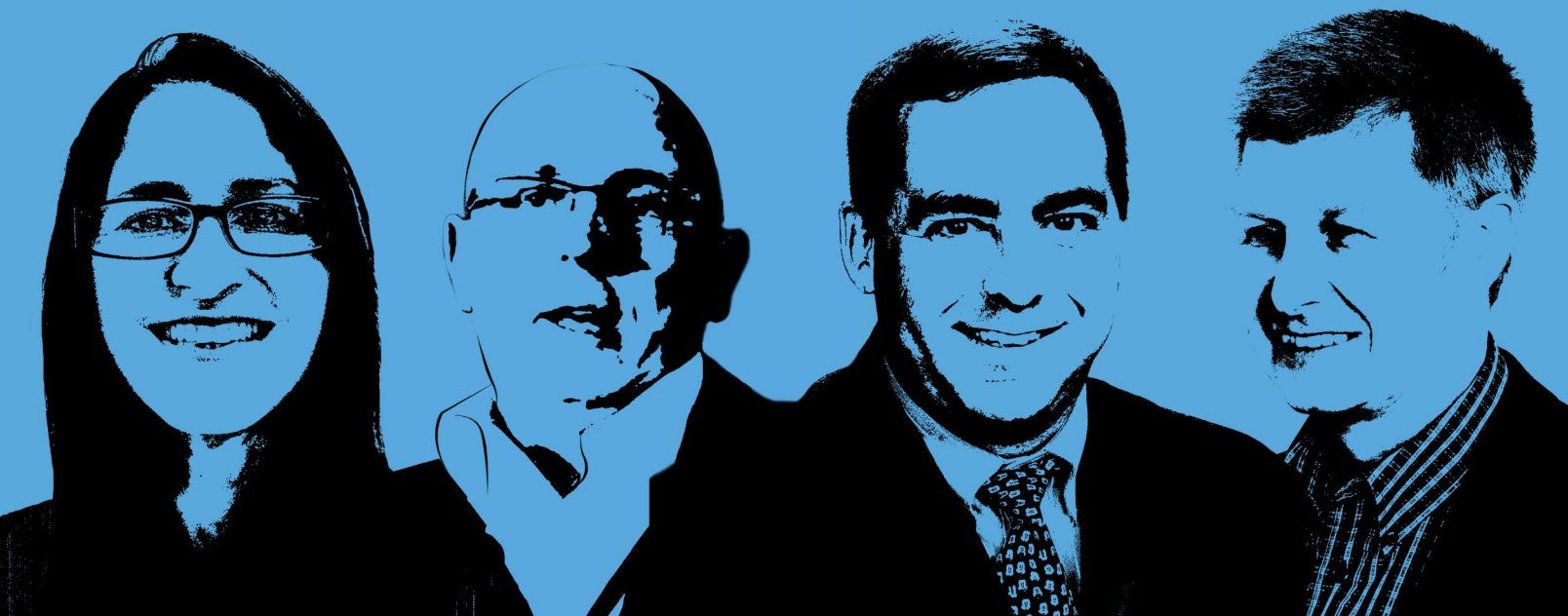


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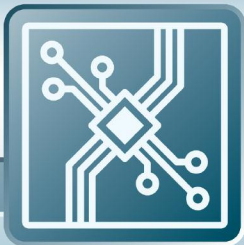
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WHAT IT TAKES TO

LEAD

AN RFID PROJECT



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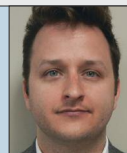
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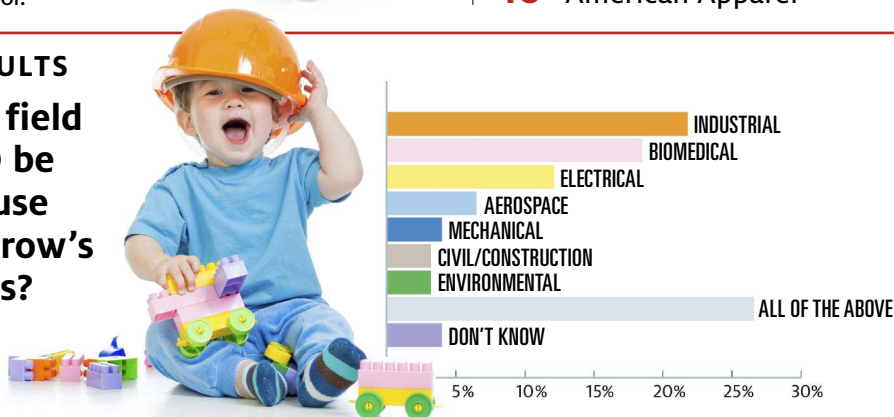


Find products that can help you deploy RFID successfully. Here's an example: Thanks to a USB interface, Tertium Technology's **IceKey** UHF reader lets you use PCs, notebooks and other devices to encode tags. It has an embedded antenna, 3 LEDs, a multitone beeper and a proximity sensor.



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- [SML Group Buys Software Company Xterprise](#)
- [De Wolky Shop Reduces Stock-Outs, Boosts Sales With RFID](#)
- [Microsoft Researchers Develop 3D Passive ID Tags](#)
- [RF Code, Vehnet Offer Solution for Managing Assembled Vehicles, Components](#)

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- 3 RFID problems
- 4 Construction
- 5 Safety and security
- 6 Walmart
- 7 Asset management
- 8 Tire tracking
- 9 Automotive applications
- 10 American Apparel



The Inside Scoop

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- What are the most popular RFID solutions for tracking data-center assets?
- How is RFID being applied in the mining sector?
- Are there any RFID UHF success stories involving hospitality and events?
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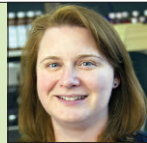






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Stepping Up

I'VE ALWAYS LOVED HISTORY. What fascinates me is how some men and women can lead others to accomplish great (and sometimes awful) things. In high school, I liked to discover the wide variety of skills people brought to bear on solving a problem or achieving a goal. Some leaders, like General Douglas MacArthur, were



groomed for their missions. Others, like President Harry Truman, rose to the occasion when circumstances thrust them into a leadership role.

Thankfully, planning and implementing a radio frequency identification project is not as difficult as launching a military campaign or rebuilding global geopolitical alliances after a major war, but it's not a simple matter, either. It's complicated by the fact that most companies do not have RFID experts on staff. Typically, someone

sees a problem RFID can fix, and he or she assumes the role of project leader.

In the coming months and years, many people in myriad industries will likely find themselves in such situations. To discover what the job entails, we asked the heads of four successful deployments to discuss the skills they called on and cultivated (see "What It Takes to Lead an RFID Project" on page 12).

It begins with the vision of a relatively new technology solving a problem or improving a process. It takes awareness that there will be obstacles or difficulties, and confidence that you will be able to overcome them. It takes patience. And it takes breadth of knowledge.

BP's Mike Haley led a project that developed

an RFID solution to make oil refinery maintenance procedures faster, safer and more accurate. Learning about RFID tags and readers was important, he says, but it was also essential to understand back-end systems.

Communication skills are crucial, says Vinny Pagliuca, who headed the development of an RFID system for managing costumes worn at Disney resorts. "The implementation of this project required so many different areas, teams and people to make it a success that without excellent partnering and communication skills... the project would have failed," he says.

Managing change and taking care of the "small steps" are among the lessons learned, says Fernando Matos, who led the development of an RFID solution to track engine overhaul components and tools at TAP Maintenance and Engineering, a subsidiary of Portugal's national airline. Betsy Cohen says implementing an asset-tracking system for Florida's Seminole County required a willingness to learn on the job and keep an open mind.

If you are thrown into an RFID project, remember that you are not alone. All four project leaders we interviewed say teamwork is essential—not only for the skills different people can contribute but also to earn colleagues' trust and cooperation.

I've had the privilege of meeting many RFID project leaders and learning how they accomplished their missions. You can, too, because we invite them to discuss their deployments at our LIVE! events. Cohen says attending the conference helps her keep up with RFID technology—and pick up project leadership tips.

Mark Roberti, Founder and Editor

DISASTER RECOVERY

GPS—and RFID—Mark the Spot



Studies show that passive RFID tags can speed up disaster recovery by cutting the time it takes to find buried utilities.

AFTER HURRICANE SANDY ravaged the northeast in October 2012, many businesses and residents in Connecticut, New Jersey and New York were without power for days or weeks. Part of the problem: The recovery crews searching for access to underground electrical switches and other equipment were hampered by the fact that streets near the shore were buried under mounds of sand and detritus from destroyed stores and homes.

Research being conducted at the Geospatial Research and Applications Center (GRAC) at Auburn University, in Alabama, suggests that a combination of GPS, radio frequency identification and magnetic locators could greatly reduce the amount of time required to find manhole covers, junction boxes, fire hydrants and other gear and utilities after a storm.

"About four years ago, we received a grant from the Economic Development Administration to mark assets near the beaches in the Gulf region, so they could be found after a storm," says Chetan S. Sankar, a professor at Auburn and founder of the GRAC. "We sent about 100 students to the region and recorded the GPS coordinates for some 12,000 elements."

But when a team from the GRAC returned to the Gulf to find the objects using GPS coordinates, locating them took a lot of time, even when there was no storm debris covering them. "GPS is just not accurate enough for practical purposes for locating buried elements," Sankar says.

An executive at Berntsen International, a Madison, Wis., manufacturer and supplier of aboveground, visible survey markers, read an article about the GRAC's work in the Gulf and contacted Sankar. Berntsen had created the InfraMarker, a rugged passive RFID tag capped with a magnet. The

InfraMarker RFID System uses a magnetic locator to find an underground asset and an RFID reader to identify the asset. In 2011, the Village of Thiensville, in Madison, Wis., began using the markers to track its force main sewer line (see [RFID Helps Prevent Sewer Disasters](#)). Berntsen wanted to see if its system could find buried assets faster.

Sankar's team conducted an experiment last fall in which it simulated a disaster-recovery situation, and sent students to find some assets with GPS alone, with just RFID and the magnetic locator, and with GPS, RFID and the magnetic locator together. "We found that combining GPS and RFID and the magnetic locator is the best way to go," Sankar says. "Within the time allotted, students located 91 percent of the targets using the combined technologies, 39 percent of the targets using RFID and magnetic locator technology alone, and only 19 percent of the targets using GPS alone."

This summer, the GRAC team is working with Riviera Utilities, in Alabama, to bury 50 infrastructure elements tagged with InfraMarkers. In the fall, teams of students will test whether the elements can be found more quickly with GPS alone or with GPS and the InfraMarkers. The teams will use Trimble handheld devices to read GPS data and Android phones equipped with RFID readers to check data from the InfraMarkers. Sankar expects the results to provide information on which combination of technologies works best to identify the elements fast and effectively.

Sankar's hope is that utilities around the country will take notice of the research and consider using RFID to identify critical infrastructure and assets. That way, the next time a storm as powerful as Sandy hits, utilities can get back up and running more quickly. —Mark Roberti

RFID Sensors in the Round

Researchers are developing a device that could monitor conditions in large or remote environments.

FUTURISTS HAVE ENVISIONED a day when low-cost radio frequency identification sensors will monitor soil conditions across large farms and gather data in hostile or remote environments, such as rivers contaminated with chemical spills and rain forests. But there's a basic challenge that must be met to make this vision

these wouldn't work on hard terrain.

Researchers at the Center for Nanoscale Science and Engineering at North Dakota State University, Fargo, have come up with a simple solution—a ball-shaped sensor with a near-isotropic antenna, which can be read from any direction with the same intensity. Michael

Reich, a senior research engineer and adjunct faculty member, and Layne Berge, a graduate student, have developed such a device and tested a proof of concept. They used a 3-D printer to create a structure just 5 centimeters in diameter to house a sensor, double dipole antenna and printed circuit board, and attached a conventional Alien Higgs-3 chip to the antenna. A concept sensor that incorporates a three-axis accelerometer has also been manufactured and tested.

"We are only getting about a meter to a meter and a half read range," Reich says. "Obviously, we

have some work to do to try to increase that."

To that end, Reich and Berge are looking for funding from private companies interested in developing sensors that could detect certain chemicals after a spill, moisture in soil or lack of moisture in wilderness areas prone to fires. "Right now, we're not focused on a particular application," Reich says. "We want to build a platform that could be adapted to suit a variety of needs."

The research is still in the early stages, but he and his colleagues seem to be on a roll. —M.R.



Michael Reich and Layne Berge display the ball-shaped sensor they developed and tested.

a reality: How do you deploy large numbers of sensors over a vast area?

One way would be to sprinkle RFID transponders with sensors from unmanned aerial vehicles or piloted aircraft. But this is problematic, because it would be impossible to control the orientation of a transponder's antenna so it could be read easily. Sensors could be designed to self-orient by weighting the bottom, but this would require more mass and probably more expense. Another option would be to create sensors with spikes, but



THE POWER OF NATURE

Number of electrical outages in the Northeastern United States in 2011 following Hurricane Irene:

5.5 million

Number of electrical outages in Japan in 2011 following a tsunami and undersea earthquake:

4.4 million

Number of electrical outages in Australia in 2011 following a cyclone:

170,000

Number of electrical outages in New Zealand in 2010 following an earthquake:

160,000

Number of electrical outages in Poland in 2013 following heavy snowfalls:

100,000

Number of electrical outages in Northern Ireland in 2010 following a blizzard:

30,000

—Rich Handley



PATENTS

Companies Back U.S. Bills to Fight ‘Patent Trolls’

With some patent holders suing companies that use RFID, end users are supporting efforts in Washington to revise the nation’s patent laws.

ONE SIGN THAT RADIO FREQUENCY IDENTIFICATION technology is catching on is the growing number of lawsuits claiming patent infringement. As with Wi-Fi and other technologies, patent holders see the growing RFID market and hope to make money by suing end users that have deep pockets.

But end users of RFID and other technologies are fighting back. Dozens of major U.S. companies signed a letter addressed to lawmakers in Washington urging them to pass bills they said would protect new products against “extortive demands” from patent holders. Among those companies were Wal-Mart and Macy’s; both are being sued

by Round Rock Research, a firm that owns ultrahigh-frequency RFID patents originally filed by semiconductor company Micron Technologies (see [Update on the Round Rock Patent-Infringement Lawsuit](#)).

Many companies feel they are being unfairly targeted by “patent assertion entities” (PAEs), which purchase patents with the sole purpose of suing users of technology that might or might not infringe on their patents. These firms are called, derisively, “patent trolls.”

In the letter to the leading Democrats and Republicans on the Senate and House of Representatives’ Judiciary

Committees, 44 companies urged the passage of bills that would reform the U.S. patent system. The letter says:

“Members of both parties, the White House, legal scholars, economists, businesses, and public and private organizations increasingly recognize the need to address the growing problem of patent abuse. Wasteful and often frivolous litigation is burdening businesses and innovators across America. We need to ensure that our patent system promotes innovation and job creation, not abusive litigation. Real and lasting patent reform must deal with both symptoms—lengthy, expensive, and abusive lawsuits—and causes, including the flood of low-quality business method patents commonly behind the current epidemic of litigation.”

The letter goes on to say that litigation brought by PAEs has exploded in size and scope, and now represents a majority of all patent litigation: “In 2011 alone, patent troll activity cost productive companies \$29 billion in direct payouts, and even more in indirect costs.”

Passage of the patent bills would broaden the power of the U.S. Patent and Trademark Office to review patents and invalidate any it determines should not have been granted. Today, the patent office has the power to review business-method patents that relate to financial services more aggressively than other patents. The proposed legislation would expand that authority to include all business-method patents, which are often used by PAEs.

This change in the law, the letter says, “would increase certainty for innovators actually bringing new products to market, who now face an increasing threat of extortive

demands based on low-quality patents.”

In a separate letter, 50 industry organizations—including the American Bankers Association, American Hospital Association, Consumer Electronics Association, Food Marketing Institute and National Retail Federation—pushed Congressional leaders to act on the bills, citing the same issues. “In 2012, trolls sued more non-tech companies than tech, spanning a wide range of American businesses,” the letter said. “We seek reforms to the current system that would significantly curb trolls’ ability to extort settlement demands from retailers, technology companies, small businesses, financial services institutions, state and local government entities, and many others who are today the targets of their outrageous claims.”

That letter goes on to state: “There is no single solution to this complex question, but meaningful reforms like [those in the bills and legislation proposed by President Barack Obama] would make it more difficult for patent trolls to continue their destructive business model. This broad support and the willingness of Congress to work across the aisle and across chambers on this complex issue is a testament to its importance.”

Senator Chuck Schumer, a New York Democrat, introduced the Senate version of the bills in May, and California Representatives Darrell Issa, a Republican, and Judy Chu, a Democrat, launched a similar measure in the House in July. These bills have not moved out of the committee stage for a vote in either the Senate or the House, but these letters could get Congress to act. —*Mark Roberti*

TECHNOLOGY

NFC—Not Just for Consumers Anymore

Companies are deploying Near-Field Communication technology in business applications once seen as the province of UHF RFID.

ACCORDING TO CONVENTIONAL wisdom, passive ultrahigh-frequency radio frequency identification, with its long read range, is the go-to technology for business applications. And Near-Field Communication, a short-range form of high-frequency RFID designed for

device-to-device communication, is strictly for payment and other consumer applications. Indeed, more than 100 mobile phone models now come with integrated NFC readers.

But as is often the case with RFID, the conventional wisdom is wrong. Even as NFC

5 NFC Business Applications

01 Argentine Winery Harvests Crops With RFID

At Bodega Norton Winery, vineyard supervisors use NFC-enabled smart-phones to read workers' smart cards and tagged containers, improving productivity.

02 Bergische Security Co. Gains Visibility via NFC

The firm uses NFC-enabled mobile phones and RFID tags to monitor security guards at its client sites.

03 Brigham and Women's Hospital Tests NFC RFID for Patient Bedside

The solution enables health-care staff members to manage the administration of medication at a patient's bedside.

04 Geotab Adds NFC RFID to Solution for Managing Fleet Vehicles

The technology allows a company to identify a vehicle's driver, as well as link that individual to details about the vehicle's operation.

05 RFID Helps Milano Malpensa Airport Complete Maintenance Work on Time

To make its repair and cleaning operations more efficient, the airport installed 50,000 tags to equipment and other objects, and issued RFID-enabled phones to all its maintenance workers.

carves its place as a payment solution and social-media tool (neither has neared the tipping point), it's beginning to make inroads in business applications. It won't challenge passive UHF technology as the predominant form of RFID used in the supply chain, manufacturing and retail stores for tracking and managing goods. But it offers some advantages that make it the best option for certain business applications.

NFC's short read range—just a few inches—reduces the possibility of someone eavesdropping on the communication between a mobile phone and payment terminal in a store and stealing valuable transactional data. Another advantage of NFC is its high level of security. NFC Type 4 tags have built-in encryption, as well as password-protected memory.

When French wine maker Chateau Le Pin was considering technologies to help it reduce counterfeiting of its wines, which average \$3,000 a bottle and can fetch as much as \$10,000, it turned to anticounterfeiting identification technology company Selinko. The Belgian firm offers an NFC solution consisting of a 13.56 MHz NFC-compliant RFID tag built into a wine bottle's label, an application for an NFC-enabled phone to capture that label's ID number, and a server to manage the collected data. Each NFC tag contains an encrypted, tamperproof digital certificate stored in the chip, and the communication between the tag and a reader is encrypted. This would make it very difficult for counterfeiters to copy the NFC tags (see [Chateau Le Pin Uses NFC to Ensure Its Wine's Authenticity](#)).

Le Pin could have chosen a UHF-based anticounterfeiting solution, but then the company, as well as the distributors and auctioneers that sell its wines, would have had to purchase UHF handheld readers or install fixed readers. Either option would have been expensive. With this solution, any NFC-enabled Android phone can be used to read the tags on the wine bottles and check their

authenticity. In addition, Le Pin's customers can use the application to make sure they are not investing in a bogus bottle.

Gentag and Advanced Health & Care (AHC) recently introduced a low-cost NFC solution for managing services supplied by home health-care providers. The system consists of an NFC-enabled mobile phone designed by Gentag and software from AHC, a supplier of IT solutions for out-of-hospital and home health-care provider organizations. It is being used by home-care providers working for the Bath and North East Somerset branches of Bluebird Care, in the United Kingdom.

Providers of home care typically have to document services performed in order to be paid by government agencies or insurance companies. Before Bluebird adopted the NFC solution, home-care workers reported visits by means of landline phones. Calling the office was a time-consuming process, and

many patients did not like workers to use their phones.

With the NFC solution, a health-care worker can tap an NFC-enabled phone against an RFID tag installed in a client's home, to indicate when he or she arrives and leaves. The data is transferred over the cell network to the provider's back-end system. The software collects data regarding visits and provides the worker with details about the tasks to be completed at each site (see [Gentag and AHC Debut NFC RFID Solution for North American Home Health Aides](#)).

NFC's short read range makes it best suited to business applications in which individuals are reading a small number of tags. While it's not likely to replace business applications in which data can be captured automatically, without human involvement, companies might find it an attractive complement to UHF RFID in their operations. —M.R.

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WHAT IT TAKES TO LEAD AN RFID PROJECT

The heads of four successful deployments discuss the communication, financial, organizational and technical skills they called on and cultivated.

BY JOHN EDWARDS

RADIO FREQUENCY IDENTIFICATION is a relatively new technology, so most organizations do not have any staff members with RFID in their job descriptions. That means when a plant manager suggests deploying RFID to improve manufacturing efficiencies or a marketing exec comes up with a great idea for using the technology at a promotional event, he or she is often thrust into the role of RFID project leader.

This can be a daunting challenge for someone who is not a technologist and knows next to nothing about radio frequency systems. *RFID Journal* asked four project leaders who led successful deployments to share the challenges they faced, the skills they relied on and the lessons they learned. While they span a variety of industries, occupations and backgrounds, all

had one thing in common: a rock-solid commitment to completing their mission on time and within budget.

While all four are proud of their accomplishments, they're the first to admit there's no glory without pain. It was only through careful research, paying close attention to detail, and winning the loyalty of colleagues and the confidence of management that they were able to create an RFID system that met every project goal.

BLAZING A DETAILED TRAIL TO INNOVATION

Mike Haley was a consultant in the chief technology office of BP's Information Technology & Services group when the oil



and gas firm introduced a general companywide track-and-trace initiative designed to apply new technologies to an array of business challenges. As Haley held workshops with management at BP's refinery in Gelsenkirchen, Germany, about track-and-trace capabilities, isolation tracking emerged from the collaborative discussions as a potential high-value target. Haley introduced the Gelsenkirchen refinery's management to RFID, and the CTO decided it would be natural for him to manage a project that emerged from the discussions he led.

"Coming up with the idea was the first thing," Haley says. "We then had to prove to them that this was worth doing." He did that and more, leading the development, testing and implementation of a brand-new RFID application. The system,

called Isolation Tracker, was deployed in September 2010 at the Gelsenkirchen refinery. Isolation Tracker makes isolation processes—a key part of a scheduled maintenance procedure that requires sections of the refinery to be shut down—faster, safer and more accurate. (The solution won the 2012 RFID Journal Award for Most Innovative Use of RFID; see [BP Refines Maintenance Operations](#).)

As RFID system planning began, Haley says, one of the most important decisions he made was to create an internal crossfunctional team. He and Lothar Berger, site IT manager, carefully selected team members who would enable key stakeholders to understand project requirements and identify potential benefits and challenges. They also knew man-

agement support would be vital to the project's successful implementation and operation.

Business development and relationship skills were essential to gain funding and support, Haley says. "Vendor management expertise was important to orchestrate the work of several suppliers, and, of course, problem-solving abilities, leadership skills and good communications were all basic requirements for success." He and Berger worked tirelessly to keep the yearlong project on track.

During any initiative's planning, testing and deployment stages, a project leader must pay close attention to system details. This is particularly true for a company like BP, which operates facilities that produce and handle hazardous materials. "If we find a technology

deadlines, Haley says. It takes the skill and coordination of an orchestra conductor to ensure that personnel and contractor schedules mesh seamlessly and project work doesn't interfere with ongoing business activities. "It's a big challenge," Haley says, "whether you're on a platform in the middle of the sea, in a refinery or at a chemical plant."

ORGANIZING A CAST OF CHARACTERS

Many project bosses feel like they're leading a cast of characters as they work closely with colleagues and partners to develop an effective and reliable RFID solution. For Vinny Pagliuca, director of creative costuming at Walt Disney Parks & Resorts, in Lake Buena Vista, Fla., dealing with some of the world's best-known characters was key to implementing an RFID solution for managing costume inventory.

"I wasn't actually selected to lead the project," Pagliuca says. "By default, the project fell completely under my responsibility, so essentially the project was self-generated by my costuming team and, hence, I was the de facto leader."

The RFID solution is a revamp of a bar-code-based costume inventory system called the Garment Utilization System (GUS). The installation uses EPC Gen 2 passive ultrahigh-frequency RFID tags to track \$100 million worth of costumes and uniforms at the company's theme parks as well as on its cruise ships. GUS also enables a worker to quickly locate a specific garment within a storage room, bring it to an RFID-enabled self-service kiosk, present his or her ID badge and then walk away with the outfit.

GUS might sound like a simple system, but efficient solutions based on sophisticated technologies nearly always look easier than they really are. Developing GUS required Pagliuca to take on a task many managers would shy away from. "Just like the post office, which handles millions and millions of pieces of mail each day, we deal with thousands and thousands of garments," he says. "It's a lot of clothing each day that we can't afford to lose."



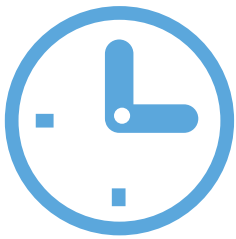
It's essential for a project leader to set and then accurately manage benchmarks and deadlines.

—MIKE HALEY, BP

and it appears useful to us, I will often have to take it to an 'intrinsically safe' specialist company to have the device either remade or rebuilt so we can ensure it meets our stringent certification process," Haley says. "This is true even if it's only a simple RFID tag."

Haley notes that an understanding of end-to-end technical requirements was critical to the project's success. "That included not only an understanding of tags, readers, Wi-Fi, handheld devices and application integration but also of the unique challenges involved in deploying these technologies in a harsh, heavy metal refinery environment with requirements for intrinsic safety," he says. Having knowledge of back-end systems, and how to efficiently interface RFID with those assets, was critical as well, he adds.

It's essential for a project leader to set and then accurately manage benchmarks and





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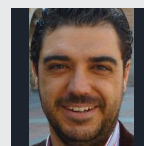
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Pagliuca believes that partnering and communication skills were most useful in organizing and managing the project. "The implementation of this project required so many different areas, teams and people to make it a success that without excellent partnering and communication skills, none of which had any bearing on the technical success of the system, the project would have failed," he says.

"Solving problems as they arose required a great deal of personal tenacity," Pagliuca adds. "The tenacity factor really tied to fighting through all the pitfalls we found. Keep in mind, we had to communicate a change in our costuming issue process to over 50,000 cast members in over 25 different locations."



"Without excellent partnering and communication skills, none of which had any bearing on the technical success of the system, the project would have failed."

—VINNY PAGLIUCA, WALT DISNEY PARKS & RESORTS

Still, before an initiative is green-lighted, a project leader needs to become familiar with RFID technologies, standards, practices and trends, by reading publications, attending conferences and participating in webinars. In-depth research helped Pagliuca determine which technologies were best suited for this particular system. He is pleased that he opted to base the system on UHF technology rather than HF components. "Luckily, we made the right call; if we hadn't, I think we would have fallen behind the curve and found ourselves trying to change out the technology," he says.

A deep knowledge of RFID also helped Pagliuca understand system requirements and accurately interpret trial results. "Although I could not necessarily get in and tell everyone what frequency we needed to make the antennas work well, or the exact distance the garment needed to be in relation to the readers, I did have

quite a good deal of familiarity with all the parameters that needed to be tested," he says. "I had visited multiple locations where RFID tags were in use and multiple testing locations where RFID tags were being produced and, all things considered, probably had the best balance among the needs of our operators, our IT group and our cast members, the users." Pagliuca says he also surrounded himself with a team of experts, including technical experts, who could answer deep technical questions as they arose.

One of the biggest technical challenges Pagliuca faced was finding tag locations that would ensure fast and reliable reads on garments ranging from Mickey Mouse costumes to Cinderella gowns and restaurant wait staff uniforms. "If we couldn't sew it in, we had to figure out a way to either heat-seal it in or put it in a pouch, and then somehow get the pouch to adhere to the garment itself with a belt or something else," he says. "We actually had to create a manual on RFID placement."

As project leader, Pagliuca also had to be a business and finance expert, capable of proving that a particular solution really could deliver value to the organization. "To secure funding for the project, we prepared a cost/benefit analysis with an internal rate of return of 25 percent, to be achieved through improved inventory management and labor efficiencies," he says. "Potential benefits were quantified with targeted savings over the next five years."

TAPPING INTO YOUR INNER GURU

In 2007, TAP Maintenance and Engineering (TAP ME), a Lisbon-based subsidiary of TAP, Portugal's national airline, began planning a solution to help its staff reliably track and organize the expensive and easy-to-lose engine components used during engine-overhaul operations. At the same time, TAP ME began studying how RFID could be used to increase the speed and efficiency of complex, labor-intensive operations involving the removal, processing and reassembly of hundreds of different and sophisticated components.



Under the leadership of Fernando Matos, TAP ME's head of information technologies, those two initiatives coalesced into TAP ME's Mobile Enabled Engine Repair Application (MEERA). Matos, who guided the project from inception to completion, continues to monitor its operation and plan future improvements. "MEERA is now helping us get more data for efficient engine workshop management," he says. (See [Portuguese Airline TAPs Into RFID](#).)

It's up to the project leader, at key stages during planning and deployment, as well as after system launch, to ensure that anticipated goals are being met. "It is one thing to plan what the system is going to do," Matos says. "Then, you have to really start measuring the key performance indicators and check to see if everything is really OK."

Matos says he and his colleagues learned many lessons while shepherding MEERA to deployment. They found, for instance, it's best not to approach such an important and complex project with blind optimism. Seemingly small details, such as tag and reader placement, can take days—even weeks—to refine and perfect. "One must really take care of the small steps," Matos observes.

Besides serving as a business, financial and technical guru, a project leader must also become a teacher, motivator and diplomat. "You sometimes, for instance, have to force production staff to use new methodologies, new processes and new technologies," Matos says. "If you have someone who has been trained for 20 years doing something one way and you suddenly tell him he's now got to do it a new way, if he is not confident on the new system he will keep doing things the old way."

LEARNING ON THE JOB

The purchasing division of Florida's Seminole County is responsible for managing some 10,000 tangible assets, from hospital cots to bulldozers and office equipment. "A few years ago, we were hit very badly with budget constraints, and the property administrator position was eliminated," says Betsy Cohen, a

county procurement supervisor. "That forced me to look into ways to be more effective."

Cohen knew that an adjoining county was planning to implement an RFID asset-tracking system. "So I started looking into this," she says. Cohen soon found herself assuming the role of an RFID project leader. "The project was my idea and my initiative," she says. "We were able to piggyback that [county's] particular contract. We met with the company representative, and we thought that [the solution proposed] was something feasible for the county."

In 2011, Seminole County deployed an RFID asset-tracking system that has slashed the procurement department's workload, as well as the workloads of other county departments that use

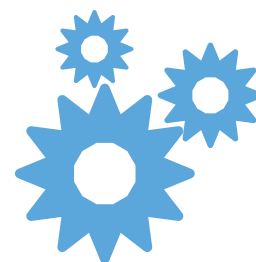
"You sometimes have to force production staff to use new methodologies, new processes and new technologies."

—FERNANDO MATOS, TAP ME

the same assets (see [RFID Helps Florida's Seminole County Manage Equipment](#)). Achieving that goal required Cohen's willingness to learn on the job and keep an open mind.

One of the first tasks Cohen faced was learning how inventory processes work within an organization. "This was very important, especially in the process of extracting the data needed to comply with the county policies and procedures, as well as fixed assets mandates," she says. To ensure the deployment would mesh well with the county's accounting software, Cohen also had to become familiar with the budgetary aspects of inventory maintenance and depreciation.

To learn about RFID, Cohen attended [RFID Journal LIVE!](#) and participated in webinars. "I educate myself as much as I can to keep up with changes in the technology," she notes. There was an additional benefit to hearing conference speakers discuss their deploy-



ments—Cohen picked up helpful RFID project leadership tips.

Operating from a well-thought-out strategy and plan of action was critical to the project's success, Cohen says. For the most part, system planning, which Cohen worked on with Kellen Erlandson, Seminole County's asset-management coordinator, proceeded without any significant hitches, though they did hit a major problem. Since the procurement department wanted to track nearly everything the county used, tag attachment emerged as a critical issue.

"With office equipment, you can just peel and attach an RFID sticker, since these items won't be handled much or moved from place to place," Cohen says. Road equipment, on the other hand, required tags that could withstand

continue when we encountered rough times before, during and after finalization of the project," she says. "It was important to separate feelings and emotions from the process and to concentrate on the goal," she says. "Changes are not necessarily well-received, and we needed to embrace change with caution."

Shortly after the system was deployed, Cohen found herself dealing with a number of skeptical county employees who felt the technology was designed to spy on them. "When we first started tagging the vehicles, the workers in the field thought it was GPS and that we were tracking where they were going," Cohen says. "We simply explained that this is not a GPS system—it's just a way for us to inventory their truck or their car."

Cohen takes pride in the way her system is helping the county become leaner and more efficient. "It's a lengthy process at the beginning, but the outcome is so beneficial to the organization," she says. "As a governmental entity, we are responsible to the taxpayers, and it is a good feeling when you have an inventory [database] that matches the financial system."

When a project leader succeeds by helping his or her organization create a highly functional and productive RFID system, the word spreads rapidly. Seminole County learned a few months ago that news of its inventory tracking solution had traveled all the way to Russia. "We received a request from a delegation from Russia," Cohen says. Twelve representatives soon arrived in the county. "We were very excited," she says. "They were very interested in our system, especially in the public-safety arena, where we tagged everything that's inside fire rescue."

Cohen, like the other RFID leaders profiled in this story, understands that it takes teamwork to deploy a successful RFID solution. From the first day of planning, Cohen strived to create a feeling of teamwork within every employee involved in and touched by the project. "By including and making them feel part of the team, we were able to gain cooperation and collaboration from them," she says. "We couldn't have done it without their involvement and their input. We are very proud of ourselves." ■



Operating from a well-thought-out strategy and plan of action was critical to the project's success.

—BETSY COHEN, SEMINOLE COUNTY

Florida's heat, humidity, water, dirt, stones and other environmental threats. "We needed to find something more durable, and we needed to find a way to attach the tags," Cohen says. She inspired her team and partners to become innovators. "We decided to attach sealed tags to the road equipment using a galvanized cable and clamp. This works very well," she adds.

"In a project of this magnitude, we needed to keep an open mind, admit wrong and embrace change," Cohen explains, noting that the project required making decisions that would affect many county departments and divisions. "We needed to be sensitive to others and to know those within our sphere of influence and understand their needs."

It was also essential to maintain a positive attitude, even when jolted by unpleasant surprises, Cohen says. Keeping an upbeat approach "influenced and inspired others to

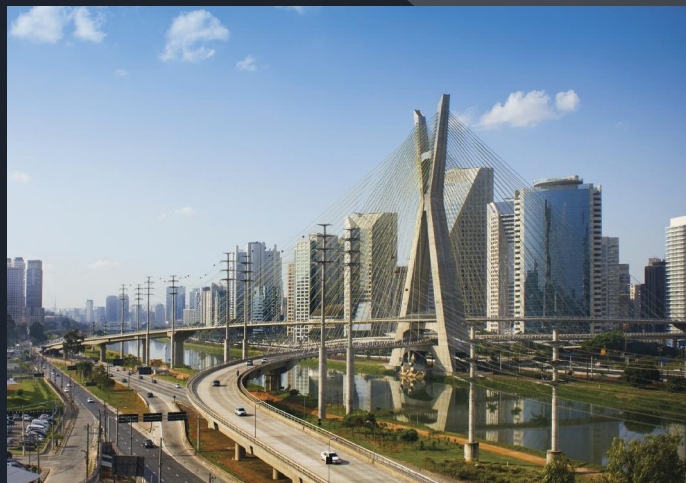




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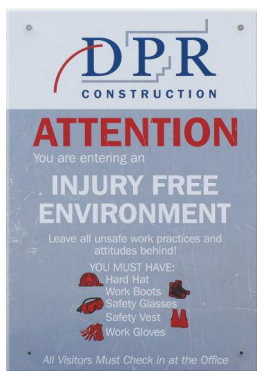
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BUILDING TRACKING **A CASE FOR** **CONSTRUCTION** **MATERIALS**

Increasingly, contractors are using RFID to improve safety and security on job sites. But interest lags when it comes to tagging supplies for authentication, though counterfeiting is an industrywide problem.

BY MARY CATHERINE O'CONNOR

|



TOP PHOTO: ISTOCKPHOTO | INSET PHOTO: MARY CATHERINE O'CONNOR

DURING THE PAST DECADE, the University of California at San Francisco, dedicated to the health sciences, has transformed the Mission Bay district along the city's eastern shore. The 57-acre campus has grown into a biotechnology hub for academia and industry. The university's current project, the UCSF Medical Center at Mission Bay, broke ground in 2010 and is scheduled to open in 2015. The complex will include three hospitals—children's, women's and cancer—and

is designed to be energy efficient, meet the state's seismic regulations and provide an urban oasis for the public.

To manage the project, the university took an innovative and collaborative approach to the design and construction of the new medical center. Called integrated project delivery, it involves architects, contractors, engineers and others working as a team to manage processes and production. In this case, 23 firms are working together at the construction site.

That means on any given day, as many as a thousand workers enter and exit the 900,000-square-foot site daily. To help keep all those people safe and secure at the work site, DPR Construction, the project contractor, worked with Trimble's ThingMagic division to implement a passive ultrahigh-frequency RFID-based access-control system. DPR installed RFID reader turnstiles at the site's entrances and exits. The contractor divided the construction site into 19 zones, with RFID fixed readers at the entrance to each zone.

Personnel from the different companies are issued RFID-



DPR Construction monitors the 900,000-square-foot construction site for the UCSF Medical Center with an RFID access-control system. The solution bolsters security and improves worker logistics.

enabled identification badges that allow them to enter only the work areas they are authorized to access. The security solution also prevents unauthorized personnel from entering the site. In addition, it lets DPR monitor in real time each person's location, by zone, in the event of an emergency that could require an evacuation or a search-and-rescue operation.

DPR says the RFID solution has bolstered security while reducing related costs. At other job sites, the contractor has to hire security guards and supervisors to manually track workers, a time-consuming process. What's more, the solution has improved worker logistics. By knowing how many people are deployed onsite daily, and where work has been performed, subcontractors can plan their schedules more efficiently and ensure they are not overstaffing or understaffing the project.

Indeed, securing construction sites has emerged as one of the key drivers of RFID in the construction industry. Some construction

firms are also beginning to employ RFID to track equipment and materials to improve job-site operations.

But while these applications deliver substantial benefits, the construction industry is historically slow to embrace new technologies, says Todd Sutton, a business unit manager with San Antonio-based Zachry Construction, which provides construction, maintenance and program management for large-scale projects in the public and private sectors. Sutton believes the only way construction companies are likely to deploy RFID on a large scale is if the technology proves to be effective in fighting counterfeiting, a problem that plagues the industry. He and other industry experts are trying to convince stakeholders, including supply-chain partners, contractors and building managers, that embedding RFID tags in construction materials at the point of manufacture can thwart counterfeiting and enable other benefits, resulting in a return on investment.

PHOTO: MARY CATHERINE O'CONNOR

MONITORING CONSTRUCTION SITES

There's a general consensus among those involved that using RFID to control access to construction sites, which tend to be busy, noisy and often chaotic environments, can improve safety and security. But finding the most appropriate tags and readers requires balancing cost and performance. DPR opted to use a passive UHF access-control system. Turner Construction

plans to monitor workers at six construction sites, in San Antonio, Tex., with a passive UHF solution from ADR Software (see [ADR's RFID-Enabled Workforce Monitoring Service Keeps Tabs on San Antonio Construction](#)).

Consolidated Contractors Co. (CCC), a \$5 billion construction company that employs a workforce of 100,000 individuals for projects worldwide, is testing both passive RFID tags and more expensive, active tags for automat-

Hong Kong Housing Authority Issues RFID Mandate



Passive RFID tags embedded in precast concrete facades let contractors track when they are delivered and installed.

In 2007, the Hong Kong Housing Authority, which implements the region's public housing projects, began studying how it might use RFID to control the quality of important building materials, track the building process and make building maintenance systems more efficient. It initiated a pilot program to examine the effectiveness of embedding passive RFID tags in precast concrete facades used in its residential buildings. Today, the agency requires all its contractors to attach an RFID tag to each precast concrete facade, as well as to every wooden door, aluminum window and metal security gate they install.

The RFID mandate was issued in early 2012, says Vincent Chau, senior structural engineer on the agency's Components and Materials team. The first residential apartment block to be constructed with all RFID-tagged components is due to open in mid-2014. With approximately

1,600 flats, the housing block will contain roughly 18,000 RFID tags.

Contractors are required to use passive tags encoded with a unique identifier compliant with the GS1 EPC G1AI-96 standard. They are free to select the RFID supplier and component manufacturers, but the tags must be mounted at designated locations on or in specific components. Contractors also must collect logistics and manufacturing information, and keep it associated with each unique tag ID, along with the date and time each component was delivered to the site (by reading the tag upon receipt of the component) and the date and time the component was installed in the building (again, by reading the tag).

Contractors must then deliver these electronic records to the Housing Authority through a Web-based interface, to enable the agency to track the components through the supply chain and into service in the building. "Whenever there are latent defects or major quality issues, the [RFID] data enables us to quickly retrieve essential background information," Chau says.

Tracking building components is not the Housing Authority's first foray into RFID. In 2010, the agency's Estate Management Division began attaching RFID tags to important safety and security devices, such as water pumps, fire alarms, electricity generators and closed-circuit television cameras. The Housing Authority's maintenance contractor has already attached tens of thousands of passive tags to these assets in existing housing blocks, and adds them to the devices in new blocks as they are constructed. Contractor employees carry handheld RFID readers to collect tag data from these devices during regularly scheduled inspections as well as repairs. The tag data is stored, along with the maintenance and repair logs, on a central server the Housing Authority can access to confirm the devices' proper functionality or to re-search their repair history in the event of an accident or security failure.

In addition, as new housing blocks are constructed, the Housing Authority is using RFID tags mounted on trucks to track the removal and disposal of demolition materials and other waste. —M.C.O.C.



The ability to track assets helps construction companies complete projects on time and within budget. Here, a worker equipped with an RFID handheld reader uses the Jovix system to locate snow-covered pipes.

ing attendance tracking. With an average of 5,000 workers needed over the course of a large construction project, the firm wants to speed up the process of accounting for all personnel, which involves checking each worker's ID at the beginning and end of each day and when workers leave the premises for lunch.

CCC conducted a pilot project in Abu Dhabi this year that revealed UHF passive RFID tags attached to employee badges could not be read consistently. They found similar results with battery-assisted passive tags. There was simply too much interference from the environment and the workers' bodies.

CCC then deployed an active RFID access-control system to monitor 500 workers at a job site outside Abu Dhabi. The readers used to collect the data, which are mounted near entrance and exit gates securing the site, are solar-powered. The system also lets CCC verify each worker's time sheet and show its client the labor budget is being spent properly. The

active system provides superior performance, and it saved the firm \$6,500 per month by eliminating manual checks of each employee badge, says Firas Hijazi, a manager of information systems at CCC. But, he adds, the high cost of active tags remains a hurdle.

The Abu Dhabi site will require 4,000 workers, so CCC plans to issue lower-cost passive RFID tags, attached to each employee's hard hat, with passive UHF readers mounted near entrance and exit gates. Meanwhile, the firm continues to test various tags, as it searches for the most reliable and cost-effective solution, Hijazi says.

WorleyParsonsCord, a general construction contractor, has been providing equipment and services to the booming oil-sands industry in Edmonton, Canada. To keep 1,000 workers safe at one of its assembly yards, the company worked with John Rustenburg, owner of CJR Backup Safety Solutions, to deploy a Scan-Link system designed to prevent accidents. Em-

PHOTO: JOVIX

employees wear RFID-tagged hard hats and safety vests that communicate with RFID readers mounted inside forklifts and other heavy-duty vehicles. The active RFID technology improves on incumbent sensor-based safety systems used in more than half the heavy-duty vehicles on most sites to give drivers audio alerts when they sense obstructions behind the vehicles, Rustenburg says.

“Those systems alert drivers even when a bird or another vehicle is detected,” Rustenburg says. “The drivers become complacent, and they start to hear it as noise pollution.” Scan-Link alerts drivers only when another employee, wearing a Scan-Link tag, is behind the truck and therefore obscured from the driver’s view. “No one wants to back up a forklift and hit a parked truck, but you can replace that,” he says. “But no one wants to go to an employee’s spouse and say, ‘he is coming home with a leg missing’ or ‘he’s not coming home at all.’”

MANAGING CONSTRUCTION EQUIPMENT AND MATERIALS

RFID is also helping construction companies complete projects on time and within budget by ensuring supplies, tools and equipment are located at the right place when workers need them. Atlas RFID Solutions, for example, recently introduced its Jovix system designed to track assets through the supply chain to construction sites. The materials-management solution lets multiple parties—from project owners to engineering firms, contractors and suppliers—access a database to locate assets quickly. The company reports that the solution enabled one of its customers to cut staff at a lay-down yard by nearly 80 percent (see [RFID Tracks Assts at Canada’s Oil Sands](#)).

Some large structures are built with prefabricated pieces scheduled to be delivered to the construction site shortly before installation. Typically, these modules are tracked manually with paper invoices, an error-prone process that often leads to costly delays when either the wrong modules are delivered or the

items don’t arrive on time.

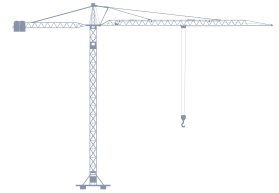
Gammon Construction has been using an RFID solution from Tecton to tag and track the structural steel components it manufactures and sells for government and private projects in Hong Kong, such as the Opus Hong Kong, a luxury Frank Gehry-designed apartment building. The company reads the Xerafy tags, designed for optimal use on or near metal, at the point of manufacture and again at the job site, to track proof of delivery. The solution can also help contractors comply with recent requirements issued by the Hong Kong government to track building components (see “Hong Kong Housing Authority Issues RFID Mandate” on page 23).

CONSTRUCTION’S KILLER APP

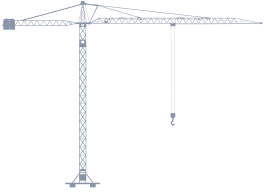
More contractors might begin tracking assets on job sites if they received tagged supplies from manufacturers. And monitoring tagged products as they move through a long, complex supply chain could help verify the quality and authenticity of construction materials, which is a universal concern. Take, for example, the defective drywall that sickened thousands of U.S. homeowners from 2001 to 2008 and caused many to have to move out of their newly constructed homes. The drywall was branded as a U.S. product, but it had originated in China and contained a filler material that hosted bacteria that caused the products to release hydrogen sulfide gas, which led to sicknesses ranging from nosebleeds to respiratory illness.

In 2011, the Construction Industry Institute (CII), a global consortium of more than 100 leading owner, engineering-contractor and supplier firms from both the public and private arenas, surveyed its members and found that 76 percent of respondents have been affected by counterfeiting. What’s more, of all the counterfeit items discovered within respondents’ supply chains, more than 80 percent came from “approved vendors.”

RFID-tagging construction materials at the point of manufacture would enable companies to authenticate their products, says Zachry



In 2011, the Construction Industry Institute surveyed its members and found that 76 percent of respondents have been affected by counterfeiting.



“One of my goals, and one reason I work with Fiatch, is to promote the integration of RFID sooner rather than later.”

— TODD SUTTON,
ZACHRY CONSTRUCTION

Construction's Sutton. He and Reg Hunter, senior project manager at Fiatch, a consortium of engineering and construction industry leaders, are actively meeting with manufacturers to show them how embedding RFID tags in their products would provide a means to authenticate product, as well as gain a competitive advantage through the value the tags represent to contractors and building owners.

They are trying to reverse the perception that there is an unclear return on investment from deploying the technology. That was one of the findings from a 2011 survey of nearly 150 construction industry stakeholders conducted by David Grau, an assistant professor at the College of Engineering at the University of Alabama, to gauge the state of adoption of RFID and other auto-identification technologies. The survey found that while academic reports have long been singing the praises of these technologies for boosting efficiencies and savings costs in the construction industry, there is a significant gap between research and reality. “We set out to find the barriers and opportunities to accelerate deployment of RFID technologies,” Grau says. In addition to concerns about ROI, he notes, there is a lack of support for the technology among the various parties leading a given construction project.

In 2010, *RFID Journal* reported that Newmans Valves, a Texas-based company, was RFID-tagging valves produced at its factory in Yangchen, China, to assure customers they were buying authentic products and not counterfeits. Sutton and Hunter want to see this practice spread to all manufacturers that make valves, as well as the other most commonly counterfeited construction items, including steel, fasteners, pipes and circuits. They say the industry already has an electronic data-sharing infrastructure that can be leveraged for sharing the unique identifier that would be encoded to each tag, providing a means for all parties in the supply chain and end users to verify its authenticity.

“One of my goals, and one reason I work with Fiatch, is to promote the integration of

RFID sooner rather than later,” Sutton says. The bigger goal, he adds, is to get all stakeholders, from manufacturers to project owners, to understand the value RFID provides. While Sutton has experience with active RFID technology, he believes standardized passive UHF tags are the only solution, because of their lower cost and long life. (Several years ago, Zachry Construction participated in a pilot with Fiatch, in which they used active tags to track assets inside a lay-down yard at a job site.) Plus, a standard approach will keep costs down for each party that wants to track materials. “At a job site, I once saw a fabricator attaching active tags to material that was already carrying passive tags,” he says, “but because they did not have passive readers, they could not utilize the tags.”

Despite slow adoption rates, Sutton is encouraged by how much he has seen passive RFID systems mature. “A lot of people perceive passive RFID tags as no different from bar codes, which is not true,” he says. “The read range on UHF tags is far greater than it was five to 10 years ago. Now, we can get 60- or 100-foot reads from passive tags.” But, he adds, “end users do still find active tags superior for some applications, based on RF interference or other factors.”

Interest in leveraging RFID for improving traceability throughout a building's life cycle is growing in Hong Kong and throughout the developing world, says Evelyn Ong-Halboth, Xerafy's sales director. “More governments should [require vendors to] use RFID, because it helps them know who to hold accountable for using low-quality materials,” she says.

DPR, CCC and other construction companies are convinced RFID can improve employee security and safety, which is no surprise to Fiatch's Hunter. “In the capital projects industry, if you can improve safety, you almost automatically get a hall pass and the technology gets adopted,” Hunter says. Convincing manufacturers and building owners they can use RFID to fight counterfeiting and improve construction and building maintenance, he says, will take more work. ■

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A Gem of a Solution

By Minda Zetlin

RFID providers have developed complete inventory-management systems for monitoring jewelry items in the supply chain and in retail stores.

IN SOME INDUSTRIES, making the case that radio frequency identification can deliver a return on investment takes careful calculation. In the jewelry industry, the financial benefits are quite clear. Gem dealers and jewelry-store retailers must manually track thousands of small, high-value items daily, a time-consuming and error-prone process. RFID providers have developed complete solutions—with tags, readers and software designed for monitoring gems and jewelry—that automate the process, reducing the amount of time required

to take inventory, eliminating shrinkage and freeing up salespeople to help customers.

Moreover, these jewelry inventory-management solutions are delivering a fast ROI. In 2012, for example, Borsheims, a Berkshire Hathaway-owned jewelry retailer in Omaha, Neb., deployed the ZeroShrink RFID solution from TJS. The system has already paid for itself, says CFO Erin Limas (see [RFID Eliminates Shrinkage at Borsheims' Jewelry Store](#)). In 2011, the Steinmetz Diamond Group, based in Geneva, began using



a SpaceCode solution to track, manage and secure tiny, highly valuable gemstones. The system began paying benefits almost as soon as it was taken live, says CFO Pavlo Protopapa (see [A Diamond Ping](#)).

A jewelry retailer or gem dealer that has never had an item misplaced, lost or stolen can benefit from RFID's labor savings, says Michael Liard, VP of auto-ID at VDC Research. "A jewelry store has to take inventory at least once a day, and may do it several times a day," he says. "Doing that in a manual fashion is time-consuming and takes employees away from other tasks." With RFID, an employee can quickly inventory tagged items by passing a wand or handheld reader over jewelry displays.

Shelf-mounted readers in display or storage units can provide inventory information on demand. "Jewelry retailers are very interested in that," he adds.

Some providers offer RFID-enabled pads or trays that salespeople can use to present an item to a customer. Some of these readers come with screens that can display information about the item.

Inventory management is one of what Liard calls the "layers" of value proposition for RFID in the jewelry industry—the many ways in which RFID can deliver an ROI. Another layer, he says, is access control. "Many times, display cases are individually locked for added security. With RFID, you can equip each employee

With the ZeroShrink RFID solution from TJS, an employee can quickly inventory tagged items by passing a handheld reader over jewelry displays.

TrachTech Systems' box reader can identify jewelry items that are packed on trays or in bins.



“Now that the industry is reducing costs, there’s an opportunity to benefit from RFID for your local mom-and-pop jeweler.”

—Michael Liard
VDC Research

with an access-control card that unlocks the case, so he or she can open it without having to dig out one of 10 keys for 10 cases.” That also lets management see how often employees are accessing cases, and who opened which case last. “There’s an additional level of security,” he says.

RFID in the retail jewelry industry is now in its “next wave” of interest, Liard says. “Historically, it’s been used in Europe,” he says. “Where you do get a lot of interest in the United States is in very high-end jewelers in key markets such as Las Vegas. But now that the industry is reducing costs, there’s an opportunity to benefit from RFID for your local mom-and-pop jeweler as well.”

Providers of RFID-enabled jewelry inventory-management solutions agree with this assessment. “Eight years ago, we had to describe what RFID was,” says Keven Peck, CEO of TrachTech Systems. “Today, people are calling us because they see the need for RFID to control

their inventories at a fraction of the cost. In a multiple store chain, just on store transfers, they quickly save the cost of installing the system.” But a single jewelry store will see its RFID investment pay for itself in “months, not years,” he says.

While Steinmetz and some other gem dealers and wholesalers are employing or investigating RFID, adoption so far has been greater at the store level, Liard says. But that will change. “What will drive RFID further up the supply chain will be requirements from jewelers to supply-chain partners that they deliver items with tags already on them,” he says. That’s because, while prices have dropped for RFID tags, there’s also cost associated with applying the tags to many tiny items. Gem dealers will feel pressure to take on that task, especially since tagging will also help their operations. “The farther back in the supply chain an item is tagged, the more visibility throughout the supply chain. That will help all the players along the

way, especially with theft and diversion,” he says. “That will help fuel adoption.”

Peck, on the other hand, believes the compelling use case for gem dealers will drive rapid adoption in that part of the industry, which will, in turn, create added interest at the retail level. RFID providers have developed reusable tags that fit neatly into the paper parcels called “brifkas” typically used to hold loose diamonds, as well as RFID cabinets, tunnel-shaped readers and transportable

microwave-style boxes that make tracking seamless. “Right now, I think the technology is perfect for manufacturers, distributors and diamond dealers,” he says. “A manufacturer has one or only a few locations, so it can install printers and readers and see benefits right away.” RFID’s ability to read many items in rapid succession is a big plus in the wholesale world, he says. “Once the programming is working, it doesn’t matter if I read 1,000 items or 100,000.”

Some Leading Providers of RFID Jewelry Inventory-Management Solutions

<i>Company</i>	<i>Product</i>	<i>Tags</i>	<i>Readers</i>	<i>Software</i>	<i>Market</i>	<i>Special Features</i>
Electronic Inventory Solutions rfid-sys.com	FastAudit	UHF EPC Gen 2 tags	Handheld, tunnel and tray readers; smart shelf	FastAudit	Retailers	Ring tray allows tags to hang down for accurate reading
GemBox RFID gemboxrfid.com	GemBox	HF reusable tags to insert in diamond papers and printable labels	Magellan Technology large and small desktop readers	GemBox	Gem dealers and retailers	Designed to read large volumes of closely stacked “brifkas” and other items
Northern Apex gem-where.com	Gem-Where	UHF EPC Gen 2 Tagsys reusable tags and Data2 printable labels	Impinj wand reader, Smart-View tray with screen	Gem-Where	Retailers	Smart-View tray with screen can present detailed information for salespeople and customers
SpaceCode spacecode-rfid.com	Plexus Diamond Jewel	LF and UHF reusable tags and printable labels	Board, box, cabinet, drawer and tray readers	Plexus Diamond SmartTracker	Gem dealers and retailers	Tags for diamond packaging and objects with high metal content
TracTech Systems tractechsystems.com	TracTech	UHF EPC Gen 2 printable labels for individual pieces and polybag tags for gem parcels	Board, box, handheld, and wand readers	TracTech	Gem dealers and retailers	Tags look like classic jewelry tags and come in nine colors
TJS tjs.com	ZeroShrink	HF diamond, label, rattail, reusable and parcel tags	Handheld and pad readers	ZeroShrink Express and Standard	Gem dealers and retailers	Tamper-evident tags; express kit that customers deploy themselves costs less than \$1,000

GemBox RFID's desktop reader is a fast way to inventory hundreds of diamonds and other precious gems.



Missing one high-end piece of jewelry or loose diamond is a very big deal.

—Justin Patton,
RFID Research Center,
University of Arkansas

IN PURSUIT OF ACCURACY

The jewelry industry presents a challenging environment for RFID technology. Accuracy is critical, yet it can be difficult to read many tagged items gathered together in very small spaces, often made partly or completely of RF wave-blocking metal. “If it’s not accurate, it’s not very useful,” says Justin Patton, managing director of the RFID Research Center at the University of Arkansas. “If you do RFID tracking for socks and you miss one, it’s not good but it’s not the end of the world.” But missing one high-end piece of jewelry or loose diamond is a very big deal, he adds.

To achieve accuracy, some providers have based their solutions on high-frequency RFID technology while others use ultrahigh-frequency (see table on page 31). Proponents of UHF say it provides accurate read rates, and it’s the technology being adopted in the retail industry.

“HF has proven to be more accurate for a

jewelry environment, in which pieces tend to be highly concentrated,” says Adrian Prezioso, CTO of TJS. “UHF is susceptible to metallic reflection of the radio waves, which can cause either dead spots in certain scanning areas or detect tags outside of the intended scanning area. In addition, HF scanners are less expensive, so there is a lower cost of ownership.”

HF might make sense in some situations, Patton says, because it has fewer physics issues and direct interference problems. “It depends on what you’re trying to do,” he says. “HF has a shorter range than UHF, so it’s well-suited for a shelf antenna. But, he adds, UHF might be better for scanning jewelry with a handheld device.

SpaceCode offers both low-frequency and UHF technology, says CEO Craig Cook. LF delivers “100 percent accuracy,” he says. “We don’t place limitations on how the system must be used to ensure it works accurately. It simply works all the time, even in very chal-



Features

- » No battery—uses RF energy
- » Pocket-size
- » Simple to use
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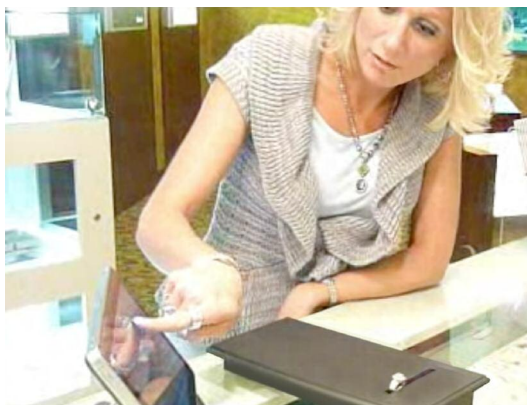
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Northern Apex's Gem-Where Smart View pad and attached screen can display detailed information about an item or suggest other pieces to go with it.



Inventory-management solutions include applications that can help jewelers increase sales.

lenging RFID jewelry applications.”

LF reads more slowly than HF or UHF, Patton says. “But the advantage is it doesn’t require directional antennas,” he says. “Low frequency is not the same physics; you can use a looped wire that reads when a tag crosses it. So it’s cheaper infrastructure—you can run a wire around a jewelry cabinet or an exit.”

Liard predicts UHF technology will take over the entire market eventually. “We’ve made tremendous strides in getting UHF to work around harsher materials such as metal,” he says. “We’re beginning to solve that, so it will be less of an issue going forward.”

TOWARD WIDESPREAD ADOPTION

Aesthetics counts in the retail jewelry industry. “Jewelers are precise about the look of the tags,” Peck says, noting that TracTech tags come in nine colors and different configurations to accommodate jewelers’ display preferences. Borsheims attaches TJS’ Cotton Thread tags to the inside of watchbands. A “rattail” tag, offered by several providers, is designed to hang away from the item, so it won’t get in the way when a customer tries it on.

(Tageos developed UHF paper labels without plastic inlays, so they can be cut into different configurations to fit a variety of jewelry items. Cleor, a French jewelry retailer, worked with Tageos and several other vendors to deploy a custom inventory-management system, which it has rolled out to more than 60 stores; see [Cleor Strikes Gold With RFID Solution.](#))

Other innovations include applications that

can help jewelers increase sales. The RFID-enabled pads and trays used to present jewelry to customers, for example, can provide managers with information about which salespeople are showing which pieces, and which items are viewed most often. The data can be integrated with point-of-sale software, and that information can be used to analyze trends, says Gabriel Nasser, CEO of TJS. “It’s opened the jewelers’ eyes to say, ‘If I have this kind of data, my merchandising decisions will improve dramatically,’” he says.

Northern Apex’s Gem-Where Smart View pad comes with an attached screen that can display detailed information about an item or suggest other pieces to go with it. “Put the tagged jewelry on the reader and the information pops up,” says Kevin Knuth, the firm’s business development manager. “It allows someone without a lot of training to know a lot about products, or it could be used directly with the customer.”

Because many of these applications come under the marketing umbrella, “operations and security people are no longer the only decision-makers on deploying RFID,” Nasser says. “You have the marketing and merchandising people very interested, and they get the CFO interested. When you have all these folks around the table making the decision, you get much better adoption and deployment.”

The adoption of RFID by department stores to improve inventory accuracy in their apparel and footwear departments is likely to impact the jewelry industry. “Retailers like Macy’s are starting with apparel, but will move down the product category to jewelry,” Liard says. “Everything will be RFID-enabled at some point.”

Knuth agrees, and says when that happens, manufacturers will be obliged to provide RFID-tagged items for these large chains. “So manufacturers will already be putting an RFID tag on everything, since they won’t want to do two tags,” he predicts (see [Getting to the Tipping Point](#)). “If I’m a jeweler, I can take advantage of that.” When most or all jewelry items arrive at stores already tagged, he says, deploying RFID readers will be a truly easy decision. ■



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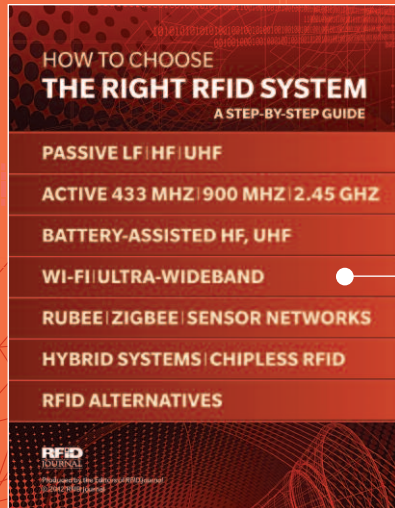
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A New EPC on the Block

GS1 has developed an RFID standard for identifying automotive components and parts.

By Ken Traub



AUTOMOTIVE manufacturers have been using RFID to manage operations in closed-loop applications, but the industry has never had a standard way to track materials and goods in the open-loop supply chain. Until now. GS1 has

just published Version 1.7 of the Electronic Product Code Tag Data Standard, which will enable auto manufacturers to receive RFID-tagged components and parts from their various suppliers.

The consumer industry has been using EPCs to uniquely identify items in manufacturer-to-retailer supply chains. But RFID-tagging auto components and parts differs from tagging consumer goods because of the way numbers are assigned. EPCs for products have three parts: a header that identifies the EPC format, a product identifier and a unique serial number. In the case of a consumer product, the product identifier—typically, a Global Trade Item Number (GTIN)—is chosen by the product's manufacturer. The manufacturer assigns a different GTIN for each product, then encodes the EPC header, GTIN and unique serial number into the RFID tag it affixes to each instance of the product.

In the auto industry, the carmaker assigns the part number (equivalent to a product number) for each auto component or part. But the supplier must encode and apply the RFID tag so the part can be tracked on its way to the carmaker. This creates a challenge, since each carmaker has its own series of part numbers. Two carmakers, for example, could use number 1234 to identify different parts from the same supplier.

GS1 solved this problem by introducing a new type of EPC called the Component/Part Identifier (CPI). The CPI combines a unique GS1 Company Prefix issued to each carmaker with the carmaker's part number, to create an overall part number that is globally unique. If two carmakers both use part number 1234, each CPI will be unique because its company prefix is different.

In software terms, the CPI introduces two new EPC headers. One header defines a 96-bit CPI format that can hold a short numeric part number; the other header defines an encoding for larger tags that can accommodate an alphanumeric part number.

Carmakers that implement CPI must obtain a GS1 Company Prefix and communicate it with their part numbers to their suppliers. Both carmakers and suppliers must ensure that their RFID middleware or other software knows how to encode and decode the CPI structure in accordance with the standard. Not all RFID hardware and software products will handle CPI out of the box, so carmakers and suppliers will need to familiarize themselves with the encoding and decoding procedures, and either implement them themselves or ask their vendors to do so. I've posted a free interactive encoder/decoder at www.kentraub.com/aidec, which you can use to get started. ■

Ken Traub is the founder of Ken Traub Consulting, a Mass.-based firm providing services to companies that rely on advanced software technology to run their businesses. Send your software questions to swsavvy@kentraub.com.



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Improving Food Safety and Quality In China

A platform that uses Internet of Things technologies can be used to monitor the country's food supply.

By Junyu Wang and Hao Min



IN RECENT years, China has been plagued by tainted milk, pork, rice and other foods that have endangered people's

health. As a result, the government has made food safety a top priority. In 2011, the Auto-ID Lab at Fudan University, in Shanghai, began working with 17 other research teams at universities, research institutes and enterprises on a project called Agriculture Internet of Things and Food Safety and Quality. The project, supported by China's Ministry of Science and Technology, uses technologies developed for the Internet of Things (IoT) to track and trace agriculture from the field through the supply chain and in food-processing environments. We have developed a platform that comprises three layers: sensing, communication and application.

The sensing layer is designed to monitor the condition of crops and livestock on farms and in the supply chain with different automatic identification and data capture technologies, based on cost-effectiveness. RFID tags, for example, can be used to identify swine and cattle, as well as cases of high-value meats and fruits. Cases of low-cost fruits can be tracked using 1-D or 2-D bar codes. Wireless sensor networks can monitor temperature, humidity, carbon dioxide, heavy metals and other environmental conditions in fields, greenhouses and housing for swine and cattle, as well as perishable items during transport.

The communication layer is designed to allow various stakeholders to access supply-chain information. We set up an IoT architecture based on Object Name Service (ONS), so

information can be captured and stored on the Web. The China Network Information Center provided the root ONS for this project. Currently, the system tracks by lot level, but it will be able to manage goods at the item level using unique identifiers, such as a Serialized Global Trade Item Number or Global Individual Asset Identifier.

The application layer will support applications and services that could be used by farmers, retailers, the government, analysts and consumers. It includes a database containing China's food safety regulations. Supply-chain partners will be able to analyze data captured from the RFID tags and bar codes to determine product quality and shelf life. Farmers will be able to build their own applications and services—we've created some examples, including "my farm," "my crow house," "my supply chain," "tracking and tracing system" and "recall assistant." Consumers will be able to check product expiration dates, quality guarantee periods, test reports, electronic pedigrees, product photos and videos, and customer evaluations.

The supply-chain management system is still in development, but by year-end, we will be able to use it to monitor more than 10 types of food produced in Shandong Province and Shanxi Province, from the field to retailers. In the near future, schools will be able to use the platform to improve food safety for students. ■

Junyu Wang is an associate director of the Auto-ID Lab at Fudan University in Shanghai, China. Hao Min is the lab's research director.



Addressing Conflicting Tagging Requirements

Apparel suppliers and retailers must agree on best practices for RFID-tagging items at the point of manufacture.

By Bill Hardgrave



MY PREVIOUS COLUMN, [Getting to the Tipping Point](#), suggested that as more retailers deploy RFID, it will become cheaper for a supplier to tag all items with the same SKU, even if some of its customers aren't yet using the technology in their stores. But

that assumes the tagging requirements from multiple retailers are the same or similar. Unfortunately, that is not always the case.

Here's a real-life example (actual company names have been changed). The T-Shirt Factory manufactures T-shirts for several retailers. Four retailers ask the Factory to RFID-tag individual selling units of its popular white V-necks (a selling unit is a plastic wrapper containing three T-shirts). This should enable the Factory to reach the tipping point and RFID-tag all white V-neck selling units at the source of manufacture when other labels are applied. But Retailer A requests the Factory to RFID-tag selling units using Tag-Type One inserted into the plastic wrapper. Retailer B also wants to use Tag-Type One, but it prefers the tag adhered to the top outside edge of the wrapper. Retailer C wants the tag inside the wrapper, but would like to use Tag-Type Two. And Retailer D wants Tag-Type Three adhered to the bottom inside edge of the wrapper. With these different requirements, the Factory has to create separate tagging processes, which proves inefficient and chaotic.

So the Factory is forced to meet with each retailer to negotiate a solution that will work for everyone involved. It takes months for three retailers to reach a consensus regarding tag type and placement. After several more

months, the lone holdout relents.

This, of course, is not a viable solution for industrywide adoption. Fortunately, retailers and suppliers have been working together, with guidance from GS1, to address conflicting tagging requirements. The thinking is that suppliers need to have flexibility in tag selection and placement—as long as the tag meets minimal performance requirements and any aesthetic demands of the retailer. “GS1 has been working with industry retailers and brand owners on recommended voluntary guidelines and standards regarding tag performance,” says Melanie Nuce, a VP with GS1 US. “We will soon begin prototyping potential solutions, so we can document the outcomes, produce best-practice guidelines and recommend standards enhancements to the Global Standards Management Process.”

As more suppliers and retailers begin using RFID, it is important that they realize the potential problems with conflicting tagging requirements and work to resolve those problems before they become a major issue. Ultimately, suppliers should decide on tag type and placement, but only when it meets an accepted set of requirements that satisfies the needs of all retailers. ■

Bill Hardgrave is the dean of Auburn University's Harbert College of Business and the founder of University of Arkansas' RFID Research Center. He will address other RFID adoption and business case issues in this column. Send your questions to hardgrave@auburn.edu.



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The Internet of Things on Wheels

RFID and sensor networks will enable the connected vehicle and passenger.

By Kevin Ashton



RFID HAS HAD A LONG, fruitful relationship with the automotive industry. One of the earliest applications was launched 25 years ago, when buses crossing Australia's Sydney Harbour Bridge automatically identified themselves

to toll booths. Throughout the 1990s, toll-road automation drove much of the infant RFID industry's growth. Today, systems that once required drivers to slow to 5 miles per hour can read the RFID tags on windshields of cars going at any speed—in fact, the readers' true upper limits are beyond the capabilities of most vehicles.

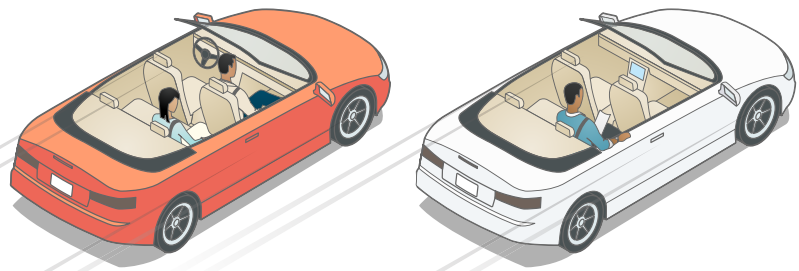
But toll-road automation was just the beginning for RFID in cars. Many vehicles produced today are "keyless"—instead of inserting a specially shaped metal prong into a slot on the steering column, the car will start at the push of a button, provided the right key fob is nearby.

Other wireless technologies are at work in a car's cabin. Sensors, for example, determine whether it is safe to deploy a passenger-side air bag by detecting distribution of volume and mass in three dimensions, to distinguish between adults and children. Air and fuel sensors monitor engine efficiency, hall effect sensors measure wheel and shaft speed to prevent skids, and curb feelers and parking sensors help with reversing and parallel parking.

A modern car is a sensor platform on wheels, but few of the sensors communicate with each other, and fewer still communicate beyond the vehicle. The next step is for them to converge into a single, coordinated system, first as part of a connected vehicle, then as part of a connected city, providing a range of services from navigation assistance and

maintenance management to entertainment and interpersonal communication.

Of course, the next big thing for vehicles with connected sensor systems is driverless automobiles. The technology is here now; it will be commercially available within the next 10 years, and will be widely used within the next 20 years. And that will enable the



next big thing—a rich intersection between cars and the Internet of Things. Once the car is doing the driving, passengers will be free to form "carmunities," in which they integrate their travel experiences with their existing social networks.

In the not-so-distant future, researchers predict the connected vehicle market will be worth billions of dollars. Why? One reason is that the first generation of drivers born in the 21st century is about to take the wheel. People who have never known a world without mobile phones and Wi-Fi—without always on, always there communication—do not want to go from A to B if they have to leave cyberspace to get there.

It's a sign of RFID's promising future that two decades in, the technology is still only scratching the surface of the place where it got its start: the automotive industry. ■

Kevin Ashton was cofounder and executive director of the Auto-ID Center. He is currently a general manager at electronics maker Belkin.

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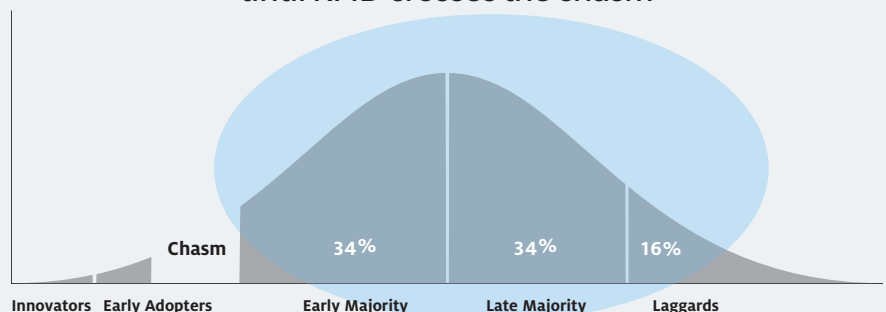


Based on a new survey of RFID end users, this guide reveals:

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- › Who the RFID buyer is
- › How companies make RFID investment decisions
- › The applications end users are pursuing

POTENTIAL MARKET SIZE TODAY

Almost 85 percent of companies won't invest until RFID crosses the chasm



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