UHF and HF technology standards are viable frequencies for item-level tagging. firms may need to change frequencies based on read rates or, in some cases, product interaction effects. Also, as part of this evolution, many small and midsize RFID vendors may consolidate in the next few years or simply go out of business.

- ⁵ Tags are sold with economy-of-scale discounts; \$0.17 per tag applies to purchasing volumes between one and 500 million.
- ⁶ The marginal lost revenue from installation downtime and lower line speeds during commissioning was gauged as being on average 5%, relative to a completely-capacity constraint value of 100%.
- ⁷ For manufacturers, this addresses only the basic systems integration necessary to extract required fields like the lot number and the expiration date from the host systems (e.g., ERP, MES) that establish an item's master data context. For distributors, this enables RFID to supplant traditional bar code tracking only.
- ⁸ Forrester has provided an in-depth discussion of TEI and the individual elements within the methodology. See the September 26, 2003, "The Foundation of Sound Technology Investment: The Total Economic Impact™ Methodology" report.

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