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EVERYTHING YOU NEED TO KNOW ABOUT RFID AND YOUR BUSINESS:

From implementation, to costs, to omnichannel and the future of RFID in retail.

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Radio frequency identification (RFID) has seen a recent resurgence as retailers seek more accurate inventory counts in order to deliver a true omnichannel experience to ever-savvy consumers.

Retailers now know consumers are constantly shopping, and today's buyer wants the freedom to make purchases anywhere, anytime, anyplace.

Sourcing Journal spoke with Dr. Bill Hardgrave, Dean of the Harbert College of Business at Auburn University and founder of the RFID Research Center at the University of Arkansas and Francisco Melo, VP of global RFID at Avery Dennison to discuss the technology and demystify the implementation process.

The single most relevant factor for today's fashion market is seamless shopping and, according to Hardgrave, "The only way you can guarantee omnichannel is if you know exactly what you have and where you have it."

Retailers once saw RFID as a tool that could be useful, but had no sense of urgency to incorporate it, Hardgrave explained. But with the omnichannel experience becoming a necessary offering over the last 18 months, "Retailers are realizing if they don't embrace it and head down this path of omnichannel, they're going to be obsolete in a few years," he said.

Today, Melo added, "This acceleration of RFID adoption is being driven by improvements in the RFID technology itself, an increasingly streamlined implementation process and a better understanding of the ROI RFID can provide due to highly-visible RFID initiatives by leading global retailers."

In this report, Hardgrave and Melo outline how RFID creates business value for retailers and offer a look at what's to come for the technology.

What exactly is RFID and how does it work?

RFID is a no contact identification system that wirelessly transmits electronically stored information about an item via radio waves.

It's a type of automatic identification (auto-ID) technology, like a barcode or key fob, used to reduce the amount of time and effort needed to input data. But where a barcode requires manual scanning to capture data, RFID readers can capture data with little to no human involvement.

"The RFID technology used today in retail is based on Ultra High Frequency passive tags and open standards for interoperability," Melo explained. There is no proprietary technology for the industry standard RFID technology, which is set by GS1, a supply chain standard setting association. That means any reader from any manufacturer will work with any tag from any manufacturer.

But the manufacturing technology and processes that dictate the quality and competitiveness of the solutions often differ from one maker to the next, Melo said. Avery Dennison, for example, has invested heavily in RFID innovation and owns more than 500 patents worldwide that are specific to the manufacturing process and related tag construction which enable the integration of RFID with key branding and information elements for the apparel retail industry.

The system consists of a reader and a tag containing a microchip. The reader, a device with an antenna, sends out radio waves and

receives product information back from the tag. That information is then turned to digital form and delivered to a computer system.

In terms of retail, that means if RFID tags are embedded into product trim, a reader that has a 10 to 20 foot read range could reasonably scan an entire 50-by-50 foot stock room in a matter of minutes, versus the half-day of years past. To give this proper scope, if stockroom staff could manually scan 250 items per hour with a barcode reader, RFID would allow them to take three or four passes around a backroom with a handheld reader and read 20,000 in that hour, Hardgrave said.

Retailers who may already have hand held barcode readers for stock scanning could pay to trade up for a similar device with added RFID functionality, eliminating the need to purchase entirely new devices and minimizing the cost of implementation.

Door portals are another option for RFID reading. Instead of a handheld device and its human operator, RFID antennas can be installed around doorways to create a portal to read products as they travel from stockroom to sales floor. If there are multiple doorways leading from the loading dock into the stockroom and from that stockroom onto the sales floor, a portal could be installed in each doorway. This minimizes the human element in taking inventory, reducing both cost and inevitable errors.

At American Apparel, for example, Hardgrave said, almost every item has an RFID tag. Door portals and antennas are installed in the ceiling throughout the store, so the retailer always knows what is on the floor and in the back room. "If you think about American Apparel, their sales floors are fairly small, so they often only have one or two of a size or color out on the sales floor and as soon as somebody buys it, they can refill it from the backroom. RFID tells them immediately, 'OK, this one's been sold, please bring out a yellow tank top, we just sold one.'"

RFID isn't new, so why the sudden hype?

RFID technology launched into the mainstream for the first time in 2003 when Walmart started pallet and case-level RFID tagging, and customers considered it a supply chain tool. But tracking became problematic as items were separated from their respective pallets and it became evident that inventory tracking breakdowns were happening at the store level and not at the warehouse. This knowledge, combined with significant improvements to the RFID technology, ultimately caused the shift to today's item-level tagging.

Now with omnichannel reshaping the shopping landscape, retailers are realizing its significance.

RFID is an enabler for omnichannel, Hardgrave said. "The Holy Grail of RFID is improving inventory accuracy.

Over the years, studies have shown that inventory accuracy among retailers hovers somewhere around 50 percent. For a typical retailer, they only have an accurate inventory count of about 50 percent of their items. As a result that's why you have out of stock and carry too much inventory."

Top performing retailers have slightly higher average inventory accuracy at around 60 percent. By implementing RFID, Hardgrave said, that number increased to about 95 percent accuracy.

At this level, restocking systems can operate properly in terms of ordering products, retailers hold less inventory, supply chains are leaner and out of stocks go down, which means sales go up, Hardgrave said. "That's why RFID is key to inventory accuracy."

According to Melo, "Now RFID adoption in the apparel industry is accelerating at a rapid pace as retailers expand applications throughout the entire supply chain to enable a fully enhanced, omnichannel customer experience. In fact, two out of three of the top 30 retailers in the US have RFID initiatives in play."

Retailers like Inditex, H&M, Marks and Spencer, Macy's, Lord & Taylor, American Apparel and Kohl's have already rolled out the technology.

"This trend is only going to continue in 2014 and beyond, as retailers look to continuously improve on the customer experience and bottom line results," Melo added.

How is RFID reshaping retail?

RFID technology is making retailers more efficient and consumers more loyal. It's cutting inventory taking time considerably and giving brands an opportunity to consistently deliver product to shoppers across any channel.

With the speed of inventory data collection, retailers can take product counts daily rather than setting aside time and staff to tally the goods once a week or every other week.

And styles won't get forgotten in a stock room. In a department store shoe section, for example, staff can use RFID readers to scan everything in the back room and on the sales floor, and it can show that there are 26 styles that are in the stockroom, but not on display.

Associates can then make sure to bring those styles out and sell them. That is why RFID can drive sales up, Hardgrave said.

Once employees have taken stock of everything on and off the floor, they can look at the RFID enabled handheld when a customer asks for a style, and tell them exactly which colors and sizes are available because of the up-to-date inventory count.

"It's good for the retailer and it's good for the consumer," Hardgrave said.

RFID is allowing retailers to advance with the shifting omnipresent retail landscape, and the future shopping experience will be vastly more accommodating to the consumer. As Melo explained:

> *"Imagine a retail reality where a shopper can always find the item they want in the right size and color, be it online or in a physical store. A store where associates know exactly what they have on-hand, and where to find it. A store where shoppers can instantly access information about the garment they are interested in – whether it be corresponding pieces to create a full outfit, where it was made, who designed it or what material has gone into its creation. A store where all customer information is readily available when a shopper walks in the door and the salesperson knows exactly what their favorite color is and what size they wear, and where shoppers can pay simply by swiping a button on their smartphone. A store with much reduced associate or shopper theft. This is the store of the future – the store that is being created today with RFID. RFID will continue to have a transformation impact on the retail landscape, creating a unique experience that shoppers don't yet know that they want."*

What's required for implementation?

The cost of implementation at the outset has often intimidated retailers, but there are attainable ways to roll out RFID.

"Simplicity and scalability are key to ensuring a successful rollout. In the most simplistic form, a retailer will need a middleware that can sit on the cloud with a connection to its retail management systems and a couple of handhelds to run frequent counts. Infrastructure is not a bottleneck, as it does not require a large investment for the base use case of inventory accuracy and visibility," Melo said.

The basic requirement is that products have RFID tags coming into the store. The general rule, according to Hardgrave, is that the tag should be applied to the product as close to the manufacturing process as possible. "Because the sooner you put that tag on, the sooner we start getting the benefits of the visibility that it provides," he said.

"Source tagging right at the point of manufacture provides maximum benefits and ensures compliance," Melo added. "By having RFID tags at the source, retailers and brands can track deliveries along the supply chain, strengthening the project return on investment. What's more, the addition of RFID tags or labels at DC or store level does not enable supply chain visibility and also adds a significant extra cost that is not present when inventory is tagged at the factory."

Hardgrave noted that the stage of tagging has varied between U.S. and European retailers. "In the U.S. right now, retailers so far are embedding RFID on the regular hangtags that you see. In Europe, some retailers are embedding RFID into the clothes themselves, in the hem or collar or something, therefore it's not a separate process, they just do it during manufacturing. Then you don't have to worry about the tag getting lost or stolen," he said.

Once product comes in with tags attached, it could be as simple as getting the RFID reader, which connects to WiFi and therefore doesn't require any network or infrastructure setup, and then starting to take inventory.

Then comes the software that will read the collected data.

Broadly, Hardgrave said, "The software can be as simple as "data grab", meaning it will capture the data from an RFID tag and send it to a file. The retailer can then use this information however they want (essentially, it is raw data). This, of course, is very simplistic. From this simple base, many functions can be added, such as: creating replenishment lists based on what is on the sales floor and the backroom; compliance reports, indicating product that may be in the back room but not displayed on the sales floor (such as shoes); replenishment execution reports (i.e., are store associates executing replenishment properly – going to backroom and bringing out products?); etc."

"You have to decide as a retailer, 'Do I just buy something that's already going to enable me to do this or do it myself?' You can either buy something off the shelf that's going to do that or you can have your own people write it, but either way retailers can expect to spend some money on the software—at the end of the day, RFID is only as good as the data it provides and the value that can be extracted from that data," Hardgrave said.

So, what are the costs?

RFID tags and labels come in many shapes and forms and different selections will naturally influence price. But as an average point of reference, the price of one tag today is typically under $0.10 for high volume standard solutions. For apparel, there are several options for implementation and the costs vary accordingly.

TAGS & RAW INLAYS

Tags costs can depend on the vendor you buy from, the size of the tag and the purchase volume, as with any other trim. There are finished tags that are fully equipped with RFID elements and nothing else needs to be done prior to attaching it to a garment, and there are raw inlays, which include just the RFID chip and antenna and could be sewn directly into an article of clothing.

Raw inlays can cost around $0.06 or $0.07 each. There is a continuum of finished tags, just as hangtags vary in cost. An RFID sticker tag that might be placed on a shoe box, for example, could cost $0.08 to $0.09 and a regular hangtag with RFID technology might be $0.12 to $0.14.

READERS & DOOR PORTALS

As far as the readers, handheld versions can run anywhere from $1,000 to $2,000. For a store the size of an American Apparel, for example, two handheld readers would suffice for taking inventory.

Door portals can cost anywhere from $1,500 to $2,500 or more.

SOFTWARE

Depending on the level of functionality desired for converting RFID data into useable information, software can be one of the more significant costs of the system. Software with the most basic functions for communicating data could cost $10,000, whereas software with added bells and whistles could be as much as $250,000 or more. The range is as wide as the available system capabilities.

If a retailer simply wanted to get started with handhelds and just capture data, most handhelds can store data, and that data could reasonably be transferred to a basic spreadsheet.

According to Hardgrave, having software that at least has minimal capability to format data for use is ideal.

But, deploying RFID technology is not about the cost, it is about the return, Melo said. "Typically, retailers experience pay-back on their initial investment within one year. Additionally, if you look at what the technology brings in terms of savings through improved efficiencies and inventory accuracy, increased sales, improved loss prevention, reduced inventory levels and vendor fraud, the return far outweighs the cost. No other technology in retail today provides such a compelling ROI."

"The improvement in inventory accuracy will justify the cost in almost every situation right now," Hardgrave added. "If a retailer truly wants to do anything with omnichannel and provide more opportunities for customers to buy their product other than just in the store, then they are going to have to adopt RFID to have accurate inventory."

What are the benefits?

The benefits of RFID for retailers can be many, but namely, it maintains up-to-date inventory counts, reduces the need for markdowns, combats retail shrink and improves loss prevention.

As more customers turn to online purchases or in-store pickups, there is an added pressure from both the retailers and distribution centers to meet the demand, Melo said. "Store associates can use RFID to process incoming shipments from the DC and vendors, through Electronic Proof of Delivery, immediately updating store inventories and identifying discrepancies between what was ordered and what was received."

He added, "Through the accuracy RFID provides, retailers are able to confirm the proper item will be in stock while the distribution centers can confirm it will be delivered or replenished as needed. Furthermore, in the next three years RFID technology can help enable retailers to achieve a 90% + first-fill rate, meaning an online order will be correctly delivered to the customer the first time within twenty-four hours."

RFID implementation also means retailers can hold less inventory because they know what they have and what they need, and don't need to retain as much safety stock. Less inventory means less cost and can also translate to a savings in transportation costs as retailers won't need to ship as much product.

Because of the continuously current knowledge RFID provides, margins could also benefit as a result of the reduced need to markdown.

If that department store shoe floor fails to put out a sandal and it doesn't make it to the sales floor until the end of the summer, the retailer will have to mark it down to move it, Hardgrave explained. "With RFID they would have been able to save margin because they would have been moving the shoe at a regular pace," he said.

In terms of reducing retail shrink, "RFID provides loss prevention professionals with the timely, actionable intelligence they need to focus their efforts on problem areas, pinpointing dishonest store associates and stores or departments that are suffering unusually high levels of shoplifting," Melo said. According to the Global Retail Theft Barometer, shrink, which includes shoplifting, employee or supplier fraud, organized retail crime and administrative errors, cost the retail industry more than $112 billion globally in 2012 and represented 1.4% of retail sales, on average.

What's next for RFID in retail?

Every year, RFID is getting "better, faster, smaller and cheaper," according to Hardgrave, and within the next few years, adoption is expected to be much more wide-reaching.

"Due to RFID technology improvements that empower category enablement, in terms of sensitivity and size, RFID technology can be utilized in every department of the store without limitations due to the materials being tagged or the size of the product. Before, there was a concern that RFID technology could only work in certain situations due to challenges in tagging items made of certain materials like metals or liquids, or tagging products like jewelry that are smaller in size," Melo said.

"We've already reached the tipping point, and RFID has gone from a "cool new toy" to a must-do to remain competitive. With retailers like Macy's and Marks & Spencer and brands like Burberry leading the way, RFID is well on its

way to reaching critical mass in apparel retail," he added.

Hardgrave said, "I think we will hit critical mass in the next 18 to 24 months, which means that not everybody will be there but the momentum and the majority of retailers will be there, and then it's just a matter of time for all of them to come on board."

Some retailers have overcome the perceived complexity of implementing item-level RFID solutions and are now seeing the benefits that improved inventory accuracy, visibility, and ROI can bring.

"But there is still a growing market for RFID, as only an estimated 2 percent of the global apparel segment produced annually is enabled with RFID technology today. The retailers who aren't in the pilot stage or haven't adopted RFID are already behind," he said.

In terms of advancements, experts are developing electromagnetic ink that would allow manufacturers to print RFID tags, which could considerably reduce the cost of the tag. These printed RFID tags could be used for goods like canned food or other items with paper labels.

Checkpoint Systems, a global supplier of merchandise availability solutions for the retail industry, recently released a new RFID label using the latest chip technology from NXP Semiconductors with optimal read/write sensitivity for increased accuracy in counting and quick encoding.

The label, called Zephyr 2, has been certified by University of Arkansas' ARC Center and allows Checkpoint's customers to use the same tag globally across multiple categories, streamlining source tagging operations.

"As international item-level RFID adoption continues to grow, it is crucial for retailers and brand owners to have access to 'global' RFID tags that can perform equally well in retailers across the world in various frequency ranges. Checkpoint's U7 Zephyr 2 is one of the first generation of these new global tagging solutions approved in multiple apparel and hardline categories for the US and Europe," Justin Patton, RFID Research Center managing director at the University of Arkansas said.

"Because of accurate inventory information, retailers are seeing that an item-level RFID implementation across all items and departments can provide a significantly enhanced in-store and online shopping experience. Retailers are moving towards these full-store RFID implementations to improve their omnichannel experience, which will significantly change the retail landscape in 2014 and deliver exponential results," Melo said.