The 7 Success Factors of RFID

By Lynn A. Fish and Wayne C. Forrest -- 9/1/2006

Today, the implementation of radio-frequency identification (RFID) systems is a work in progress. Over the past three years, many companies have begun planning implementation efforts. As has been the case with previous technology innovations, many managers appear to think that older business rules do not apply. Instead they search for a “secret code” that they believe will allow them to put the new-technology initiative on a faster track.

Our experience, however, shows that such secret codes are nowhere to be found. Instead, we observe that the most successful RFID implementation programs use sound project-management techniques in conjunction with reliable operations-management practices. The techniques themselves are tried and true—and not at all unique to RFID technology.

This article breaks out seven specific factors that underlie successful RFID implementations. It also examines some of the strongest reasons for launching RFID implementations in the first place and offers insights into how to cope with some of the limitations now being experienced by the pioneering implementers.

The “Slap-and-Ship” Response

RFID’s core technology is not new. But its implementation on a grand scale—in large volumes across global boundaries for a vast array of products—is a new and complex challenge for supply chain managers today. In particular, mandates by Wal-Mart and the U.S. Department of Defense (DoD) have acted as key drivers, spurring RFID implementation with the ultimate goal of attaining real-time visibility at the individual product level.

These mandates, however, have met with a mixed reception. Currently, many supply chain managers are complying by instituting a “slap-and-ship” approach. In essence, this is their interim response while they struggle with obtaining cost-effective RFID tags, grapple with still-untested technology, and deal with issues of global standards. In general, this suboptimal strategy is best described as an “on-the-fly” approach with a questionable return on investment (ROI), increased data-management needs, and little or no integration with enterprise operations.

Supply chain managers clearly need to develop and apply a solid strategy if they are to address this challenge properly. So what exactly are the success factors associated with RFID implementation? We believe that successful RFID implementations follow best practices in project management as well as proven operations-management principles. This conclusion is based on our longtime studies and experience combined with our consulting work to key RFID companies and our detailed tracking of several important RFID implementation initiatives.

Specifically, we have identified seven success factors as follows:

1. Develop a clear strategy with top management support.
2. Implement RFID as a project.
3. Manage a gradual rollout: “Start small, dream big.”
5. Work on negotiation and build trust among flexible partners.
6. Utilize a cross-functional team.
7. Fully develop the technology throughout the whole supply chain.

It is instructive to look at each factor in more detail, with particular scrutiny of the project- and operations-management practices that make each of them effective:

1. Develop a Clear Strategy With Top Management Support

Like any project that promises to add business value, an RFID implementation calls for a clear strategy that enjoys the consistent commitment and support of senior management. As is underscored by well-known project-management studies, senior management commitment is essential to any project’s success. Initial RFID implementation results at retailers such as The Gap and Abercrombie & Fitch demonstrate that top management support, particularly at the level of the chief executive’s
office, is critical. Although The Gap’s project yielded 99.6 percent inventory accuracy with RFID tags, it failed to win the full support of top management. As a result, the company chose not to continue with the initiative. The story was similar at Abercrombie & Fitch.

It’s important that managers select projects that meet criteria that support company objectives and provide a positive financial outcome. Management therefore needs to examine the business drivers for and against RFID—including the financial analysis and qualitative issues at hand. Business drivers that favor RFID adoption include meeting customer mandates, exchanging information for inventory, improving business processes, and reducing demand uncertainty. Drivers against it include the instability of the technology, failure to demonstrate a positive ROI, privacy issues, and lack of automation in RFID tagging.

More specifically, companies should start the strategy-development process by understanding RFID applications and deployments and their customer’s expectations. Is the RFID initiative being driven by a customer mandate? Is so, management should realize that working to meet the mandates of retailers like Wal-Mart is quite different from meeting the requirements of a closed-loop customer such as the DoD. If not, is RFID being applied as an asset-management tool? RFID implementations appear to be more successful when they stem from a specific requirement to reduce costs and improve productivity through inventory tracking.

Interestingly, when compliance with an external mandate is the driver, we have found that the initiative tends to receive minimal top management support and investment. Why is that? Since the technology is still in the early adoption phase, most companies acting under mandates are still struggling to develop a business case for implementation. They do not yet have ROI figures so they cannot justify the resources they need.

The key is to fully assess RFID organizational readiness and acceptance, internal infrastructures, the impact upon the supply chain and operational performance metrics, the risk factors, and the potential business opportunities that the RFID project will yield. The sidebar titled “What to Ask at the Start” lists questions that will help the executive team to address, develop, and support a clear strategic case for RFID implementation.

In the United States, Wal-Mart continues to be the retail leader and the Defense Department leads government efforts in RFID implementation. Wal-Mart has introduced a series of mandates as part of a carefully formulated approach intended to support its mission to deliver “low cost” products. By exchanging information with its suppliers about product and product location—information accessed through RFID tags—Wal-Mart can further reduce inventory costs and improve customer service. Forecasting and logistics can be improved while stockouts will be reduced.

For its part, The DoD has been using the world’s largest closed-loop RFID network to track and secure equipment and cargo worldwide for more than a decade. Both of these examples are based on sound business strategies that have been well thought out. The strategies match RFID investments to bottom-line business benefits and company mission. And, importantly, top management supports and is committed to these efforts.  

2. Implement RFID as a Project

Once management has fully bought into the strategy, the RFID implementation must be approached as a project with a beginning, middle, and end. This approach requires careful planning in terms of time, resources, costs, communication, and related projects—especially at the pilot stage. A successful implementation calls for project-management practices, including contingency planning, scheduling, contract management, resource management, cost control, performance and quality management, and project documentation.

During the planning phase of the RFID project, relevant project-management tools include a project charter, a statement of work and specifications, a milestone schedule, a work-breakdown structure, a defined budget, and a responsibility matrix. Also helpful are Gantt and PERT charts, which help with the scheduling and timing of tasks. Organizational and team-member considerations are also critical to any project’s success.

It is essential to get the project right from the start. If project-management practices and tools aren’t used during planning, the implementation may not succeed. If the plan does not make logical sense on paper, the effort will assuredly fail!

Consider the case of Tesco, a large United Kingdom-based supermarket chain that uses item-level tagging for DVDs, cosmetics, and electronic games. Tesco’s initial pilot fell short of producing a positive ROI partly because the company was unable to automatically apply RFID tags. Further, the tags did not function reliably and consistently in all cases. Finally, Tesco’s failure to account for (and plan for) changes in demand for DVDs while pilot testing made it difficult for managers to compare stores using RFID-tagged DVDs with those that did not use the tags. These are the types of problems that could be prevented by better planning.
A well-executed RFID pilot is critical to the overall success of the implementation. Even though pilot programs almost always start small in terms of number of cartons or pallets that are tagged and suppliers and locations that are involved, they still need to be designed around the right applications. Managers should carefully select the products, SKUs, attributes, and locations used for the pilot. They should favor situations that involve high-value items or fast-moving assets that support business goals and that are not currently automated. Additionally, although such pilots should require little systems integration, they will benefit from some integration at the database level.

A successful pilot RFID implementation will begin by considering the following questions:

- What are the right products or processes for piloting RFID usage?
- Which business process will benefit most from the implementation?
- How many products, SKUs, and attributes will be included in the pilot study?
- What are the objectives of the pilot?
- Which and how many locations will be included?
- What is the time frame for the pilot?
- Where will the pilot be conducted—in a lab or a production environment?
- How will the data be integrated into current information systems?
- What are the physical considerations at the pilot site that may interfere with RFID read rates? Does the company need to look at materials, tag alignment, tag location, and environmental conditions?
- What training and integrations issues will the company face on these products? At this site?
- What data should be captured and analyzed?

Philips Semiconductor provides an example of the benefits of tying an RFID pilot to the company’s strategic goals and applying project-planning and project-management techniques. Philips Semiconductor is taking advantage of its role as a supplier of RFID chips. It is using them in a pilot to track the movement of product from its assembly facility in Taiwan to its distribution centers (DCs) in Hong Kong. So far, this pilot, which is completely controlled by Philips Semiconductor, has yielded a 25 percent reduction in labor costs and halved the costs of shipping.

3. Manage a Gradual Rollout: “Start Small, Dream Big”

After successfully completing the pilot, the RFID program should be rolled out to include all products. Again, careful planning and implementation are of paramount importance. Yet at the same time, the company needs to remain flexible as the rollout proceeds. In the United Kingdom, retailer Tesco is preparing to expand its RFID efforts to 1,400 stores and 30 DCs in Europe. Similarly, Philips Semiconductor (now being spun off by the Dutch electronics conglomerate Philips) continues to expand its internal RFID utilization. In each case, the company “started small” with its pilot project and “dreamed big” during expansion to other products. In doing so, the companies were able to adjust their strategies based on what they learned from their pilot experience and to build comprehensive business cases that linked RFID’s operational impact to bottom-line financial and performance metrics. As noted above, Philips tied its implementation program to cost reduction, which it substantiated through its pilot.

Should a pilot program fail, it is imperative that another one be launched based on the feedback from the unsuccessful attempt. Marketplace pressures and other demands should not force the company to rollout the technology without successes at the pilot stage. It is important to note that the implementation is more likely to succeed if RFID projects are contained within the organization—as is the case at Philips Semiconductor—and if they include technology requirements with proven RFID capabilities. Complex, broad RFID projects that involve third parties and environments outside of the company’s control are more likely to fail.

Continued implementation success also involves developing a plan to accommodate rolling RFID out to other products and locations and appropriate monitoring and control processes. Monitoring processes should focus on the performance, cost, and time information collected over the life of the project. The most popular performance measurement system is earned-value analysis. Earned-value analysis is a technique that allows project managers to compare budget and actual cost and to schedule variances as a project progresses. This technique assists with managing the “triple constraint” of performance, cost, and time over the project’s life cycle.
RFID implementation is currently moving out of the initial implementation stage for many first movers such as Wal-Mart, Target, Best Buy, and Metro. For example, Wal-Mart’s first phase involved its top 100 suppliers implementing 20 to 30 SKUs in two distribution centers. The retailer has since rolled the program out to 12 DCs and 600 stores. Target and Best Buy have adopted a similar scale-up strategy. In Germany, Metro has adopted an incremental implementation process as well, focusing first on stock-out reduction and then moving RFID into warranty claims and returns.

4. Continually Improve Procedures

Most of the publicized RFID implementations that we are aware of utilize the “slap-and-slip” approach, whereby the tag is “slapped” manually onto the carton or pallet just prior to leaving the warehouse. (This scenario is analogous to what happened in the early 1980s, when desktop computers were first used as replacements for typewriters.) The key to a successful RFID program, however, is to identify the areas where RFID can do the most to help streamline current processes. A typical starting point is to see how RFID could improve inventory flows across the extended supply chain, using value-mapping techniques before implementing the technology—not after. Later, it is worth evaluating how RFID systems can be applied to extend supply chain visibility back through the manufacturer, examining business practices and identifying where visibility and information from RFID would be most beneficial.

Total Quality Management (TQM) and operations-management tools—such as process reengineering, value analysis, and process improvement—are useful in improving processes while implementing RFID. Successful reengineering begins by asking such questions as:

• How can we achieve greater visibility of our products?
• Where are the problems within the supply chain?
• Where are the critical integration points with suppliers and customers?
• Where would RFID improve supply chain visibility?
• Where will the company get the greatest ROI?
• Where is the company losing money or not getting the desired return on assets?

Value analysis examines the processes, materials, information systems, and materials flows involved in production.13 Specific to an RFID implementation, value-analysis issues include:

• What is RFID’s function on the item?
• Where in the process should the tag be added?
• What is the tag value to the customer? To the company?
• Who should gather the data generated by the tag?
• How will the data be communicated throughout the chain?
• How should the supplier and buyer integrate systems to incorporate RFID?

Process-improvement techniques, such as flow diagrams, trace the flow of information, customers, employees, or materials through a process.14 By using improvement techniques that focus on the final customer, companies can make significant process improvements while implementing RFID.

In short, RFID will be most effective when the fundamental business processes are changed to take full advantage of the technology. From a supply chain perspective, managers need to take a more expansive view of the technology. Instead of just focusing on device implementation, they should study the sequence of activities in their supply chain and explore how to change them to reap improvements from using RFID.

As an example, Hewlett-Packard (HP), a supplier to Wal-Mart, has benefited from implementing RFID throughout its supply chain in Brazil. At its São Paulo printer production facility, HP uses item-level tagging and takes advantage of a unique electronic product code (EPC) on each box to track each printer from production through distribution to South American customers. In effect, HP is demonstrating the next step in RFID implementation by moving the tagging upstream and improving its processes. By doing so, HP was able to track the contents of the units, validate shipment of the appropriate unit, and measure results. And this, in turn, has enabled HP to improve quality and
logistics control and invoicing throughout its operations.

5. Work on Negotiation and Build Trust Among Flexible Partners

The negotiation processes among supply chain partners should be fair and flexible. It should address the needs of all parties, optimize the entire RFID system, and create a “win-win” solution for all. Partners should use project-management best practices for negotiation include separating the people from the problem, focusing on interests rather than positions, seeking alternatives for mutual gain, and insisting on objective criteria.\textsuperscript{15}

Obviously, when mandates are given by a customer, those practices don’t necessarily apply, so there is a higher chance of the project failing. However, even under those circumstances, it is possible to achieve a balance. For example, in spite of its size, marketplace presence, and mandates, Wal-Mart negotiated with its suppliers throughout implementation. Similarly, a negotiation approach adopted at Target, Metro, and Best Buy allowed their suppliers to “start small” and “build to full compliance.” Best Buy used one-on-one sessions with suppliers to gather critical feedback on technological problems that were then jointly solved.

Obviously, the customer must be flexible with each supplier as unforeseen issues will arise and not all products lend themselves well to RFID tagging. Each relationship and experience will vary, but a cooperative venture is far more likely to be successful.

Trust between supply chain members is crucial to RFID success. Project-management recommendations favor building communication and trust and utilizing conflict management techniques to solve differences. Efforts to remove localized actions, identify underlying problems, remove blame, learn from other supply chain relationships, and eliminate duplicate information, can all improve supply chain communication and build trust.\textsuperscript{16}

6. Utilize a Cross-Functional Team

The best implementation results come from leveraging cross-functional teams that comprise personnel who have strong technical skills, are politically sensitive, have a strong problem and goal orientation, and are available and motivated to work on the project.\textsuperscript{17} The teams should include the following: RFID suppliers; middleware experts; and staff from operations, logistics, purchasing, information systems. They must then be molded into a cohesive team, united by a common vision.

Early RFID adopters have indicated that knowledgeable teams that set the project scope and work with business users will help compensate for the limitations of RFID implementations. At a minimum, the successful core team should include IT data-warehousing team members and business users. For example, Pacific Cycle Inc., a bicycle manufacturer, included two IT workers with RFID technical skills and two business users on its four-person pilot team.\textsuperscript{18}

Project-management experts say that technical expertise is particularly important during project formation and build.\textsuperscript{19} Successful RFID projects typically utilize an experienced, knowledgeable, hands-on, on-site consultant during implementation. For example, Target’s suppliers met Target’s RFID mandate by using a consistent plan and a core group of RFID consultants. These third-party experts can assist in reengineering efforts and technology selection while improving information-sharing capabilities.

7. Fully Develop the Technology Throughout the Whole Supply Chain

To date, most reported RFID projects have only implemented tagging from the DC to the retailer. But to avoid mistakes like the ones made during desktop computer implementations in the 1980s, management should fully implement the technology for the entire supply chain system. Full implementation includes hardware and software—RFID tags, electronic seals, chips, printers, antennae, readers, data aggregation, filtering systems, middleware, tracking devices, network support, and information system infrastructure at the platform, network, and application layers.

The goal for full integration is to create an information system that can handle all incoming RFID data and transform it into meaningful transactions in real time. To do this, the integration needs to align information technology considerations with organizational and business processes. Future information systems will be able to use the data provided by RFID tags to improve demand forecasting, purchasing, inventory information exchange, and business processes while at the same time reducing demand uncertainty.

As RFID deployments grow from pilot to full integration, RFID data will be required to flow to upstream business applications through various readers and different devices. Other issues that will become more pronounced include data management and technology considerations (such as choosing the right system frequency for the right application), additional maintenance costs, and operational issues related to installation and continued use of the system. Senior managers need to consider the context of the application, take an end-to-end view of the environment, view the systems and
applications holistically, and integrate technology capabilities and requirements.

In general, IT projects such as RFID are risky and prone to failure because they tend to be multifaceted, multiyear efforts that cross departmental borders and require abundant collaboration. Many such projects fail when they drift from their pre-specified objectives for scope, time, and budget. Issues associated with information system integration include the following:

• How will the technology enhance business processes, support improvements, and improve data analysis?
• Will the current infrastructure support the massive amounts of RFID data?
• Is there enough network bandwidth and storage capacity in the current system?
• How will the middleware route the data to the correct applications and business processes?
• How will the supply chain members use the RFID data to provide insight into processes?
• How can the RFID network be integrated with wireless technologies to provide the most cost-effective and efficient infrastructure?
• Where will it be the most effective to efficiently filter and add value to the data?

It will help to employ best practices used in conventional IT projects. For example, consider dividing the project into smaller projects with specific objectives and assigning responsibility to a senior manager, who can help cross department boundaries and establish a single point of contact.

Project Management Approach Needed

If there is to be one key lesson that comes out of our studies, it is that RFID implementation is truly a project. And as such it involves the planning, organizing, directing, and controlling of company resources to complete specific goals and objectives over a stated period of time. In executing the implementation project, it’s helpful to keep in mind the four guiding questions listed in the accompanying sidebar, “Four Questions to Guide the Implementation Effort.”

It is a fact of life that much in the RFID arena is still in flux—for example, core technology and standards, to name just two areas, are still evolving. But those challenges should not deter supply chain managers from applying familiar project-management techniques to launch and run the right kinds of RFID initiatives. This calls for best practices that should be second nature to most of today’s supply chain managers—practices like strong and consistent communication, collaborative techniques using cross-functional teams, relationship-building between partners, change management procedures, and more. Putting in place these best practices today, will help organizations realize the true potential of this powerful technology.

Author Information

Lynn A. Fish is an associate professor in the Department of Management & Marketing at Canisius College, Buffalo, N.Y. Wayne C. Forrest is the principal of WCForrest & Associates LLC, a management consultancy based in Williamsville, N.Y.

Endnotes

6. Field.
7. Loo.
What to Ask at the Start

• Is there a competitive advantage to RFID implementation?

• Will collaboration with peers, suppliers, and/or competitors provide cost savings?

• Which tools and/or partners are proving to be the best for RFID implementation?

• What should we do to align ourselves with emerging standards around tags, readers, and data specifications?

• Are our existing and future infrastructures capable of handling RFID data?

• Will RFID deployment replace a bar-code application?

• What are the compliance requirements for our suppliers? For our customers? For us?

• Where can cost justification be derived from implementation?

• How will changes in RFID standardization affect our current and future prospects?

• What are the benefits and costs of sharing information?

Four Questions to Guide the Implementation Effort
1. So what are the benefits to successful implementation? The benefits are enormous! A University of Arkansas study of 24 RFID-enabled Wal-Mart stores overwhelmingly indicated a positive change from a reactive to proactive pick-list process, a 16-percent reduction in out-of-stocks, and a replenishment rate three times faster than non-RFID-tagged product. To date, estimated cost savings for RFID-equipped Wal-Mart stores exceed $1.7 billion. In general, successful RFID implementation leads to an efficient, agile, and secure supply chain that manages inventory better; improves customer service; and reduces labor, warehousing, and transportation costs.

2. Why should RFID efforts begin soon? Because the technology’s initial high-risk phase has passed, and RFID is now moving into a growth phase not only in the United States but throughout the world. In the United States, Wal-Mart issued its first mandate in June 2003; since then, its first- and second-tier suppliers have met the mandates and gained a lot of experience. Wal-Mart is being followed closely by other retail giants such as Metro and Tesco, all with their own layers of suppliers who are learning how RFID can bring down costs and improve supply chain visibility and control.

3. What about the limitations of RFID implementation? Plenty of limitations remain: the continued evolution of the core technology, the warring standards issues, and the many operational challenges around reengineering business processes. System costs also need to fall further. As of late 2005, passive tags cost seven cents each despite the increase in tag volumes, and each Wal-Mart supplier spent an average of $500,000 to comply with the retailer’s mandate. And in the United States, when RFID initiatives reach the end customer, consumer privacy will be an issue until it is fully resolved in the courts. But at the same time, many managers still have to properly factor into their ROI calculations the potential savings in such areas as customer retention and business process redesign.

4. What if the company fails to correctly implement RFID? There is another chance—provided that the company has not moved from failed pilot to expanded rollout. Tesco’s initial experience with RFID was not successful as additional costs and time surfaced and an ROI failed to appear. By re-evaluating the implementation plan, making necessary adjustments, and using good planning techniques, Tesco’s managers have changed these results, paving the way for expansion of RFID initiatives into other products and other supply chains. True RFID benefits can only be realized by re-evaluating how to take full advantage of the information provided throughout the supply chain. The key to future customer satisfaction and cost reductions will be accurate and up-to-date information that is available to all supply chain members. By establishing the RFID infrastructure and procedures properly today, the true benefits of this innovative use of an old technology can be gained quickly.