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Highlights

"The Canadian grocery industry RFID pilot was done for the right reasons, the right way and provides members with the right information to understand the conditions that will be required for successful implement of RFID throughout the grocery supply chain.

The commitment of the industry to take a collaborative approach to understand RFID's potential and the impact and benefits to both suppliers and retailers is unique to the Canadian market and defines our industry approach to changes that require critical mass adoption to maximize benefits."
- David Wilkes, Senior Vice President, Trade and Business Development, Canadian Council of Grocery Distributors

"The Canadian RFID Centre and the RFID Industry pilot are excellent examples of the industry working collaboratively to ensure due diligence on emerging issues that can significantly affect the supply chain. In the case of RFID, building knowledge and examining the business case collectively provides stakeholders with an objective perspective that can be used to make decisions."
- Elaine Smith, Senior Vice President, Industry Affairs Food and Consumer Products of Canada

Executive Summary

Preparing for the future of RFID

The Canadian RFID Grocery Industry Pilot was born out of the collaborative partnership between the key players associated with the Canadian RFID Centre (CRC): industry, associations and technology providers. Four grocery product manufacturers, one retailer, three industry associations and three RFID solution providers participated in the Pilot, which was conducted under the premise that RFID and EPC adoption should be approached as an industry-wide initiative.

With a focus on the business case validation of food traceability, distribution centre efficiencies, environmental monitoring and reduction of out-of-stocks at the retail level, the Pilot took place between May 2006 and January 2007. To analyze the Pilot results, our detailed methodology covered:

- analysis of the product flow dynamics;
- benefits identification and quantification;
- investments assessment; and
- business case development for each manufacturer and retailer involved.

This White Paper examines the results of the Grocery Industry RFID Pilot and suggests recommendations for industry adoption. As RFID gains traction in the Canadian market, the question of RFID adoption in Canada's grocery industry is not a matter of "if", but rather, "when." Early – and informed – adoption is key to successful implementation.

Results Overview

Even though the Pilot had a unique, collaborative industry-wide approach, it confirmed some findings identified in other previous studies. When considering RFID, it is important to delve deeply into an organization.

Read rates improved significantly over the course of the Pilot, rising an average of 18% overall. By using "inference of read rates" companies can achieve benefits in various categories, including traceability, promotions management, condition monitoring, out of stock and improved labour efficiencies. In addition, new and upgraded technology can contribute to improved read rates and thus improved results. Effectiveness can be maximized by integrating the RFID solution data into existing applications for improved decision-making.

From a retailer perspective, RFID provides a positive return given critical mass of tagged cases and pallets is achieved through the distribution and store network.

On the manufacturer's side, the results were mixed. Payback for this pilot study was highly dependent on how manufacturers were currently performing in the six benefit areas analyzed. If manufacturers were performing very efficiently in certain areas, or they had difficulty quantifying their existing environment, potential improvement opportunities were harder to identify and track. It should also be noted that payback was very sensitive to changes in the labour required to tag cases and hardware costs.

With Slap and Ship, RFID benefits are only considered after the tagged product leaves the manufacturer's DC. Therefore, it does not represent the full potential RFID can offer to a manufacturer.

Other potential benefits derived from additional information and inventory visibility to support other business areas – such as demand forecasting, production, inventory management and marketing – have not been quantified and included in the business case. The business cases also exclude benefits that could be realized in other supply chain execution areas such as transportation management, asset tracking and raw materials and work-in-process inventory management. Such areas were not in scope of analysis in the Pilot.

Some of the results were surprising. Given the current high level of effectiveness in managing shipments from suppliers to retailers, only limited Proof of Delivery benefits were quantified. These results, however, may not reflect the reality of the industry, particularly for those companies with very fragmented distribution networks that see the standardization of their processes as a challenge. For those companies, RFID could provide drastic gains by automating their shipping and receiving.

For traceability, benefits depended greatly on each pilot participants own supply chain network and were mainly qualitative in nature. That's because the real value of traceability information is serving as a source of feedback to support pro-active risk mitigation measures that will drive efficiency gains and optimize logistics, manufacturing and quality management processes.

Using RFID Successfully

The greatest benefits discovered in the Pilot related to improving promotion execution and reducing out of stocks. These benefits categories provided substantial potential, but are highly dependent on the interaction among members in the supply chain. Therefore, the benefits realization can be compromised by lack of collaboration between retailers and manufacturers in terms of information sharing and process execution.

Critical to any successful RFID deployment is a collaborative effort – the sharing of information between manufacturer and retailer to realize mutual benefits associated with promotion management and out-of-stocks at the retail store.

The Pilot showed that:

- "Slap and Ship" can be a workable approach, if used in a low-volume situation where there is no benefit in investing in a larger solution. Regardless, it was discovered that the earlier the tag was applied in the supply chain, the better the result in terms of improved accuracy and more efficient shipping.

- RFID can be used to avoid OOS situations. RFID delivers real-time information about inventory levels in the supply chain, enabling employees to act upon that information. Thus, operational variability can be reduced and product availability at the stores can be improved.

- RFID technology is expected to offer a superior level of promotions management due to the enhanced visibility both retailers and manufacturers gain on inventory positions, before and during the promotions. RFID is also promising improved traceability during a recall because managers can have full visibility into where the products are moving from the moment they have a commissioned RFID tag attached to them until they are available to consumers.

- RFID can improve the effectiveness of shipping and receiving processes. It enables operators to proactively identify wrong picks, short shipments and overages before loading is concluded.

Cost Considerations

The most cost-effective solution for each client was chosen, and the range of costs is illustrated in the following table for all participants in the Pilot.

Investment Area	Lower Range % of total costs	Higher Range % of total costs
Corporate Services	6	16
Application & Integration	9	20
Maintenance	1	4
Hardware	3	67
Labour	0	35
Tags	3	33

Explanation of costs:

- Corporate Services: All consulting and internal manpower required for an RFID solution.
- Application and Integration: Application hardware, middleware and costs to integrate RFID application into existing WMS systems.
- Maintenance: Yearly software maintenance and support.
- Hardware: RFID readers and tagging equipment
- Labour: Labour required tagging cases and pallets
- Tags: individual costs of an RFID tag

Tailoring RFID for your business needs

Given the findings of the Pilot, a compelling case exists from a retailer's perspective to deploy RFID. From a manufacturer's perspective, the case is not as clear cut. Preparation of a full business case is required to see where a particular manufacturer stands. Depending on their specific pain points, deployment of RFID by product or product category may be a viable option.

Highlights

The Canadian RFID Grocery Industry Pilot was conducted under the premise that RFID and EPC adoption should be approached as an industry-wide initiative. This White Paper reports the findings and conclusions from the Pilot and suggests a series of recommendations for industry adoption.

Pilot Overview

Background and Scope

The Canadian RFID Grocery Industry Pilot (the "Pilot") was launched as a logical extension to the collaborative partnership created at the Canadian RFID Centre (CRC) between industry, associations and technology providers. This Pilot was conducted under the premise that RFID and Electronic Product Code (EPC) adoption should be approached as an industry-wide initiative. All the participants identified herein have contributed significantly to this project and its findings.

The purpose of this White Paper is to report the findings and conclusions from the Pilot and to suggest a series of recommendations for industry adoption.

Four grocery product manufacturers, one retailer, three industry associations and three RFID solution providers were involved in the pilot.

The industry participants were:

- General Mills Canada
- Loblaw Companies Limited
- Maple Leaf Foods
- Kruger Products Limited
- Unilever Canada

The industry associations were:

- Canadian Council of Grocery Distributors (CCGD)
- Food & Consumer Products of Canada (FCPC)
- EPCglobal Canada

The solution providers were:

- IBM Canada Ltd.
- Intermec Technologies Limited
- Motorola, Inc. (formally Symbol Technologies Limited)

Unless otherwise stated, the results (including findings and recommendations) outlined in this paper are based on the scope in which the Pilot was executed.

Each of the four suppliers tagged two to three SKUs at the case and pallet level for the Pilot. In total, 10 SKUs were tagged. The tagged SKUs were shipped to a single retailer distribution centre and then sent to be sold at two retail stores. The selected products spanned a wide range of categories, encompassing frozen products, refrigerated products and dry goods. They included:

- Dry products
- Canned products
- Fresh, processed meat products
- Frozen products
- Display-ready pallets

During the life cycle of the products, they were read by fixed RFID portals at the time of: manufacturer shipping; retail distribution centre receiving; retail distribution centre shipping; retail store receiving; upon entry or return from the retail store sales floor; and finally, when entered into the retail store trash compactor.

The following were specific to each location:

Supplier Warehouse: The supplier warehouse or third party logistics (3PL) entity, which provided RFID and EPC enablement services on the supplier's behalf, stored goods for shipment to customers. The key technology consideration for the supplier was the entry point and conversion of products with UPC SKUs into the EPC standard, and the departure of EPC enabled goods to other locations of the supply chain.

Distribution Centre (DC): The distribution centre was used to store goods from multiple suppliers, and to fulfill orders of required goods for the two retail stores. The distribution centre infrastructure allowed RFID enabled product to be tracked as they entered and left the distribution centre. The key points of interest in the distribution centre included receiving and shipping docks, as well as storage (freezer, fridge, dry goods).

Retail Store: The retail domain consisted of the back end, receiving area of a retail store where shipments were received from the retailer's distribution centre, the entry point to the store floor where goods were displayed for sale, and the trash compactor where the boxes and wrappers were disposed.

Objectives, Execution and Deliverables

The primary objectives for the Canadian Food Industry RFID Pilot included:

1) Validation of the RFID business case associated with food traceability, distribution centre efficiencies, environmental monitoring (temperature) and reduction of out-of-stock at the retail level

2) Creation of an industry implementation approach for each supplier, distributor and retailer

3) Validation of the findings made at the Canadian RFID Centre (CRC) in the field

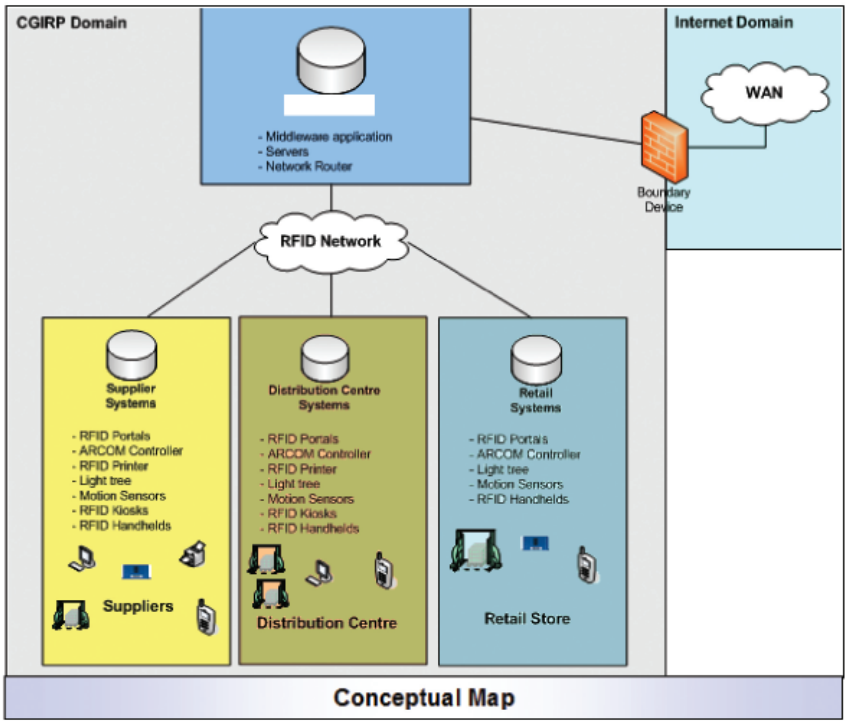
To accomplish these objectives, the project was organized into five distinct phases, beginning in May 2006 and ending in January 2007.

Phase 1	Phase 2	Phase 3	Phase 4	Phase 5
Project Mobilization & Solution Design	Solution Build & Site Mobilization	Solution Install & Solution Test	Pilot Launch & Pilot Run	Result Analysis & Report Development
May 1 - June 6	**June 6 - July 6**	**July 7 - July 28**	**July 28 - November 3**	**November 4 - January 15**

Technology

The Pilot was conducted using a centralized hosted applications model; therefore, limited technology was physically deployed at each of the participating sites. This approach was used because it provided:

- Speed to deployment;
- Lower costs for participants;
- Easier management and support during Pilot execution; and
- A scalable solution, capable of being reused in a future deployment.



Analysis Methodology

A detailed methodology was applied to analyze the Pilot results. The methodology covered not only analysis of the product flow dynamics during the Pilot, but also benefits identification and quantification, investments assessment and business case development for each manufacturer and retailer involved.

Business processes that were impacted by the rollout of an RFID solution were investigated. The business processes were then used to define a set of benefit categories for analysis. In addition, several discussion points were prepared for the respective benefits. A questionnaire was completed to summarize baseline data for each Pilot participant.

The benefits were quantified at a per-case level, to take into account different volume flows throughout each participant's supply chain. Along with the potential benefits calculation, real illustrations of how business can capture value provided by RFID solutions were identified as a result of Pilot observations. Examples were shown throughout the Pilot with the aid of information provided by an RFID solution. These included proof of delivery (discrepancies treatment, service level improvement, returns), traceability (old code / spoilage, order tracking, recalls), condition monitoring, inventory visibility, out-of-stock, promotions management and labour efficiencies.

Market pricing from the software and hardware vendors involved were utilized as a baseline for the investments calculations. Using information from participants, a customized, cost-effective RFID solution was conceived for each participant. A yearly deployment strategy was then developed to obtain the best net financial outcome for all the participants involved in the Pilot to supply one retailer.

The number of cases requiring RFID tags on a yearly basis was used for each participant and hardware investments were extrapolated accordingly to handle the flow of RFID tagged cases. Specific assumptions were made around the price depreciation of RFID equipment and future trends (i.e. tag prices). Some of the key assumptions used when calculating payback were a $0.10 tag cost depreciating to a floor of $0.05 and hardware discounts based on large orders. Finally extensive sensitivities were conducted on these variables to assess the level of impact.

Four Investment Models

From an investment perspective, four distinct investment models were evaluated for each manufacturer: Slap and Ship, Hybrid, Inline Printing, and Corrugate Tagging. Each model was considered for the manufacturers and the best viable solution was analyzed in detail for them to provide an RFID solution to one retailer.

Slap and Ship: This model was used during the Pilot project and requires all suppliers' products to be manually tagged at their manufacturing sites or distribution centres. This model provides the least required capital investment but allows companies to provide an RFID solution to comply to any potential mandate with significant impact to their current processes. However, because labour costs rise as case volumes increase, it is not recommended as a long-term solution.

Hybrid: This model is a "slap and ship" model in early deployment years (when volumes are low), and a "print and apply" automated system in the later, high-volume years. Some additional manual labour is still required. This model proves that tagging may be done at a 3PL or within the manufacturing/distribution network of the suppliers. The Hybrid model provides the smallest investment for a large manufacturer who still needs to provide an RFID and non-RFID solution to its customers.

Inline Printing: All cases are tagged by an inline printer installed on each of the manufacturer's product lines. This model provides the best long-term solution for manufacturers/suppliers in terms of reducing the labour costs and inefficiencies. It affords the best opportunity to capitalize on additional benefits that can be gained upstream in internal warehousing, inventory control and logistics. The challenge here is twofold: 1) Segregating RFID orders from non-RFID orders is difficult, and 2) Many manufacturers have a global supply chain and would require an international RFID initiative to make inline printing a practical and cost-effective solution.

Corrugate Tagging: This final model considers RFID tags embedded into the case corrugate by the corrugate suppliers. This option, like inline printing, is deemed to be a viable long term solution. However, the viability of the corrugate tagging model strongly depends on the technology maturing and its broader adoption by other members of the supply chain. Corrugate suppliers should understand that products with RFID labels can be considered a distinct line of business, and as such, might drive substantial business opportunities.

Highlights

Integrating the RFID solution data into existing operational and decision-making applications will align the use of the information with day-to-day activities.

Pilot Results

Results Overview

Results clearly showed that read rates improved significantly over the course of the Pilot, rising an average of 18%. At the same time, it was evident that by using "inference of read rates" companies can achieve benefits in various categories, including traceability, promotions management, condition monitoring, out of stock and improved labour efficiencies. New and upgraded technology can contribute to improved read rates and the benefits realized. And finally, the effectiveness of the solution can be maximized by integrating the RFID solution data into existing applications for improved decision-making.

Technology Key Messages

Read rate performance promises significant business value across the supply chain

Read rates improved significantly over the course of the Pilot. The initial average read rate for the nine piloted SKUs was 71%. However, by the end of the Pilot, the average read rate had risen to 89%. This 18 percentage point improvement can be attributed to modifications and adjustments to the process, equipment and application including upgrading the firmware and middleware. In addition, proper tag placement on the product was critical to achieving the optimal read rate.

Even more significantly, three out of the nine SKUs had 100% read rates and seven out of the nine SKUs had read rates over 85%. The results of the Pilot show that for many product categories and packaging types, RFID read rate performance is adequate today to drive significant business value across the supply chain. However, there are others for which further read rate improvements are still required before there is a rationale for adoption.

It is important to note that this Pilot did not consider the process changes or the business reengineering of pallet configurations; therefore, the read rates experienced in this Pilot could have been higher had these changes been considered. This report cannot make recommendations on pallet reconfiguration – each company needs to evaluate the implications of making such changes to their business.

Ultimately, given ongoing technology improvements, read rates are expected to continue to rise. Ongoing testing of new technology such as tags and readers will further improve read rates, bringing RFID a step closer to full adoption.

Inference of read rates often sufficient to drive business benefits

In situations where a 100% read rate is currently not achievable, the concept of "inferring a read" may be applicable. Read rate inference utilizes the known number of case tags associated with a pallet. During pallet building, RFID tags are printed and commissioned. The number of case tags along with tag EPCs are then associated with a specific pallet tag. Those tags are applied to the cases and pallet, and a baseline or aggregation is performed.

Therefore, at the next read point, if only 85% of the case tags are read, the other 15% are inferred or read based on the known fact they are associated with that pallet. If at any instance in the supply chain the pallet is broken down, and baseline or aggregation is established, case tags are then associated to the pallet tag for the newly created pallet.

Inference of read rates will allow a company to achieve benefits – where achieving a 100% read rate is currently not available – in various categories, including traceability, promotions management, condition monitoring, out of stock and improved labour efficiencies.

Retailers will often use the concept of Trusted Supplier Agreements with their vendors and regularly audit receipts from vendors to ensure that case quantities associated with pallets are accurate. In this way, when there is a high degree of trust between the retailer and its vendors in terms of ship/receive quantities, inference of read rates is an acceptable RFID practice.

As RFID technology improves, companies must continue to assess its benefits

As demonstrated during the Pilot, upgrades to existing technology components, along with the introduction of new technology, contributed to the improvement of read rates and the overall efficiency of the technology. This allows for more options when designing and implementing an RFID solution; they improve the read rates of products with challenging compositions.

Companies must continue to monitor and evaluate RFID technology. Technology assessed at the beginning of a deployment will improve within a short time frame, and applying the most efficient technology components will allow a company to achieve the most from its RFID strategy. For example, during the three months of the Pilot, we observed an improvement in all aspects of the technology: readers, firmware, software, and middleware.

Integration of RFID technology with existing decision-making tools will improve benefits

Integrating the RFID solution tool sets and data into existing operational and decision-making applications will align the use of the information with day-to-day activities.

Most sophisticated replenishment, inventory management, manufacturing and warehouse management systems drive the planning and operational activities – and subsequent feedback – into the financial aspect of the organization. Point-of-sale information is typically integrated into back-office solutions periodically throughout the day.

However, the speed and quantity of data flowing from an RFID solution – dynamically integrated with the operational and decision-making tools – can expedite the action/reaction time significantly. Triggering management or operational alerts to situations such as out-of-stocks, code date issues, stocking, picking or shipping errors, will only be beneficial if that information is provided real-time to the user who must remedy the situation. This changes the landscape of reaction and execution, to event-driven activities that need to be performed by floor staff in the retail store, warehouse or manufacturing environments. The key is having the information received by the right person at the right time, giving them the opportunity to correct or address the situation.

Information available to the manufacturer, such as inventory status and sales trends, can increase the accuracy of production volumes and capacity requirements from a planning and production perspective when integrated into planning and forecasting modules. This can reduce the reliance on forecasting methods that are typically used today – which are "best-guesses" based on historical information instead of real-time data. This is not to say that these methods will become obsolete, but they can be enhanced by the influx of current data and information.

The level and timing of integration should be tempered with maximizing the benefits. Integration into complex systems can be a long and expensive endeavor. Integration of the RFID data into business and operational systems through detail planning, design, development and deployment should be an activity that is performed in the initial phases of an RFID deployment plan.

Highlights

Reducing out-of-stock (OOS) levels represents the greatest opportunity area for both retailers and manufacturers to profit from RFID technology adoption.

Business Case Drivers

Benefits Overview

The Pilot demonstrated that RFID can be used to avoid OOS situations. RFID delivers real-time information about inventory levels in the supply chain, enabling employees to act upon that information. Thus, operational variability can be reduced and product availability at the stores can be improved.

It also showed that RFID technology is expected to offer a superior level of promotions management due to the enhanced visibility both retailers and manufacturers gain on inventory positions, before and during the promotions. RFID is also promising improved traceability during a recall because managers can have full visibility into where the products are moving from the moment they have a commissioned RFID tag attached to them until they are available to consumers.

Finally, RFID can improve the effectiveness of shipping and receiving processes. It enables operators to proactively identify wrong picks, short shipments and overages before loading is concluded.

Reduced out-of-stocks can be profitable for both manufacturers and retailers

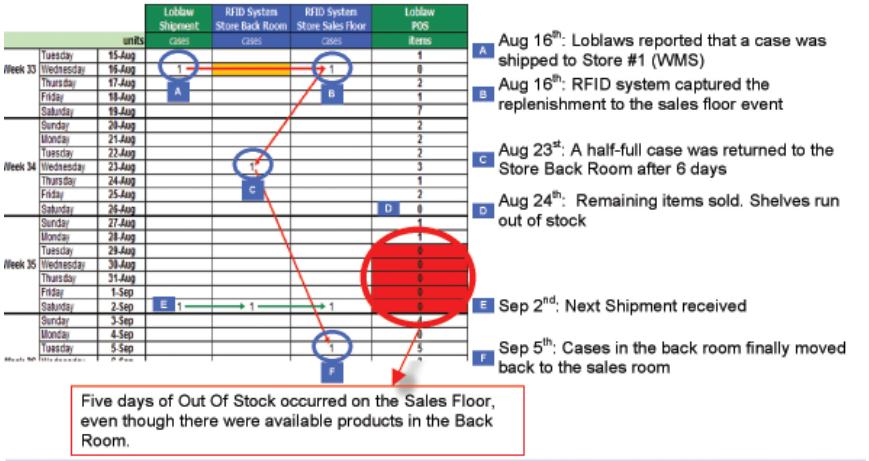
Reducing out-of-stock (OOS) levels represents the greatest opportunity area for both retailers and manufacturers to profit from RFID technology adoption. Even though several initiatives have been undertaken by the Consumer Package Goods (CPG) industry throughout the years to improve product availability on the shelves, OOS events still jeopardize brand loyalty, customer experience, and ultimately overall profitability.

Several factors can contribute to an out-of-stock situation. Unpredictable consumer behavior, for instance, is a huge source of fluctuation in demand and can play a role in reducing product availability. However, other causes of OOS are more dependent on process compliance and information-sharing infrastructure and, therefore, should have the full attention of both manufacturers and retailers.

As illustrated in the chart, below, the following situation was identified during the Pilot:

- PoS data showed a period of five days in which there were 0 sales for one of the Pilot products.
- RFID event data showed that in fact that particular product was in the back room of the store during the time at which there was an out-of -stock at the shelf level.
- In a real-world implementation, the PoS activity would be linked to an alert mechanism which would notify store staff that there is an out of stock at the shelf and that the required product is located in the backroom.

Out of Stock Example



The visibility provided by the RFID system in conjunction with the POS data could have prevented an out of stock situation by alerting the associate that a case was sitting at the backroom

RFID can enable business analysts, category managers, merchandise managers and, ultimately, store personnel to act (and react) upon real-time information concerning inventory levels in different parts of the supply chain. As a result, a great part of the intrinsic operation variability can be reduced and, therefore, product availability at the stores can be greatly enhanced. The table below describes some of the business processes that can contribute to an OOS situation and how RFID can help minimize them.

How RFID can address OOS		
Areas	Ordinary Process	RFID enabled Process
Receiving Accuracy	• Receivers need to manually count full/mixed pallets. • Tagging and scanning may be necessary for control (at DCs). • Discrepancies are identified after the fact. Correction process is time- consuming, costly and might disrupt planned availability of products.	• Automatic receiving can minimize the need for audits. • RFID-generated ASNs can speed up and improve store receiving accuracy.
Stock Visibility	• Ordering and forecasting processes is based on historical and often inaccurate data.	• Real-time visibility of inventory throughout the supply chain streamlines ordering and forecasting processes, reducing variability and shocks of demand.
Replenishment from Backroom	• In most current retail store environments, it is difficult to segregate inventory from the backroom to the sales floor. • Store associates do not have full visibility of the inventory carried at the backroom.	• In effect, RFID creates a fifth wall within a retail store so they can distinguish between back-room and front room inventory. • Triggered alerts can be sent to store associates informing them about available stocks in the back room. • Integration with POS data can drive proactive behavior to avoid the occurrence of OOS events.

The Pilot had a mandate to study, identify and quantify only the benefits associated with the interaction between suppliers and retailers. As such, it validated the importance of reducing OOS situations as one of the major benefits categories for both retailers and manufacturers. OOS represented 36% to 68% of all the potential benefits quantified. We would expect these proportions to reduce in importance as more business processes and benefits areas are investigated by each particular company.

Furthermore, RFID could contribute to market share gains if it can improve the chances that a certain brand can be available to consumers more often than its competitors, particularly in highly competitive, price-sensitive categories. At the same time, retailers could differentiate themselves by providing their customers with a more standardized and pleasant customer experience at the stores than their competitors would.

Hence, RFID enablement can be the tool to drive major competitive advantages for both retailers and manufacturers, allowing them capitalize on a more streamlined supply chain. However, such advantages tend to diminish as more manufacturers and retailers reduce OOS levels on their products through the adoption of such technology. As a result, we expect greater gains for manufacturers and retailers that first move toward investigating the impact of RFID on their own business processes.

Improved execution evident during promotional events

Today's retailers can see what's within their four walls, but cannot distinguish between back room and sales floor. RFID effectively adds a "fifth" wall.

Even though sales promotions have become an indispensable tool to drive business objectives, both retailers and manufacturers agree that there is great room to increase return on investment in consumer and trade incentives. Studies show that promotions can account for more than 60% of typical marketing budgets of a CPG manufacturer, but the profitability associated with trade promotions is still considered dismal. Anecdotal results show that as many as 2/3rds of promotion dollars do not have the desired revenue impacts for both manufacturers and retailers.

Several factors contribute to this poor performance, including inaccurate forecasting, lack of coordination among the parties involved, and competitive movements. Poor store operation has stood out as a major component. In fact, the ability to manage promotional item handling and to adjust processes quickly in a constantly changing, demand environment is essential for improving promotion results.

RFID technology is expected to offer a superior level of promotions management due to the enhanced visibility both retailers and manufacturers gain on inventory positions, before and during the promotions. Compared to a normal store, an RFID-enabled store is better equipped to provide accurate inventory levels, due to the improved visibility of the inventory at the back room. As a result, chances of a display-ready pallet sitting at the back room, or being broken down to replenish normal shelves, is reduced.

Also, store personnel and business analysts, from both manufacturers and retailers, can be alerted about the speed of inventory depletion and then make decisions that can change replenishment plans and consequently drive promotion success. This is possible by following product movement from receiving, to sales floor, and then to the trash compactor. Point-of-sale data, if shared by the retailer, can support the identification of OOS situations in almost real time, allowing even faster reaction from store management and even vendors' sales personnel.

Furthermore, RFID data can also be used to generate intelligence about past promotions that can not only improve forecasting for future promotions but also identify areas of inefficiency to enable continuous process improvement. Retailers can identify individual stores that are not running promotions effectively, for instance, and take action to improve execution of future promotions. Manufacturers, on the other hand, can better track the investment in trade dollars and claim measures from the retailers when appropriate.

The Pilot validated some of the expectations for improving promotions management. A markdown promotion was scheduled to run in different stores for a full week, in different stores. The RFID system was able to track the inventory increase at the DC during the days that preceded the promotion. It also allowed analysts to identify the dates and times that promoted products arrived at the RFID-enabled store, and when they moved from the back room to the sales floor. The promotion was successfully run at the pilot store, given that the inventory was depleted according to the forecast and no OOS event was identified. However, in another store, which was not RFID- enabled, an OOS situation occurred for many hours during peak of consumption.

Quantifying the opportunity for improving promotions execution as a result of RFID deployment is extremely complex and requires deep understanding of the processes involved in designing, monitoring, executing and analyzing the results of promotions. During the Pilot, only OOS for promoted items was quantified in terms of the potential gains that manufacturers and retailers can achieve. On average, the results showed that promotions management represents 17% to 60% of the total benefits quantified to retailers and manufacturers.

Provides an effective way to provide one-up, one-down traceability

Traceability capability is essential for the food industry – to manufacturers, retailers, and consumers. It represents not only compliance to increasingly demanding regulatory regulations but also an opportunity to provide greater value to customers while reducing costs.

While food manufacturers have applied procedures and technology environments that address the issue with a certain degree of reliability, RFID allows them to improve the efficiencies in which traceability is performed. ERP-enabled solutions can track production lots and code dates, shipments and destinations, but such information systems cannot provide visibility into the processes happening further down the supply chain.

RFID stands out as a very promising solution to enable a real breakthrough in the way traceability is performed, because managers can have full visibility into where the products are moving from the moment they have a commissioned RFID tag attached to them until they are available to consumers. RFID not only allows immediate order and shipment tracking, but it also reduces the number of intermediaries involved in the event of a recall, while preventing managers from potentially having to scrap large inventories instead of only the lots that need to be removed.

During the Pilot, a recall process was simulated with great success. Cases shipped under different purchase order numbers had their locations identified in less than five minutes, providing product, distribution and inventory information as mandated by regulatory agencies.

But the real value of RFID-enabled traceability is not just in its strengths during emergencies. Full traceability information can be used as the basis for efficiency gains and optimization in logistics, manufacturing and quality management processes, by providing quick feedback to support pro-active measures to minimize risks on future operations. Manufacturers and retailers should, therefore, make use of the full visibility to gain efficiencies in the supply chain and build competitive advantage, instead of to simply comply with regulatory requirements.

RFID-enabled condition monitoring allows greater visibility into temperature variations

Given the importance of controlling environmental conditions to maximize product shelf life, thus avoiding spoilage costs and to improve compliance with strict regulatory requirements, many food manufacturers and processors have implemented diverse solutions to control temperature variations of perishable products in transit.

However, most of these solutions can only track average temperatures inside trailers. The monitoring devices are not attached to specific cases; therefore, they cannot identify events such as poor handling at the docks or warehouses. Moreover, information access is limited to closed-circuit flows (transportation from origin to destination and back to same origin), because the reading/controlling devices need to be returned so that the information they carry can be accessed and analyzed. As a result, the data captured is normally a description of what happened in the past, limited to just a fraction of the total operation, and mostly intended to support regulations compliance.

Consequently, there is great opportunity for improving the business benefits of temperature control throughout the supply chain, and make it a source of differentiation. Because RFID technology provides visibility to manufacturers and retailers of how perishable products are handled before they are available to consumers, it can be a viable enabler of consistently providing fresher products, stronger branding positioning and, hence, competitive advantage.

RFID-enabled condition monitoring allows manufacturers to track temperature in near real time through various control points in the supply chain. Tags attached to each product case can record temperature readings, which can be accessed every time the case passes through an RFID portal. If the temperature exceeds a pre-defined, acceptable threshold, an alert is sent to the operators, enabling them to take preventive actions to avoid premature spoilage. Also, the system can keep track of historical temperature data that would serve as a record to satisfy regulatory requirements and allow for process and quality improvements.

During the Pilot, a proof-of-concept was run to validate the technology readiness and its potential. Four temperature tags were applied to a pallet of perishable product at the supplier's facility. Real-time, instant temperature reads were taken by RFID readers at various points across the supply chain: supplier shipping, retailer distribution centre and retailer store. The temperature monitoring solution was configured to trigger alerts according to pre-defined business rules that set temperature thresholds. The results showed that the products in the experiment were manipulated according to the standardized procedure, and no substantial variance was noticed. Product life shrinkage could have been calculated and alerts were set to be sent if there had been a different outcome.

It was concluded that RFID-enabled condition monitoring is already possible today, and this new way to ensure product freshness should be considered by food manufacturers and retailers as a way to reduce costs and improve condition monitoring efficiencies.

Automation of shipping and receiving processes offers more than simply productivity increase from replacing bar code scanning

The automation of shipping and receiving processes might be the most intuitive application for RFID technology. Once simply considered the next generation of bar code systems, RFID was mainly thought to provide benefits exclusively associated with the productivity improvement gained by substituting bar code scanning. This approach makes the quantification of savings more visible to managers studying the viability of deploying the auto identification concept to their business. However, it omits the benefits generated by the automated dynamic interaction between vendors, transportation suppliers and retailers.

During the Pilot, a broader approach was taken. Rather than simply focus on quantifying the labor costs associated with scanning labels, other business processes were investigated in an attempt to identify inefficiencies that could potentially be reduced. It greatly emphasized service level compliance and costs of maintaining inventory accuracy.

Results showed that shippers that have a more fragmented distribution network (several shipping locations) and a larger number of transportation suppliers – or that present a lower level of information integration among their warehouse management, order management and financial systems – tend to face a greater challenge in providing higher service levels. Such complexity represents opportunity for capturing benefits generated by RFID deployment, given that it can standardize execution processes while capturing more accurate information in real time.

RFID can enable operators to proactively identify wrong picks, short shipments and overages before loading is concluded, thereby improving the effectiveness of shipping and receiving processes. Also, the RFID-enabled automatic shipment notice (ASN) allows faster receiving and more accurate inventory control, minimizing variability associated with order fulfillment and establishing the foundation for ASN-based collection/payment procedures. Finally, RFID can reduce administrative efforts and the costs associated with correcting and managing discrepancies in inventory, outstanding orders and payment, while reducing order to cash cycles, easing conflict resolution and ultimately improving service levels.

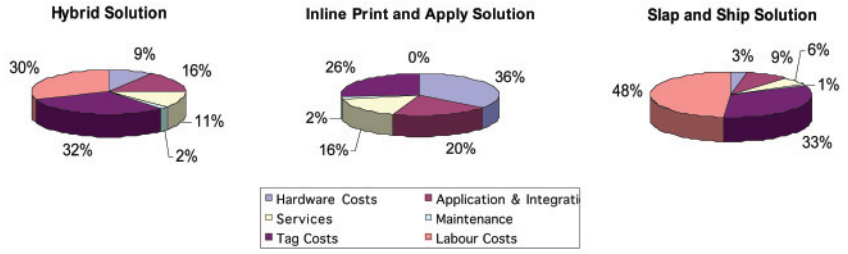
Investments

There are many cost/investment components to implementing an RFID solution. For the purposes of the Pilot reporting, the category structures used are summarized as follows:

1. Hardware: All hardware components required for the RFID technology including PCs, controllers, printers, portals, readers (fixed, portable and handheld), antennas, light trees, motion sensors, cabling of equipment and conveyors (where applicable).
2. Application and integration: Application servers and software (including licensing) to gather, filter and report the RFID transactions, middleware, hosting services, networking (one-time and ongoing monthly charge) and integration into existing information systems.
3. Services: All consultation and integration services to support the pilot/rollout.
4. Maintenance: Ongoing software maintenance support costs.
5. Tag: The cost of the tags
6. Labor: Any and all labor costs associated with applying tags to the cases on pallet, de-palletizing, re-palletizing and re-shrink wrapping the pallets of tagged product.

The chart below illustrates the results of the three different models and the breakdown of investment categories per model.

Investment Category Breakdown over six years for Supplier Deployment



Investment Category	Hybrid Solution	Inline Print and Apply	Slap and Ship
Hardware Costs	9%	36%	3%
App & Integration	16%	20%	9%
Services	11%	16%	6%
Maintenance	2%	2%	1%
Tag Costs	32%	26%	33%
Labour Costs	30%	0%	48%
Total	100%	100%	100%

As you can see, the category breakdowns differ – significantly – depending on the solution used. Each of the categories is discussed below, relative to the models and how the results changed over the six-year period of deployment.

Hardware

Hardware, while a significant investment for an RFID implementation, became less significant for the Hybrid and Slap and Ship solutions during deployment because the cost of labor and tags surpasses the cost of the hardware. Fully integrated Inline Print and Apply solutions use more sophisticated and expensive hardware, and for a full rollout, all manufacturing lines require the installation and support of Inline Print, Apply and Read Verification equipment. This approach eliminates the labor aspect from the onset, thus changing the results of the investment picture.

The Hybrid model introduces the use of Inline Print and Apply equipment further in the deployment and at a smaller scale, using fewer lines to perform the tagging of cases after production, thereby reducing the amount of inline print and apply equipment required but still demanding a significant amount of manual labor.

Application and Integration

Integrating the RFID solution into existing management networks makes up a considerable portion of the overall investment, with the majority of it occurring in the first year or two. It makes good business sense to ensure that the RFID data being gathered is effectively incorporated into the day-to-day, decision-making tools to reap the benefits of the information efficiently.

Both Hybrid and Inline Print and Apply solutions have similar results (16-20%) in terms of the percent of overall cost to integrate in this scenario. Inline Print and Apply solutions generally have more points of integration and are more complex as the solution travels further through the supply chain – starting in manufacturing or packaging through to shipping. Slap and Ship has fewer integration points requiring effort to integrate and is overshadowed by the escalating costs of labour.

Services

Services include business, process, and networking consultation and implementation assistance. The range of services required is dependent on the level of sophistication and complexity of the solution. Generally, more assistance is required to reengineer processes, install the equipment and integrate the solution when implementing Inline Print and Apply solutions. They are typically installed further up in the process, such as during manufacturing or packaging where they are integrated with existing program logic control (PLCs) and production systems. They affect more intricate processing, both at the beginning and throughout the remaining storage, picking and shipping activities.

Slap and Ship solutions, while still requiring significant effort to install the RFID equipment, affect only processes in the later stage of shipping, such as picking and shipping. Therefore, they tend to require less consultation services.

Maintenance

All software purchased today comes with maintenance offerings that are usually about 10 to 15% off the purchase price. This cost is small in the scheme of things and a good investment to ensure that upgrades and support are readily available when needed. RFID middleware and software will continue to become more efficient and effective in providing enhancements to the technology that will support critical business decisions.

Tags

Tags continue to be the most consistent investment of an RFID solution, regardless of the model used. The Inline Print and Apply model shows that in the six-year period evaluated, the hardware costs outweighed the tag costs. For Slap and Ship, the labour costs exceeded the cost of tags. This study amplifies the need for lower-cost tags. It encourages suppliers and manufacturers to look deep into their organization for the benefits that outweigh the ongoing cost of tags. They should consider solutions that can open the door to additional benefits further upstream in their manufacturing and distribution processes.

Labour

Labour is directly affected by the RFID solution implemented. Clearly, Slap and Ship continues to be the most labour-intensive approach, at almost 50% of the overall costs over six years based on this Pilot. The Hybrid Model, while reducing labour costs, still requires manual attention during the first year or two prior to implementing more automated print and apply technology as the volumes increase. However, there is potentially still the need for manual intervention to tear down the pallet, load it onto a conveyor system for tagging, and rebuilding the pallet.

If these steps can be eliminated, then there is the opportunity to reduce the labour costs further for Hybrid Models. Inline Print and Apply solutions are designed to eliminate the manual effort required to apply tags to both cases and pallets. This approach also tends to increase the consistency of tag application, and consequently can lead to better and more reliable read rates.

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