

## **The Future is Now: UA Researcher Helps Industry Adopt Newest Product Tracking Technology**

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Replaced by younger and more efficient devices, technologies once ubiquitous in society litter the dustbin of history. Barcoding, used to identify and track things in warehouses and convenience stores alike, now faces its likely replacement in the form of radio frequency identification (RFID). The long-term future of RFID envisions a tag on every product sitting in a store, potentially enabling a harried mother with kids in tow to check-out merely by pushing her shopping cart through an RFID reader area and waving her RFID-enabled keychain at the register to debit her checking account. While this Jetsonian future may be years away, companies like Wal-Mart and its partners will soon realize the benefits of using RFID to reduce costs and give them detailed real-time visibility into their supply chains.

In the 30 years since their creation, barcodes have become such an entrenched part of modern business processes, particularly in the world of retail sales, that the transition away from them could prove expensive if not properly managed. Bill Hardgrave, an Information Systems professor in the Sam M. Walton College of Business, is working to help businesses understand and navigate the issues concerning RFID adoption.

Last year, Wal-Mart announced that it would require its top 100 vendors to implement RFID tracking on pallets and cases by January 2005. Hardgrave, who is also executive director of the Walton College's Information Technology Research Center, recently joined Wal-Mart's RFID team as an independent researcher to help find implementation synergies between the various links in the retail supply chain.

"Different businesses view the costs and benefits associated with RFID differently. Retailers have one viewpoint. Suppliers have another and transportation companies have yet another," he said. Retailers see RFID as their best tool for monitoring on-hand inventory and optimizing the amount of product they have sitting in a warehouse for any length of time while many suppliers seem to focus more on the added cost that RFID technology will add to product packaging. Transportation companies sit between the two, trying to balance the retailer and supplier requirements in a way that will improve their service while minimizing added costs.

"Despite their different perspectives, each type of company also shares common RFID issues with the other two," Hardgrave said. "My job is to work with all three of these constituents in the implementation process to help them realize the value in focusing on

their common goals first. When retailers, suppliers and transporters leverage and coordinate their efforts they can multiply the immediate benefits realized in the adoption of RFID.”

At its simplest, RFID consists of a read/write device called a “reader” that is networked to a computer system and one or more tags. A reader can identify more than one tagged object at one time. Tags contain a computer chip and an antenna embedded into a substrate material. The substrate varies depending on the intended use of the tag. Tags operating in harsh conditions – extreme heat or cold – may encase the chip in hard plastic. Tags meant for general tagging of cardboard cases likely will look like a regular label with the RFID components sandwiched between two layers of paper.

Tags may be passive, active or battery-assisted. Passive tags receive their operational energy from the radio waves sent by the reader to communicate with them. Active tags contain a small battery to boost the tags’ effective range. Battery-assisted tags utilize a battery to power tag electronics but not to transmit RF-energy. Lacking the need for external power, a battery-assisted tag reflects the maximum amount of RF-energy back to the reader to increase tag readability.

Tags may also be read-only or read/write. Read-only tags contain a unique identifier which the RFID-reader passes back to a logistics or inventory system. These systems monitor total product quantities and can help forecast when new product is needed.

An RFID-reader positioned near a stockroom door could identify a case of soap when that case goes out to the store floor. Another reader installed above a box crusher could confirm when that case is destroyed. Following these confirmations, the inventory system would interpolate that all the soap has been stocked and would change the status on that product from warehoused to stocked, triggering an automatic order for another case of soap.

Read/write tags may contain specific information about the object in addition to the unique identifier number. For example, a read/write tag on a case of frozen beef might record product temperatures during transit to provide a record for food safety inspectors.

While filled with promise, RFID technology does have limitations. The radio waves used to communicate between readers and tags attenuate in the presence of certain materials, such as dense liquids, which absorb the waves, and metals, which reflect them.

“Frozen meats, liquid laundry detergent and cans of coffee all present problems for RFID readers,” said Hardgrave. “Velveeta and canned soda, both liquids encased by metal, are especially problematic.”

Privacy advocates worry about the potential for companies or others to misuse the data collected from RFID-enabled products. Hardgrave believes he can help allay some of these concerns by dispelling popular myths about RFID.

“Much of the information concerning RFID in the popular press is misleading or simply not true,” he said. “These tags communicate only over very short distances and can easily be disabled. The idea of driving down the street and reading the contents of someone’s home is fiction.”