RFID in Retail: New approaches, new viewpoints

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After she received a text message from a fashion retailer just 25 metres away letting her know that he has her favourite fashion brand in stock, a woman walks into the store and takes three pieces of clothing to the fitting room. As she undresses, three lines of text appear on the mirror, indicating that she has taken a summer dress, a skirt and a blouse. While looking at herself wearing the summer dress, the mirror starts to suggest accessories that would combine well with the dress. The woman did not plan to steal any garments but if she had, she would forget about it now, since the fitting room seems to be very well aware of what she has taken from the shop floor. At the same time, the shop keeper gets information that the particular combination of skirt and blouse that she has selected has been chosen for the fifth time today, and that the skirt is almost out of stock. The shop manager decides to dress a dummy with the skirt and blouse combination. More items of the skirt are ordered automatically. The woman in the fitting room wears the skirt and blouse now. She likes the garments, walks out of the fitting room to pay. While walking to the self-checkout she passes a large TV screen that says that there are some accessories that go well with her garments and they are 25 percent discounted. She walks to the accessories, selects what she wants, walks to the check-out and swipes her loyalty card to check if there are any other special discounts for her. Finally, she pays.

This may sound like a scene from a far away future, but technically all the components to realise this scenario are available today. The basic technology used is RFID (radio frequency identification). The garments are equipped with RFID-tags that enable automatic identification by RFID-readers in the racks and fitting rooms. Therefore the rack 'knows' which garments are taken out of it, and the fitting room 'knows' which combination of garments were selected by the customer. The intelligence behind the system comes from software similar to that used in online shops, such as amazon.com.

RFID technology is a promising technology currently finding its way into the field of customer interaction strategy, supply chain accuracy and inventory management. Primarily, RFID tags are seen as substitutes of traditional barcodes, yet they can add a lot of value and functionality. Where barcodes require a scanning device to be placed directly in front of the tag to be read, RFID tag readers are able to scan all tags that are in the proximity of the scanner . The next difference is that whereas barcodes usually are the same for all articles of the of the same type (i.e. a jar of peanut butter of brand x), RFID tags will be unique for each individual product occurrence. This opens up the possibility of tracking the entire history of a specific occurrence of a product. Moreover, due to the nature of the scanning technology, it suddenly becomes achievable for manufacturers to track individual products through all stages of production and base inventory management and front office planning on real-time data at item level from production facilities.

These properties of RFID mean that this technology can create immense value opportunities in the (retail) business both in terms of cost reduction in back office operations and inventory management as well as in terms of reshaping customer interaction management and chain management in the front office.

In the Netherlands, RFID technology has, for example, been applied in Selexyz bookstores and C1000 supermarket. The technology has been proven to work adequately if the right measures are taken. In this article, we will share the lessons learnt, and discuss the business value that can be created with RFID systems.

Business Value

The value of applying RFID-tags occurs in two areas: in the supply chain and on the shop floor. In the supply chain, the improved visibility of business processes leads to cost savings. A logistics system can keep track of inventory, place orders automatically, and check deliveries against orders. Therefore it is possible to correct human errors as soon as they are made, and prevent disputes between personnel about erroneous situations. Moreover, the logistics system can reduce out-of-stock situation automatically

On the shop floor, an RFID-based tracking and recommendation system can observe what customers do, update customer profiles and give advice on purchases. Currently, a shop system does not know what a customer does before a purchase is made at the cash register. With the tracking and recommendation system, the buying process of a customer can be influenced, as if a good friend was accompanying the customer. Application of such systems should lead to revenue growth.

The two systems can naturally be coupled. If the shop floor system knows about inventory and production capacity of suppliers, it can recommend products that are in stock. This principle is applied by McDonald's, where narrowcasting screens near the counters recommend meals of which there is ample supply. It is proven that sales of, for example, salads, can increase by 40 percent when they are recommended on the screens. This way, less food has to be thrown away and sales of out-of-season clothing may become a thing of the past.

Basic cost reduction opportunities lie in electronic article surveillance, stock reliability and in tightening store, supplier and corporate inventory management. In general, RFID tagging will increase supply chain accuracy and will enable real time information management. This upgraded accuracy throughout the chain will have positive effects on the quality of customer interaction on which we report in the next section.

An important issue if you want to reap benefits from RFID both in the supply chain and on the shop floor, is when and how the products are tagged. Ideally, the product is tagged as soon as it exists, i.e. in the plant or workshop where the product is created. This is called source tagging. This way, the RFID-tag can be used throughout the entire lifetime of the product, and the costs of tagging the product can be shared between all parties benefiting from it.

Combination of Technologies

As explained before, application of RFID is only useful if it is combined with several other technologies. For example in the supply chain, there should be an interface between the RFID system and the production control systems and warehouse management system. On the shop floor there may also be other systems that provide information about the behaviour of customers in the shop. These systems can play a role, alongside RFID.

Metro in Germany is experimenting with shopping carts that have a screen with indoor navigation capabilities. Customers can download their shopping lists on the shopping cart computer, and receive directions, special offers and menu suggestions on the screen. Shop managers can follow the trajectory of each shopping cart through the shop, and may improve the shop lay-out based on this information.

Enhanced Customer Interaction

In the next stages, customer interaction can be enhanced by adding features such as self check-out and self payment. But there is more to gain. Accurate, online information throughout the chain makes it possible to differentiate the actual offerings to individual customers depending on actual stock and production data.

In general, RFID will bring chain management more to the front office and the front office will use more stock information in driving sales. This does not mean that the chain becomes demand-

driven. That is another story altogether. RFID in itself will not change the 'inside out, schedule push' paradigm into the 'outside in, reality pull' paradigm. RFID and the related real time information management introduces new feedback and feed forward loops in decision making from which arises a mutual win-win for all chain participants including the customer.

Our basic claim, therefore, is that the full potential value of RFID can only be quantified when used in tandem with other technologies such as narrow casting, and location based services (LBS). For example, in a retail environment a future scenario could be that consumers walking through the store with their RFID tag fitted mobile phones see advertisements at narrow casting screens, targeted at their specific location in the shop and their personal preferences, before walking to the register to pay with mobile phone as well. It might also be possible for a customer to get more information by putting his mobile on an 'information point' in the shop. By combining information about who the customer is, where he is, what time of day it is, and maybe what he bought at the store yesterday, it will be possible to upload a specific offer to his mobile phone. RFID and other emerging technologies will extend uploads to the customer from 'google type' contextual advertising into truly personalised advertising - in the right spot, at the right time, with the right content - creating a really new customer shopping emotional experience and giving a new dimension to impulse buys.

Case: C1000 Supermarkets

Schuitema delivers goods and services to 450 C1000 supermarkets throughout the Netherlands. In 2005, Schuitema took the initiative for an RFID pilot, named Vers Schakel.

The pilot made use of the newest UHF Gen2 RFID technology. Vers Schakel has made a significant contribution to the continuous development of the technology. The goal of the pilot was employed to answer the following questions:
- What is the production date of the contents of the crate?
- What is the contents' best before-date?
- Are the temperature conditions constantly optimal?
- Which crate was last registered at what location?

The following offers a concise description of Vers Schakel's technological foundations

RFID technology

Vers Schakel applied standard UHF RFID tags of the second generation (EPCglobal UHF Gen2).

Data sharing

In the area of data sharing, Vers Schakel (in partnership with Container Centralen) again made a valuable contribution to testing and developing EPCglobal standards. Regarding data sharing with Container Centralen, the pilot made use of two EPCglobal standards; the EPC Discovery interface (which is at this point still in development) which reported the crate movements, and the EPC-IS interface, which subsequently distributed this data between the Vers Schakel pilot an Container Centralen.

EPC-IS

This standard defines how EPC-information may be shared between different parties. EPC-IS is an open standard. It does not prescribe specific hardware or software solutions, or standards regarding tags, readers, etcetera. Rather, EPC-IS is an enabler of cooperation and communication between different technologies.

Results

RFID-technology proved a very useful tool to track and trace products. Furthermore, the technology provided a good basis for alerting functionality; users of the system were accurately notified when products took too long to arrive, or were subject to suboptimal temperature conditions for too long. RFID also proved instrumental in detecting distribution problems; for instance in cases where products were swapped or omitted during the unloading/loading process. Vers Schakel has shown that RFID is a valuable tool in enhancing chain transparency, efficiency and accuracy.

Because of this, Vers Schakel has proven to be an invaluable step forward in the search for decay reduction and a fresher product, a fresher product, resulting in a happier consumer and better performance.

Solid technological basis

The early adoption of Gen2-technology has not missed its mark. The pilot showed read rates of 99-100 percent, independent of crate contents. Use of different crates, pallets or rolling containers (either with or without potentially interfering iron bars) did not have any bearing on tag and reader accuracy. The direction or speed with which the loaded pallets or containers were led through the reader ports was also inconsequential. Furthermore, it transpired that reader reliability was not obstructed by the use of transportation devices such as electrical pallet trucks. Even if containers or pallets were 'overloaded', the registration remained nigh on faultless.

Effective control

RFID environments such as the one applied in Vers Schakel can be an effective means of control. High read rates enable 100 percent accurate control in every step of the logistics process. Deliveries can be monitored perfectly. This makes it possible to check if the delivery corroborates with the original order: is the number of deliverable products correct? Does the delivery contain the right amount of products per product type? Do the 'best before' dates per crate check out? Another RFID characteristic, apart from control accuracy, is speed of control. This is much higher than in non-RFID environments. In this way, it is possible to perform more checks in less time. A further big advantage in comparison to traditional environments lies in the fact that RFID enables real time reporting of (distribution) errors, via display, SMS or email. Errors can be acknowledged and dealt with in time, rendering later recovery activities unnecessary. In current practice, errors only come to light while unloading crates into the shop shelf, because manual monitoring of all prior supply chain stages is too cost- and labour-intensive. Proof of delivery is, in the RFID environment, an attainable goal.

A more transparent supply chain

The Vers Schakel pilot enhanced supply chain transparency for all parties concerned. The level of detail of the RFID-based information can be tailored to the needs of each individual participant. Because of this, each party receives the information it needs (eg. the crate pool manager is provided with information on crate IDs and crate locations, not on crate contents).

Overall transparency improves, but so does transparency within the chain's segments. This means that not only distribution speeds of crates between supplier and shop shelf can be monitored, but also distribution speeds of crates within the distribution centre or supermarket environment. And the supermarket, furthermore, can track the time it takes for the crate contents to be removed from the cooling cell, unpacked from the crates, and stacked into the shop shelf.

Within this scope, average speed can be monitored, but also the absolute minimum and maximum speed within chain segments. On top of this, distribution speeds can also be tracked per product type.

By strategically placing reading locations throughout the chain, as was done in Vers Schakel, every important part of the chain can be made transparent. RFID technology offers insight into the factual stock per product per chain segment. This enables the supplier to monitor stock per product and the corresponding 'best before' dates at the store. This means the supplier can anticipate on the type of products it will have to supply shortly, negating the danger of shortages. The supermarket is aware of the stock situation at Schuitema Distribution Centre, giving it the means to accurately organise its own stock management.

Potential for shop improvement

RFID offers a great deal of room for supermarket performance improvement. Upon delivery of products, it immediately becomes apparent if containers are missing or if incorrect containers have been delivered. Upon reception,

supermarkets have immediate insight into possible missing products. Furthermore, Vers Schakel has proven that it is possible to accurately monitor the time crates spend outside of the cooling cell - both between the supermarket back door and the cooling cell, and between the cooling cell and the shop shelf. Apart from that, it is possible to determine if the products with the correct 'best before' date are being distributed to the shop shelf.

At all times, the supermarket has real time information on the stock situation (amounts present and amounts present per 'best before' date) in the cooling cell, without the need for time consuming physical checks.

RFID has, during the pilot, also proven its use for packaging management. The amount of empty, returnable crates is automatically registered, making physical checks unnecessary and thereby eliminating counting errors. In the long run, it will no longer be necessary to manually complete packaging forms, and Schuitema will no longer have to manually process these. Crate registration and deposit refunding will become part of the digital process.

Case: Selexyz Bookstores

Selexyz is the premier book retailer in the Netherlands with more than 40 stores, 730 employees, 11 million customers and a yearly turnover of more than EUR170million. Its stores carry between 25,000 and 275,000 books, with the chain selling between 15,000 and 40,000 books each day.

Selexyz has successfully implemented the world's first commercial deployment of item-level RFID technology, bringing RFID utilisation to the consumer level. The company embarked on a Progress-based automation solution that integrates its business applications with a service-oriented architecture (SOA) and implements item-level radio frequency identification (RFID) tagging to optimise its supply chain and enhance the customer experience. Selexyz is able to dramatically improve management of a supply chain process that begins with Centraal Boekhuis (central book warehouse). Centraal Boekhuis is Holland's leading book distributor of 50 million books annually throughout the Netherlands and originator of 80-90 percent of the store inventory. Selexyz's automation initiative spans a process that begins with the distributor and ends at the hands of the customer.

The process

At Centraal Boekhuis, RFID tags are generated and affixed to the books, with each tag encoded with an item-level serial number. The books are packaged for shipping, with an advance shipping notice (ASN) generated that lists each book in the shipment. The ASN is sent to Selexyz IT operations, where it is automatically updated with customer and order information from the back-office system and distributed to the individual Selexyz Selexyz-branded SmartStores. As shipments arrive at a store, the boxes pass through an RFID tunnel where RFID readers scan the book tags while the books remain in their boxes.

RFID infrastructure

CaptureTech delivered the RFID infrastructure, consisting of readers, antennas, and associated services that enable both Selexyz and Centraal Boekhuis to deliver market-leading RFID capabilities. With the assistance of CaptureTech RFID expertise and the decision to use Gen2 RFID tags, Selexyz is achieving high fidelity scanning of books while in their shipping boxes, enhancing data capture significantly.

Results

Selexyz has trimmed manual inventory steps, reduced the opportunities for error, and dramatically improved management of its supply chain process. Productivity improvements are dramatic: finding a book manually in a box of books previously took five or six minutes, and books can now be found online in seconds. Selexyz formerly had to shut down the store and engage 20 to 25 staff members to conduct inventory reviews, and the company can now complete inventory reviews in a couple of hours with only two members of staff.

Selexyz provides retail customers with an elegant way to find the books they seek, as well as assistance when they're not sure what they might want. Customers can query in their own language ("Find me a book on sailing") and continue to search on iterative results, narrowing down search results until they find the book that matches their needs ("Now search [the books on sailing] for any written for children"). This intuitive query model, with its browser-based interaction with the inventory system, enables customers to quickly refine book searches of an inventory that exceeds 900,000 titles. Enriching the customer experience also reduces the demands upon sales associates and ultimately leads to greater book sales.

Additional advantages

Store-based inquiries about the availability of books formerly took at least five to six minutes, since employees needed to go into storage rooms, open boxes and search for available titles. But since each book is tagged, inquiries are conducted online in a few seconds. This not only improves customer service, it also allows Selexyz to more efficiently utilise personnel.

In addition to using RFID to improve management of its regular book inventory (with customer access via kiosks), the new system also greatly enhances the handling of customer-ordered books. Upon delivery of special orders to the store, the books are now easily identified and routed to a separate stockroom, with automatic notification to customers via email or SMS. In the past, the process required opening the boxes for manual identification and alphabetic sorting on the stockroom shelves. Now the books can remain in their boxes.

In the stock room, tags on the stockroom shelves enable the systems to correlate the book identity with its location. When customers come to the store to pick up their order, the shop staff can find the book by querying the RFID-enabled system. A previously cumbersome manual process, with ample opportunity for error, has been significantly improved.

Retail RFID model

Selexyz has developed a model that retailers worldwide can use as a benchmark for leveraging automation to improve inventory management, supply chain efficiency, and customer service.

New Challenges for the Value Chain

There are two main challenges when implementing and investing in RFID technology. The first being a cost allocation problem, the second is related to the impact RFID will have on business processes. Problems of standardisation have been solved by the industry already, the stage is set.

In a typical RFID implementation in the retail sector, the implementation costs will have to be carried by a different part of the chain than where the benefits occur. Even stronger, the more you succeed in source tagging at the very early stages of production, the bigger the possible gains. This makes the business case dependent on strong cooperation between multiple companies and departments. The cost and benefit data should not be looked upon from the perspective of the individual companies that are engaged in a chain. The challenge is to develop mutual trust, to look at the total chain and to include the various companies. For example, in the C1000 supermarket case, it would be wise to keep stock of raw materials at the production facility, and as soon as vegetables are cut to transport them to the supermarkets, where they can be sold. In that case the supermarket is the only location that throws products away, and of course they should only pay their suppliers for products that are sold. In fact, you have to develop some B2B market structure to re-divide total benefit and cost to all chain members. So, the RFID business case game is often not about survival of the fittest: It is about survival of the most cooperative. Only a cooperative mindset fosters RFID value capturing.

The second hurdle in RFID implementations is that prototyping is not an option. Of course, one may prototype the technology, yet in order to capture the value one has to implement in using

100 percent roll-out. Although possible, a partial roll-out will lead to time and resource consuming operations because separate operating procedures would be needed for tagged and untagged goods.

This means that the decision to implement RFID has the character of a leap into hope. You have to make a decision based on data from the business case and pilot programmes. In practice, there is no way back if you look at the financial, technical and operational impact of RFID implementation.

RFID technology is mature enough to apply in practice. It will create a wealth of information on all aspects of consumer behaviour in shops, logistics and production.

The question is how to use this information and how to extract value out of it. This lesson has to be learned during the course of the next few years by experiments and learning by doing. Here is also a lesson relating to the marketing of new technology: creating a genuinely new perspective on the shopping experience.

Much of the value of the new type of customer information still has to be revealed. So, who is going to be the first?

About KPN
KPN is the leading provider of telecommunications services in the Netherlands, serving customers with wireline and wireless telephony-, Internet- and TV services. To business customers, KPN delivers voice-, Internet- and data services as well as fully-managed, outsourced ICT solutions. Both nationally and internationally, KPN provides wholesale network services to third parties, including operators and service providers. In Germany and Belgium, KPN pursues a multi-brand strategy with its mobile operations, and serves multiple customer segments in consumer as well as business markets.
At June 30, 2007, KPN served 5.8 million wireline voice subscribers, 8.8 million mobile customers, 2.5 million Internet customers and 0.3 million TV customers in the Netherlands as well as 16.1 million mobile customers in Germany and Belgium. With 27, 096 individuals (24,881 FTEs), KPN posted revenues of EUR 5.9bn, with an EBITDA of EUR 2.5bn in the first half year of 2007. KPN was incorporated in 1989 and is listed on the Amsterdam, New York, London and Frankfurt stock exchanges.
Recently, KPN has acquired Getronics. With some 24,000 employees in 25 countries and revenues of EUR2.6 billion in 2006, Getronics is a leading international provider of Information and Communication Technology (ICT) services and solutions. Applying its expertise in workspace management, applications, and consulting and transformation services, Getronics helps organisations raise their performance and increase the productivity of their people, by providing them with the ability to share information and to work together efficiently, securely and effectively, wherever and whenever they need.

About CaptureTech
CaptureTech is an international, independent specialist in the field of automatic identification. CaptureTech designs, builds, implements and maintains complete solutions for logistics applications, using the most advanced techniques in the area of bar coding, RF, RFID, Visidot and Voice Recognition. For more information: http://www.capturetech.nl