DEDICATED TO RADIO FREQUENCY IDENTIFICATION AND ITS BUSINESS APPLICATIONS

RFID JOURNAL

www.rfidjournal.com September/October 2015

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Find New Business Opportunities

RFID providers now have a source where they can find companies worldwide that are actively seeking to deploy the technology. RFID Requests for Proposals is updated regularly, with new RFPs from companies in diverse industries. Each RFP includes detailed information, contacts and submission deadlines.

RFIDJournal Virtual Events

In September, more than 450 people registered for the RFID for Warehouse and Inventory Management virtual event. Our live interactive programs offer a convenient way to learn why and how companies are using RFID to improve the way they do business. Presenters will answer your questions. If you miss an event, check our archive for on-demand viewing.

rfidconnect
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Find products that can help you deploy RFID successfully, such as Hangzhou Century Link Technology's Jewelry Hangtag. The EPC Gen 2 RFID tag is designed to track jewelry and other high-value goods, to help retailers reduce the time required for inventory counts and to eliminate shrinkage.

Most-Read Stories in September

- Intel Unveils RFID System for Retailers
- What Are the Leading RFID Companies?
- View Technologies Launches Long-Range RTLS for Passive UHF Tags
- Dutch Hospital Uses Beacons to Track Treatment for Cardiac Patients
- French Handball Team Trains With Wearable RFID Sensors

Top 10 Search Terms On RFIDJournal.com

1. Beacon
2. Read distance
3. Jewelry
4. NFC
5. RTLS
6. Warehouse
7. Apparel
8. Security
9. Airbus
10. Hospital

The Inside Scoop

What are end users saying behind the scenes? Why should the RFID community be optimistic about the industry? Who's spreading misinformation? Get insight and perspective at the RFID Journal Blog.

Ideas Exchange

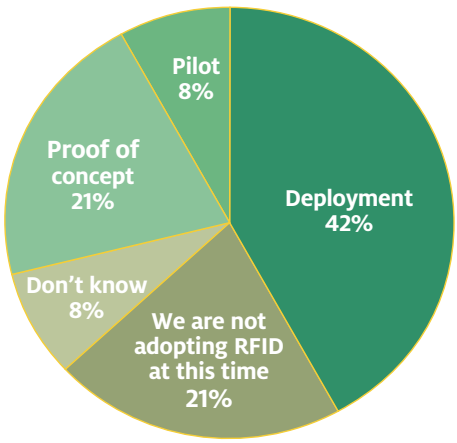
RFID Journal maintains an Ask the Experts forum, where you can submit questions about RFID technology and its applications. Your questions will be answered by RFID Journal editors or outside experts. Recent questions include:

- What kind of solution should I deploy at ski resorts?
- How does metal affect RFID reads?
- Where can I find an RFID reader able to interrogate tags from 3 feet away?
- Where can I find a solution for monitoring livestock?
- Is there any authenticating technique for RFID cards and tags in bus transit?
- Where can I purchase RFID software?

POLL RESULTS

Cast your vote.
Each week, RFID Journal takes the pulse of the RFID community. See what other people are thinking—and make your opinion count.

What stage of RFID adoption has your company reached?



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Easing the Burden of Regulation

PHOTO: SASA STAJIC

IT'S PRETTY MUCH A GIVEN among businesspeople worldwide that government regulations are burdensome. What is rarely discussed is why regulations are so problematic. Some laws are silly, such as the one in Florida that requires vending-machine labels to urge the public to file a report if they come across a machine without a label. Others are well-meaning—they're designed to protect citizens and workers, but compliance with them requires data collection, and that's where the trouble lies.

Consider the Bioterrorism Act of 2002, passed to address fears that terrorists could attack the U.S. food supply. It requires food processors to be able to identify the origin of all food received by lot, code or other identifier and provide the same information when releasing products. The act applies to both imported and domestic food, including all ingredients. Civil and criminal actions can be taken if information is not provided upon request to the U.S. Food and Drug Administration within 24 hours.

Think about this. If you mass-produce bread in the United States, you need to keep track of the flour, sugar and other ingredients that go into each batch—and be able to tell the FDA that the flour in lot No. 31 of your bread made on Aug. 15, 2015, was purchased from Supplier X on July 30, 2015. That's a crazy amount of information to keep track of, and the amount of labor needed to scan all those bar codes and make note of all the lot numbers likely has a significant impact on the bottom line of many food manufacturers. And that's just a single law affecting a particular industry in one country.

That's why companies across a wide variety of industries are turning to RFID to collect the data required by governments (see Automating Compliance Processes). While RFID enables companies to better manage their inventory, assets and other items, it also can quickly, accurately and cost-efficiently help them comply with regulations—whether that's counting the number of servers and storage devices in a data center to meet Sarbanes-Oxley requirements or tracking shipments of temperature-sensitive pharmaceuticals.

Airlines, of course, deal with some of the most burdensome regulations of any industry. They need to track every part on every plane from the moment they receive a shiny new aircraft until the day it is retired—and ensure oxygen generators and other safety devices are in working order before the first flight of each day. The industry is turning to RFID to improve operations, comply with regulations—and better serve customers (see Stress-Relief for Air Travelers).

Many government regulations require companies to track goods through the supply chain. Organizations that adopt RFID for traceability can use the Electronic Product Code Information Services standard to improve operations by sharing information with business partners (see Tuned In and Software Savvy).

RFID can't take all the hassles out of traveling or meeting government regulations, but it will likely make things easier for everyone.

Mark Roberti, Founder and Editor

SAFETY

Reducing Roadside Construction Accidents

Volvo CE and the Integrated Innovation Institute at Carnegie Mellon collaborated to develop a system that uses RFID to save workers' lives.

Roughly 1,000 U.S. workers die each year from accidents at roadside construction sites, according to the Bureau of Labor Statistics. Volvo Construction Equipment (CE), a division of the Volvo Group, and researchers at the Integrated Innovation Institute at Carnegie Mellon University have teamed up to develop a novel system called SiteAware that could greatly reduce that number.

SiteAware combines video cameras, LIDAR (a remote light-and-radar sensing technology that measures how far an object is by bouncing a laser off it and analyzing the light reflected back) and radio frequency identification to identify ground workers. The system can detect obstacles, including workers, machinery and traffic. The system then integrates and aggregates the data and transfers it to a screen on a machine operator's dashboard. It provides visual and auditory cues to operators and ground workers, who may otherwise be unaware that another worker is in their vicinity and there is danger of a collision or other incident.

The Integrated Innovation Institute is a joint initiative of the Carnegie Mellon College of Engineering, College of Fine Arts and Tepper School of Business. The aim is to bring engineering, design and business students together to learn a process for innovating and to apply it to real-world challenges, often via corporate-sponsored projects. Volvo CE heard about the program, was intrigued and decided to sponsor a project.

Fares Beainy, a research engineer in emerging technology at Volvo CE, visited the students and explained that Volvo has three core values: safety, quality and environmental care. He asked the students to think about what the work environ-

ment of a construction machine operator would be like in 10 years, and let the students come up with the project.

The students looked at a broad range of technology and considered how best to solve the problem of providing visibility to machine operators. "They were concerned with how you identify when people are in a place of danger and alert the operator," says Jonathan Cagan, Carnegie Mellon's Ladd Professor in Engineering and co-director of the Integrated Innovation Institute. "LIDAR and RFID rose to the top as ways to solve this problem that were meaningful and implementable."

To make the system easy to use, the students designed an interface for the operator that integrates the different technologies, rather than providing multiple data sources. The students also researched cognitive and psychological aspects of the problem and identified tuning out conventional alarms in a noisy environment as a potential problem. A worker might not hear an alert or a driver might not pay attention to a warning, given the distractions of an active construction site.

"The students researched something called the cocktail party effect," Cagan says. "At a cocktail party, there are many conversations going on at once, and you often can't hear anything. But when someone says your name, you hear it. That's where RFID comes in. We can identify someone working near equipment through his or her RFID transponder, and a speaker inside the cabin can warn the machine operator who specifically is in danger and, based on its volume, how close she or he is."

As the sponsor of the program, Volvo CE has the right to develop the system and commercialize it. "The next step for us is to explore the components that are required to make the system work, and strive to minimize false alarms," says Volvo CE's Beainy. "Off-the-shelf sensors were not designed for a construction environment. So we'll look at what's needed and do some modifications and testing. Some of the technology might be incorporated into our machines." —*Mark Roberti*

Researchers at the Integrated Innovation Institute at Carnegie Mellon with Volvo CE's Fares Beainy (front row, fourth from left). (Above) SiteAware RFID tag.

PHOTOS: INTEGRATED INNOVATION INSTITUTE, CARNEGIE MELLON UNIVERSITY

PHOTO: ISTOCKPHOTO

Built-in Dangers

Annual financial loss due to construction site accidents worldwide:

$1.2 trillion

Number of annual fatal construction site accidents worldwide:

60,000

Number of annual fatal construction site accidents in the Asia-Pacific region:

38,400

Number of annual fatal construction site accidents in the Americas:

10,200

Number of annual fatal construction site accidents in Africa:

6,000

Number of annual fatal construction site accidents in Europe:

5,400

—Rich Handley

ADOPTION

The Changing RFID Landscape

Interest in RFID grows in energy, manufacturing and retail and picks up more slowly in defense and government.

THERE ARE no hard statistics about the adoption of radio frequency identification technologies. Companies aren't required to report when they deploy a solution, and research firms track overall sales of hardware and software systems, but not the number of deployments or the industries in which they were made. One source of insights into adoption trends, however, is the RFID Journal readership database.

There are currently 102,000 registered readers in the RFID Journal database, up from roughly 64,000 in 2009. When we look at a breakdown of readers by industry and country, it's clear that interest in RFID is growing across all sectors and geographic regions. But interest in some industries is growing faster than in others.

Manufacturing has always been—and continues to be—one of the largest segments of the RFID Journal database. The percentage of manufacturers in our database rose from 6 percent to 7 percent from 2009 to 2012 and to 9 percent in 2015. This growth is also reflected in the increasing number of articles we publish about manufacturing companies worldwide, such as AGC Asahi Glass (Japan), Bosch Rexroth (Germany), Deere-Hitachi (United States), Madshus (Norway) and TECO (Taiwan).

The retail sector is among the hottest for RFID right now, with large, high-profile deployments by Kohl's, Macy's, Marks & Spencer, Target, Tesco and other major companies. News of those deployments has sparked interest among other retailers, and that segment of our database has increased to 5 percent this year, from 3 percent in 2009.

Another sector that has been growing in our database is energy, mining and construction. That sector was flat at 2 percent from 2009 through 2012, but rose to 3 percent in 2015. The decline in oil prices may be encouraging energy companies to look to new technologies to make them more efficient. Government regulations to improve worker safety also may be spurring interest.

The food and agriculture segment, which has always been small, rose from 1 percent to 2 percent from 2012 to 2015. RFID has long been used to track cattle, and more countries are requiring tracking of animals, but these systems are relatively

ILLUSTRATION: ISTOCKPHOTO

straightforward to deploy and most companies required by regulation to track livestock don't spend much time researching RFID. We believe ranchers are interested in learning about other RFID applications, such as automated milking stations that use RFID to track the amount of milk a particular animal produces. In addition, the number of farms and food producers coming into the database suggests there is growing interest in low-cost temperature sensors that can help keep produce fresh.

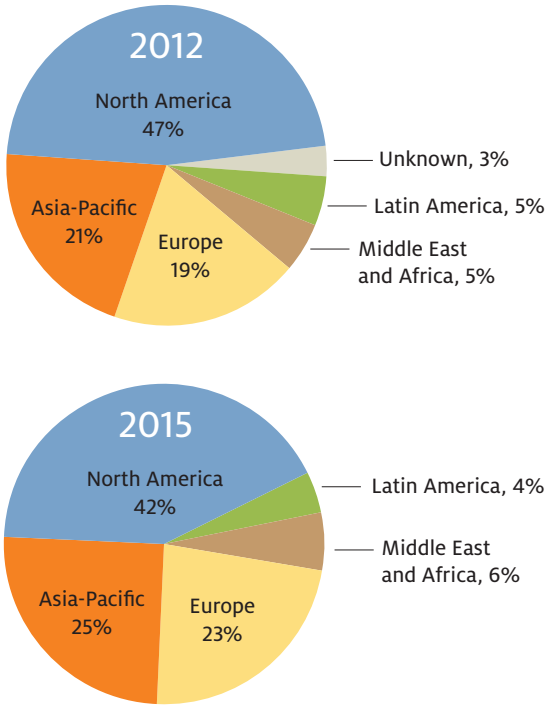
Readership in all industries rose, but it increased more slowly in some sectors. This is reflected in percentage declines, because other sectors in the database grew faster.

One surprise: Given the efforts by Airbus and Boeing to tag parts, we expected interest to be rising quickly in the aerospace sector. But from 2009 to 2015, that sector fell by 1 percent of the overall database. That trend might be changing. Recently, we've seen a noticeable number of new aerospace companies entering the database.

It's not a surprise that the consumer packaged goods sector continues to fall as a percentage of the database. Readers from that industry accounted for 3 percent of the database in 2009, 2 percent in 2012 and just 1 percent in 2015. Adoption began with Walmart requiring CPG companies to tag pallets and cases, but the focus soon shifted to item-level tracking. Given the low cost of consumer packaged goods, there was little value in tracking at the item level and interest waned. It will likely be revived as RFID readers are installed at warehouses and receiving docks at stores, where tagging at the pallet and case levels can be done at little extra cost.

A Diverse Readership

The RFID Journal website, since its launch in 2002, has always attracted readers worldwide. Traffic patterns have not changed dramatically over the years. The United States has typically accounted for roughly half of all visitors to our site, with the rest of the world making up the other half. The table below shows the changes in overall traffic by region from 2012 to 2015.



The percentage of readers from the defense sector also decreased. This is no doubt due to the cuts in defense spending in the United States and other countries. We saw government interest in RFID systems decline relative to other sectors after the 2008 financial collapse, when tax revenues fell off sharply. Interest has not yet recovered, though some countries are deploying RFID to track government assets.

The number of readers within the RFID sector—that is, hardware, software and service providers—remained about the same during the past three years, though the number of RFID companies increased. Overall, RFID companies fell as a percentage of readers from 18 percent in 2009 to 16 percent in 2012 and 13 percent in 2015.

Intriguingly, the number of consultants, students and IT providers grew as a percentage of the total database, suggesting that interest is picking up more broadly. As consultants and IT providers (companies that offer cloud services or write applications) hear about big RFID deployments or find themselves being asked about it by their customers, they realize they need to get up to speed on the technology. More students are considering RFID as a career path (see "RFID and the Non-Degree" on page 10).

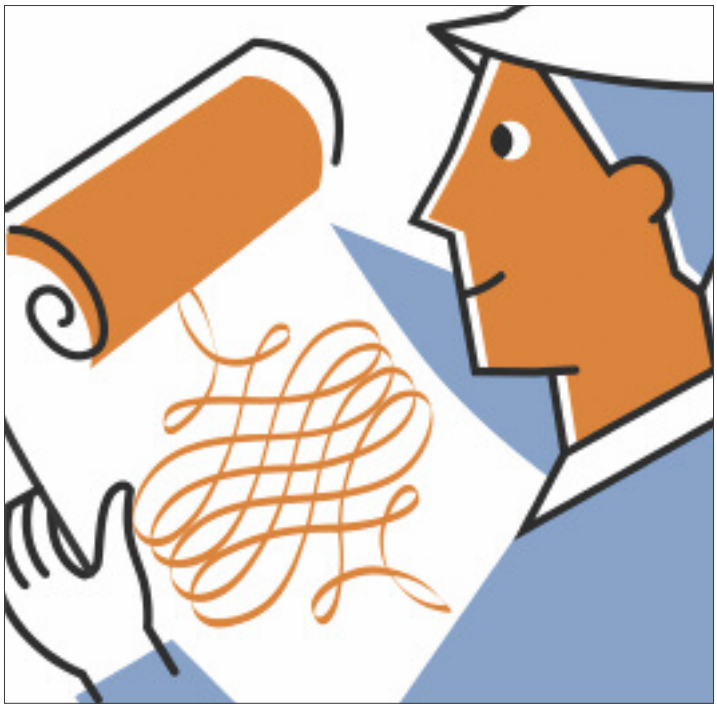
Additional evidence indicates interest in RFID is expanding. The "other" segment of the RFID Journal database increased to 12 percent in 2015, from 10 percent three years earlier. This is due partly to more people signing up anonymously, but we have also seen companies from new sectors, such as asset management and event management, joining our readership. —*Mark Roberti*

EDUCATION

RFID and the Non-Degree

People who want a career as an RFID technician will be able to earn a professional certificate that proves they are up to the job.

SOME TECHNICAL institutes in the United States and other countries offer advanced degrees in RF engineering, and many electrical engineering and logistics courses provide some education in radio frequency identification. Yet RFID Journal is not aware of any RFID degree programs.



But if universities don't offer degrees in RFID, how can a potential employer know whether a job candidate with a degree in computer science or electrical engineering has an understanding of RFID systems? And as RFID moves from a niche to a mainstream technology, how will companies be able to deploy RFID systems if there aren't enough qualified technicians?

This is a looming issue several RFID industry professionals recognized in 2012, a few months after CompTIA, a popular information technology certification body, pulled its RFID+ certification exam due to insufficient interest. These independent RFID industry veterans (including me) founded the RFID Professional Institute to develop certification exams designed to demonstrate that a test taker has a certain level of knowledge about RFID. The institute plans to offer three levels of exam.

For the past two years, the institute has been developing and refining its Associate exam. The exam will be offered at RFID Journal LIVE! 2016, being held in Orlando Fla., May 2 to May 5. The institute has also engaged InstructedU, an online training and exam delivery company, to host the exam and generate tests from an existing question pool, and its partner, ProctorU, which does online proctoring. This enables the institute to offer the certification exam to anyone anywhere in the world.

The Associate exam comprises 75 questions, divided into nine knowledge domains, each with five to 15 questions. There are three levels of question difficulty, with the hardest questions worth three times the number of points as the easiest questions.

The exam aims to demonstrate that those who pass understand:

- The difference in performance characteristics among active, passive and battery-assisted RFID systems
- The difference in performance characteristics among passive low-frequency, high-frequency and ultrahigh-frequency systems
- The differences among active systems that use Dash 7, Wi-Fi, Zigbee and other protocols
- The components that make up a typical RFID system and the role each component plays
- Methods of evaluating and selecting various system components
- The roles of providers of the various components and services related to an RFID deployment
- The role of standards bodies, the standards used in RFID and the regulations in place worldwide that govern the use of the technology

ILLUSTRATION: ISTOCKPHOTO

- The common applications for different types of RFID systems across different industries
- Issues related to privacy, safety and security that may arise during an RFID deployment
- Issues related to the design of RFID systems
- The general steps that should be followed during an RFID deployment.

There are more than 10,000 students from countries worldwide in the RFID Journal database. The exam allows them to get certified at a relatively low cost ($200) and show they have a base-level knowledge of RFID terms, concepts and systems.

The next steps for the institute are to translate the exam from English into other languages and to create higher-level exams. The test for the Professional certification will cover all aspects of RFID, as the Associate exam does, but will go into greater depth. The Associate exam, for example, requires test takers to know sources of electromagnetic interference; the Professional certification exam might require them to indicate the means of preventing EMI.

A third level will feature multiple exams, each focused on a specific type of RFID; some people will likely get certified in active RFID systems, others in passive LF, HF or UHF. The goal at this level will be to demonstrate that the test taker not only has knowledge of RFID systems but that he or she also knows how to deploy such systems.

Today, the demand for RFID technicians and experts is relatively low. But adoption of new technologies usually reaches a tipping point and then explodes—that's why it's so important to have the infrastructure in place to certify new engineers. Those interested in getting certified at RFID Journal LIVE! 2016 will be able to take a one-day fast-track training course before the test to bone up on their skills.

By developing the RFID certification exams now to test core competencies, training firms can create programs that educate new engineers and others about these competencies. People who want a career as an RFID technician will be able to prove they're up to the job, and companies will be able to hire someone who can ensure their deployment will be successful. —*M.R.*

Automating Compliance Processes

RFID will revolutionize the way organizations meet government regulations.

BY SAMUEL GREENGARD

ILLUSTRATION: ISTOCKPHOTO

During the past decade, RFID has emerged as a valuable way to track assets and inventory, manage processes and oversee supply chains. But beyond the documented benefits, including boosting efficiencies and lowering costs, is an entirely different but important value proposition: tapping RFID to improve regulatory oversight and compliance.

"Organizations find it increasingly difficult to stay on top of regulations and put the necessary processes in place to manage compliance risk," states Anthony Monaco, a partner and service line leader for regulatory compliance at auditing specialists KPMG. "RFID can play an important role."

To be sure, the list of government and industry regulations worldwide expands daily—it includes the Sarbanes-Oxley Act, U.S. Department of Defense and U.S. Food and Drug Administration regulations, Federal Aviation Administration and European Aviation Safety Agency requirements, national programs to monitor livestock and the European Union's Forest Law Enforcement, Governance and Trade plan to address illegal logging. For organizations venturing into the global arena, the risks, challenges and responsibilities are multiplied. RFID can improve accuracy while dramatically reducing the time required for auditing. "It represents a giant leap forward," says Michael McCartney, managing principal at QLM Consulting, which specializes in supply-chain management.

Some organizations, large and small, are adopting RFID specifically to meet government regulations. The Hong Kong Housing Authority, for example, mandates that all contractors use RFID to control the quality of building materials, track the building process and make building maintenance systems more efficient. Contractors must collect logistics and manufacturing information and deliver the electronic records to the Housing Authority. Hillsborough Community College, in Hillsborough County, Florida, adopted RFID to track nearly 17,000 assets on five campuses to meet annual state and federal government audits.

Other organizations are adopting RFID to drive operational efficiencies and then finding they can use the system to meet government regulations. "In many cases, a compliance project that incorporates RFID can grow out of existing RFID systems," says Patrick Javick, GS1 U.S. industry engagement director.

Mining companies worldwide, for example, are using RFID to automate manual processes, streamline production and reduce costs. With an RFID infrastructure in place, they are also using the technology for personnel tracking, which is required in Sweden and other countries. Brazil's Alog Data Centers deployed an RFID solution to automate its operations and processes at four facilities, to improve inventory accuracy. The solution also provided a more efficient way to comply with new international standards mandating periodic fixed-asset reporting and auditing for IT service firms that have public companies as clients.

Companies that are developing a business case for an RFID project—or those piloting an RFID system—should factor in the cost of complying with government and industry regulations. "RFID in conjunction with sensors and data analytics introduces highly accurate monitoring and reporting functions," says Diana Hage, CEO of RFID Global Solution. "Today, corporations must look to meet regulations in the most cost-efficient manner, and the technology exists to dramatically improve processes."

Although many organizations haven't yet begun to use RFID to automate compliance processes, significant opportunities lie ahead. "Over the next few years," McCartney says, "we will begin to see RFID used far more extensively for managing regulatory compliance." But developing a strategy and

building a framework to support an advanced compliance model requires careful planning. As with any RFID project, it's essential to thoroughly understand underlying processes and workflows and where opportunities to automate data collection exist. It's also critical to choose the right hardware, software and data-sharing framework to support an initiative.

> "Suddenly, it's possible to know that you're nearly 100 percent compliant. There is a significant reduction in risk."
>
> TOM MANZAGOL, RFID GLOBAL SOLUTION

MANAGING RISK

For many organizations, regulatory compliance is a hit-or-miss proposition. Conducting audits with manual counts or bar-code scans typically produces inconsistent and undependable results. In addition, spreadsheets and specialized compliance software often take a cookie-cutter approach that doesn't address an organization's specific requirements. Another challenge is that "many legacy systems do not provide any information about the physical location of an asset," says Tom Manzagol, president and founder of RFID Global Solution, "and this often makes it difficult to correct a problem."

The end result is data that provides an incomplete view or lags behind actual business conditions by days, weeks or months—and, consequently, interferes with an organization's ability to take action quickly and decisively when a compliance issue arises. This, in turn, may lead to public health or safety risks, government fines and other penalties, bad press, lawsuits and, in the end, a tarnished brand image and financial losses.

The problem is compounded by the fact that many organizations, especially those that operate in a global environment, aren't set up to track new regulations and implement required compliance systems in a timely manner, KPMG's Monaco points out. During the time an organization is playing catch-up—sometimes weeks or months—risk can spiral out of control. Manual counting systems and spreadsheets hinder a company that needs to move rapidly to get critical compliance capability online, he says, and they aren't cost-effective at reducing risk in a systematic way.

RFID automates manual processes, which are error-prone and inefficient, and it reduces or eliminates inaccurate inventory audits. "Suddenly, it's possible to know that you're nearly 100 percent compliant," Manzagol says. "There is a significant reduction in risk."

In addition, RFID standards have been solidified and the technology has matured to the point that tags, readers and other equipment work seamlessly, and past compatibility issues no longer exist, says Monty Cook, VP of sales at GlobeRanger. This includes the emergence of GS1 standards for capturing, handling and storing data.

DEVELOPING A SMART STRATEGY

In fact, now that there is a robust RFID framework in place, GS1's Javick believes RFID is about to take off in the regulatory and compliance space. In retail, for example, it can aid in tracking where goods originate, what countries they pass through, where additional processing and work is taking place and where the goods arrive for sale. Producing compliance records and tax data is greatly simplified. The end result is "faster and far more automated processes related to validating manifests and handling government filings," he says. "RFID can provide very granular data about processes and how they intersect with regulations."

Pharmaceutical manufacturers and their logistics providers are using RFID sensor tags

to monitor temperature-sensitive biomedical supplies and other life-sciences products. Cold-chain experts believe pharmaceutical and biomedical suppliers will increasingly turn to RFID and other technologies to support regulatory requirements. "If you distill things to a basic level, regulatory bodies want organizations to demonstrate that they have a risk-based approach when it comes to handling pharmaceuticals or biotech or diagnostic products," says David Bang, CEO of LifeConEx, a DHL Global Forwarding cold-chain-services subsidiary.

Government mandates are also driving adoption in the perishable foods sectors. Growers and manufacturers are gearing up to meet the FDA's Food Safety Modernization Act, which goes into effect in 2016, and similar EU regulations that require traceability to facilitate recalls. "Growers and food manufacturers will have to tell the story, so it's possible to know precisely where contamination or a breakdown in processes took place," McCartney says. "If a company uses RFID effectively, then the entire process becomes a laborless method of tracking inventory."

The airline industry is also turning to RFID to address inefficiencies and compliance. Every flight originating in the United States requires an inspection of the life vest located beneath each seat, GlobeRanger's Cook says. "Every day, for the first flight of the day, a mechanic must check under the seat and make sure the floatation device is in place," he says. "In a large aircraft, such as a 747 or 777, a mechanic must get down on his or her knees to make sure it is intact and report on it." Today, the report is typically submitted on paper. What's more, "if the seal [on the life vest] is broken, the plane cannot leave the gate or the airline faces a stiff fine." A new sealed life vest is required.

But RFID changes the equation in a major way. "Instead of a mechanic taking 45 minutes to physically check the vests, it's possible to automate the process and complete it within a few minutes," Cook says. With the appropriate approvals in place, the RFID-generated inspection report becomes the formal means of compliance with maintenance instructions. "A company can submit a report for FAA compliance simply and easily," he adds.

In 2013, Delta Air Lines began RFID-tracking oxygen generators to improve inventory visibility and reduce waste associated with expired devices. The solution also reduced the time it takes to verify expiration dates on devices installed on planes from roughly eight man-hours per plane to 45 seconds

RFID is being employed to monitor commercial, industrial and hazardous waste. Canadian logistics and engineering company Can/U.S. Enviro-Energy, for example, began using RFID in 2008, to track its battery inventory and provide its telecom customers with visibility into the disposal of their batteries. Before implementing the RFID solution, the company received frequent phone calls from customers asking for paper documentation, which they needed to submit to the Canadian government. The RFID system improved warehouse management and automated data collection, making disposal information available to customers online.

Since SOX was passed in 2002, public U.S. companies have struggled to comply with the law passed to prevent fraud and misreporting of financial statements—and that includes verifying that assets and inventory are in place. "RFID has the potential to provide big benefits for companies, especially those in the finan-

> A mechanic can check life vests on a plane in a few minutes, and the airline can submit an RFID-generated inspection report for FAA compliance simply and easily.
>
> —MONTY COOK, GLOBERANGER

cial services sector, that must track IT assets and have accurate counts for specific items," Manzagol says. This includes servers, storage systems, mobile devices and "ghost assets" that remain on a company's books even after they've been decommissioned.

In the horticultural sector, companies are RFID-tracking returnable transport items to improve operations. European firms can tag trolley shelves and link product data to the trolley's location, to meet a new EU directive that will require companies to trace edible plants within a couple of hours in the case of recalls, says Léonard Smits, Container Centralen's RFID implementation officer. Colorado, Oregon and Uruguay are among the states and countries that have legalized the sale of marijuana and are using RFID to regulate the market. Growers need to tag each plant so it can be tracked from the greenhouse in which it is grown to the store where the drug is sold.

> "You have to document every step and process to understand where the tags must be applied, how the data is collected and stored, and how to put it to use."
>
> MICHAEL McCARTNEY, QLM CONSULTING

While there seem to be an endless number of government rules that organizations in myriad industries must meet, there also are innovative RFID solutions to address them. India, for example, regulates the storage of grain harvested in that country, to ensure only safe, clean grain is sold for food. Adani Grain Logistics, which operates several grain storage facilities in India, implemented an automated, RFID-based system for receiving, testing and tracking food grain harvested in the states of Haryana and Punjab.

The British government adopted the Construction (Design and Management) Regulations, the Health and Safety Executive's new body of tougher construction-industry regulations, including stiffer inspections of equipment used in hazardous environments. Metal Decks, a leading U.K. structured decking and flooring specialist, deployed an RFID solution to track maintenance performed on safety nets designed to protect employees from high falls.

Dominion East Ohio delivers natural gas to 1.3 million customers. One of the company's responsibilities is to ensure that all aboveground pipelines are properly maintained. According to state and federal regulations, the firm must inspect all pipelines exposed to the atmosphere at least once every three years. The energy firm deployed an RFID solution to reduce the time workers spend collecting and storing inspection data.

IMPLEMENTING RFID FOR COMPLIANCE

Developing a comprehensive strategy and thoroughly understanding the processes and workflows that intertwine with regulatory and compliance issues is the foundation of a successful initiative. "You have to document every step and process to understand where the tags must be applied, how the data is collected and stored, and how to put it to use effectively," QLM's McCartney explains. In many cases, the process may extend to business partners, shipping and logistics firms and others. The end goal is to ensure that no gaps exist and data is accurate and dependable.

The good news, Javick says, is that existing RFID systems already capture most of the data required to manage compliance, and they are able to accommodate reads of items, totes and containers at line speed. It's simply a matter of identifying the critical data and inserting it into the right software system.

But, Javick notes, it's still important to turn to an RFID provider that offers a comprehensive solution that's optimized for your industry or business. "It's critical to communicate with technology partners about what you're attempting to do and ensure they have the right

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framework and focus to generate essential data for compliance and put it to use," he says. "They also need to understand the differences—and nuances—of regulatory frameworks."

A strong technology framework may require an organization to modernize databases and software, GlobeRanger's Cook says, and design better reporting and analytics capabilities. It may also be necessary to ensure that underlying wireless infrastructure is equipped to handle the data flow. This may mean examining existing cellular and Wi-Fi networks, but also looking to protocols and technologies such as Bluetooth and ZigBee to handle data transfers in specialized locations or when connectivity is interrupted or unavailable.

To connect all the digital dots, organizations need to facilitate discussions that span different departments or groups, including those using RFID and those not yet using it, KPMG's Monaco says. The evolving business environment requires executive oversight that extends beyond traditional enterprise boundaries, he adds. Particularly at larger firms, there's a growing need for a chief risk officer, chief compliance officer or director of internal audits to tie together compliance and regulatory requirements with other business initiatives.

What's more, to plug in RFID and use it effectively in the compliance space, there's a need to review and remap existing processes that may be woefully outdated or simply not work in a more technologically advanced environment. "It's an issue many organizations must revisit," Monaco says. "It's really about people and processes more than the technology. There's a need for a gap assessment as a starting point."

Another critical issue, Monaco says, is many organizations have crumbling data silos and disconnected systems. As a result, a business may require clouds, specialized APIs to connect systems, and other tools and technologies to break down silos and eliminate spreadsheets and paper records. This, in turn, may require data analysts and data scientists who understand how to put the data to work and match the needs of regulatory agencies and/or industry organizations. "It may require training so people understand processes and workflows, how to use the software and systems, and how to generate data that's accurate and useful," he points out.

Monaco says that because many regulations and standards are still in the formative stages and RFID technology is relatively new in the compliance arena, it's important for businesses to provide feedback to industry associations and state and national governments regarding draft regulations and how RFID can be used effectively. Playing a role in the development of the future regulatory framework can ensure that workable government industry standards emerge, he says.

> It's important for businesses to provide feedback to industry associations and governments regarding draft regulations and how RFID can be used effectively.
>
> ANTHONY MONACO, KPMG

"Many companies in various industries are going to discover, during the next several years, that it will become increasingly difficult to manage regulation and compliance tasks without RFID," QLM's McCartney says. "RFID is ready to tackle the task. The technology is mature enough to move beyond asset-tracking capabilities and address sophisticated regulatory and compliance challenges. It's now up to business and IT leaders to put the technology to use.

"We're still in the early stages of adoption in terms of regulatory compliance," McCartney adds, "but RFID technology has the potential to unlock dramatic cost savings and efficiency gains."

Stress-Relief for Air Travelers

PHOTO ILLUSTRATION: ISTOCK/RFIDJOURNAL

With an increasing focus on customer services, airlines and airports turn to RFID to improve baggage handling and reduce flying-related hassles.

BY JENNIFER ZAINO

THE DAYS WHEN air travel was a glamorous experience are long gone, at least for the average consumer. Today, passengers have to deal with seemingly endless security lines, baggage-handling fees, departure delays and limited leg room, while worrying where and how far away their gates are and whether their checked bags will arrive at their destination airport the same time they do. Anticipating their trips to the airport, many surely wonder: Can't something—anything—be done to make flying just a little less stressful?

Some airlines and airports have been working to do just that, turning to radio frequency identification technologies to track luggage more accurately, automate check-ins and provide an easier way for travelers to get updated flight and gate information. But it's been a slow journey toward the adoption of RFID baggage-handling solutions. And the use of Bluetooth Low Energy beacons in airports to deliver up-to-date information to passengers' smartphones is still emerging. But those working

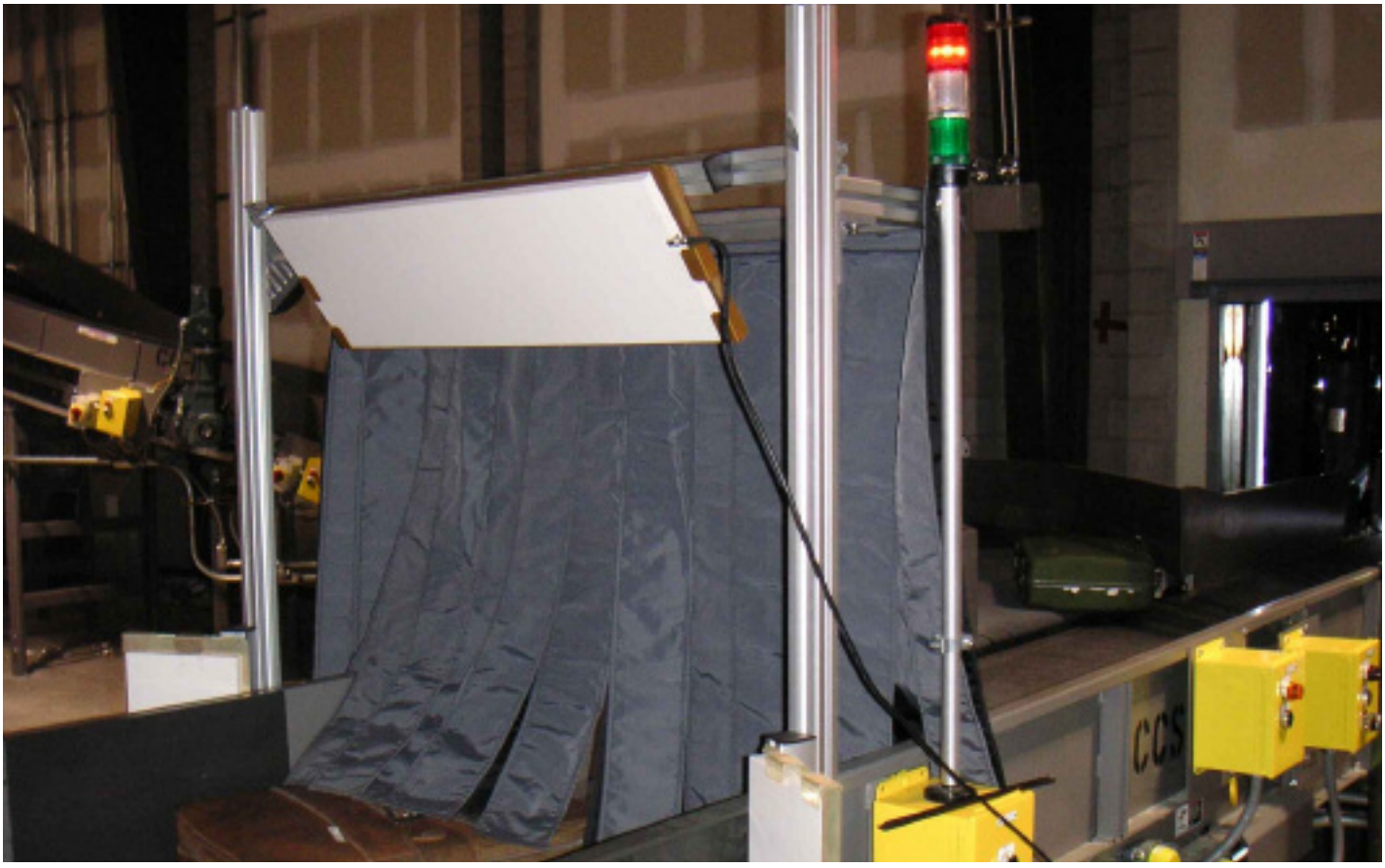

PHOTO: MCCARRAN INTERNATIONAL AIRPORT

"RFID has helped us cut down on customer frustration... and on costs to air carriers for having to reunite bags with their owners."

—SAMUEL INGALLS, McCARRAN INTERNATIONAL AIRPORT

in the airline and airport industry believe standards, improved technologies, and pilot projects and deployments will, in the next few years, move the sector from the transition phase it's in to one in which RFID is used worldwide to improve customer services. (Meanwhile, Airbus and Boeing are making progress working with customers to RFID-tag parts and equipment on airplanes, which should improve operations and maintenance, potentially reducing delayed departures. Some airlines, for example, can quickly check the presence and expiration status of life jackets on an aircraft.)

Missing: RFID Baggage Solutions at Airports

In 2005, the International Air Transport Association published the RP1740C standard, which defines the requirements for applying RFID technology to baggage handling. IATA, the trade association representing and serving the airline industry, endorsed the use of ultrahigh-frequency RFID tags and readers compliant with the ISO 18000-6C protocol as a global air-interface standard for baggage tags.

Today, Hong Kong International, Lisbon Airport and McCarran International in Las Vegas are among the few airports that have invested in RFID systems for baggage handling and tracking. And not one airline has adopted RFID for baggage handling across its entire network. "I think it's fair to say that RFID has not taken off quite as quickly in the industry as we thought it would [for baggage handling]," says Samuel Ingalls, McCarran's assistant director of aviation, information systems.

McCarran launched its RFID baggage-handling system at its Terminal 1 facility in September 2005, leveraging Gen 1 UHF technology for sorting and routing luggage. Since then, that facility has been upgraded to Gen 2 UHF disposable tags and readers, and Terminal 3

Major Airline Preps for Baggage-Tracking Initiative

MANY RFID BAGGAGE-TRACKING solutions use cellular networks for communication between RFID readers and an airline's database. An airport's Wi-Fi system operates at check-in counters and bag rooms, whereas a cellular network can reach other transfer points, conveyer belts and tarmacs.

A major (as yet-undisclosed) airline preparing for a baggage-tracking initiative asked telecom solutions vendor PCTEL to determine which cellular network offered the best coverage. PCTEL recently completed network testing at more than 300 domestic and international airports.

At each airport, the effort involved using RFID interrogators to read an RFID-tagged bag at various points from check-in to holding rooms to tarmac, testing two tier-one carriers' 3G and 4G networks at each site. (PCTEL isn't free to name them publicly.) At the end of the testing, which involved measuring data-transfer speed, signal quality, strength and reliability, PCTEL was able to recommend to the airline the best carriers and technology to program the RFID readers at each airport, says Jay Maciejewski, PCTEL's VP of business development, engineering services.

In a large airport, the nearest cell tower could be far away, Maciejewski says. Many of the gaps in coverage that were identified exist in the bowels of the airports, in the baggage-handling and luggage-transfer areas. Extremely large airports also can have issues reading luggage on the tarmac, the last point before it enters the plane.

"The terminals we walk through are primarily covered very well, but that's not where all the bag-tracking action happens," Maciejewski says. "A gap as small as a couple of hundred yards underneath the airport where bag transfers occur can be critical when it comes to RFID reads."

Airlines that test cellular coverage could share the information with the various carriers, Maciejewski says. Then, to vie for an airline's business at an airport, some carriers might consider putting in a small cell tower at their own expense. —*J.Z.*

PHOTO: HONG KONG INTERNATIONAL AIRPORT

The Baggage Handling System at Hong Kong International Airport processes more than 80,000 bags per day on average, and 100 percent of them are using RFID tags and labels.

opened in summer 2012 with the same system in place. Readers installed above conveyors at various points interrogate an RFID inlay's unique identifier, which is linked to the flight number for the luggage, and transmit that information to the airport's sortation system to ensure appropriate baggage routing. Passengers can use self-check-in kiosks to print their own RFID baggage tags.

RFID has proven itself highly accurate and stable in routing bags over the 12 miles of McCarran's complex baggage-conveyor system, Ingalls says, despite the fact that many of the airport's carriers have relatively short turn times to move bags from place to place. According to recent figures, the system achieves between a 99.2percent and 99.6 percent read accuracy for approximately 31,000 bag tags on an average day and roughly 50,000 on a peak day.

"If 10 percent were not accurately read and were either going around the system looking for a read or routed to the wrong location, that would be some 3,000 bags to be manually dealt with on a normal day or 5,000 on a peak day, and the majority of them would miss their flight," Ingalls says. "It's frustrating for customers to not have their bag arrive when they do, so RFID has helped us cut down on customer frustration. The secondary thing is that it has helped cut down on costs to air carriers for having to reunite those bags with their owners."

In addition, says David Bourgon, McCarran's manager of airport IT services, the airlines have access to the airport's database of the bags they are carrying. With all the information it hosts about every RFID read point a bag goes through, they gain "a far more granular picture of exactly what happens to bags that they can use to make decisions to improve processes."

The pace of adoption has been slow despite advantages like better read rates with RFID bag tags compared with bar codes, agrees Michael Vistisen, market unit director at Lyngsoe Systems. The company has installed its complete

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Qantas passengers who use permanent RFID-equipped Q Bag Tags can check their luggage at the airline's Auto Bag Drop kiosks.

RFID on Baggage solution at Lisbon Airport, Milan Malpensa in northern Italy and Aalborg Airport in Denmark, and 20 airports in Scandinavia use the solution for baggage tracking for Scandinavian Airlines. Lyngsoe also supplied the readers for Hong Kong International Airport's baggage-tracking system.

"When you have poor read rates, as you do with bar codes, you miss a lot of suitcases and they have to go back to the sorting process, get rerouted and so on," Vistisen says. "When the same suitcase has to go through the same sorting machine more than once, that takes up capacity."

The Baggage Handling System (BHS) at Hong Kong International Airport, for example, processes more than 80,000 bags per day on average, and 100 percent of them are using RFID tags and labels, says an airport spokesperson. "In the past few years, we completed the baggage capacity enhancement projects, which cost about HK$750 million," the spokesperson says. "Currently, RFID technology is integrated with new conveyor systems throughout the projects to increase the capacity of the BHS from 8,000 bags per hour to 16,000 bags per hour." Plans are in place to deploy RFID baggage tagging in conjunction with the airport's self-bag-drop check-in counters in the near future.

But the industry by and large is conservative, Vistisen says, and wide-scale adoption requires that "several stakeholders in the bag-handling process need to come together and have an incentive structure" to move things along. Even large airlines that have taken up the RFID cause for baggage check-in and handling purposes have only been able to take things so far on their own.

In 2011, Qantas began offering its Faster, Smarter Check-in solution, which features RFID-enabled frequent-flyer cards that passengers can use to quickly check themselves in at the airline's Q Card Reader kiosks. The card also functions as a boarding pass.

Passengers who use permanent RFID-equipped Q Bag Tags can check their luggage at Auto Bag Drop kiosks. They scan their boarding pass or Qantas Card to automatically synchronize their flight details with the Q Bag Tag's RFID chip. (Qantas Platinum One, Platinum, Gold and Silver frequent flyers receive complimentary Q Bag Tags; other passengers can buy them at qantas.com and some retail outlets.) As a bag moves from luggage belts to carts and tarmacs, fixed and handheld readers at various points scan its identity for accurate routing.

But the Faster, Smarter Check-in solution is a domestic effort—Q Bag Tags can be used only for Qantas and QantasLink flights within Australia. "The difficulty with international adoption is the RFID readers required back-of-house in the baggage-handling systems," says Richard Dinkelmann, managing director at ICM Airport Technics Australia, which supplied 80 Auto Bag

PHOTO: QANTAS

Drop systems for Qantas at six Australian airports. Qantas can exert a lot of infrastructure control at domestic locations such as its Sydney terminal, where it manages everything, he notes. So it made sense for the airline to invest in back-end RFID infrastructure at these sites.

But at most airports worldwide, many airlines share common baggage-handling facilities. The airlines would have to band together, develop a business case for an RFID baggage-handling infrastructure and convince airport owners that there would be a return on investment, Dinkelmann says. "This hasn't moved further because of this," he adds.

Found: A Route to Adoption

"RFID will slowly but surely find its way into baggage operations," according to a spokesperson for KLM Royal Dutch Airlines, which has been part of the Air France KLM group since a 2004 merger. To foster adoption, early next year, the Air France KLM Group—in conjunction with FastTrack Company, telco KPN and luggage maker Samsonite—plans to launch the eTag, a permanent electronic label that attaches to the outside of a suitcase, and eTrack, a tracking device that goes inside the bag. The idea is that the technology won't be limited to a single airline, so it will have broad appeal to airports and consumers.

The e-Tag will be available in conjunction with multiple participating airlines (as yet to be named beyond Air France KLM), while FastTrack has launched a pre-order campaign under the brand-name Eviate, in which eTrack can be purchased at a discount. The devices can be used separately but are designed to work together.

The e-Tag lets consumers load flight data to the tag and check in at home, so they can just drop off their bags when they arrive at the airport. It is readable by both bar-code and RFID readers; an airline's check-in system generates the bar-code or RFID identification. Details for each new trip can be updated automatically and reflected on its E Ink screen. The eTag uses Bluetooth to connect with consumers' smartphones, so it can alert passengers when their luggage arrives at a carousel. eTrack lets passengers flying with any airline track their bags and bag status during travel via a smartphone application.

"By including RFID in the e-Tag, airlines and airports will be able to shift to RFID in a controlled manner," the KLM spokesperson says. In addition to Air France KLM and Qantas, at least six airlines are interested in the reusable tag concept, either with or without the digital display, says Andrew Price, IATA's head of airport operations management. "They all contain an RFID component, so we will see more traction in the RFID world come through that," he says.

Other airlines are exploring development of reusable tags. Bourgon says some carriers (which he's not at liberty to name) have tested their versions of reusable tags at McCarren "in what the industry deems the largest RFID test facility in the U.S.," to have visibility straight through into the belly of their planes.

The industry is in a transitional phase, says IATA's Price. Some airlines and airports still use traditional 1-D bar codes for luggage tags and bag handling, others 2-D bar codes, and still others disposable and reusable RFID tags. Though e-tags are on the horizon, their cost, with screens and batteries, could be an issue, he says. It will take a few years to sort it all out, he adds, and 1-D tags are not being retired, because many airlines want to maintain some compatibility with existing systems. To help airlines and airports reach a consensus and move forward, IATA plans to offer research and recommendations.

> "The incentive for airports [to participate in the RFID pilot] is to keep customers in commercial areas where they spend money instead of staring at the baggage area."
>
> **MICHAEL VISTISEN, LYNGSOE SYSTEMS**

The organization's Resolution 753, for maintaining accurate baggage inventory, might be key to more widespread adoption of RFID. By

eTag uses Bluetooth to connect with consumers' smartphones, so it can alert passengers when their luggage arrives at a carousel.

June 2018, IATA members—roughly 260 airlines in more that 117 countries—will be obligated to demonstrate delivery or acquisition of baggage when custody changes; provide an inventory of bags, upon departure of a flight; and be capable of exchanging these events with other airlines as needed. "You can do that with an RFID chip inside a bag tag and that RFID chip can have a Globally Unique Identifier (GUID), and if you index that into baggage messages, it's a very nice way to do cheap and reliable tracking," Price says. "And there are a lot of opportunities there once you can track a bag to a higher degree of accuracy in terms of being able to provide more and better information to passengers."

The more information that can make its way into passengers' hands, the better for everyone. A pilot is in place now with Lyngsoe and several airports and airlines in Scandinavia to give selected frequent-flyer passengers reusable RFID tags to attach to their luggage and mobile apps to monitor their bags' location. That way, passengers can know how much time they have before their bags reach the carousel for reclamation.

"The incentive for airports [to participate in the RFID pilot] is to keep customers in commercial areas where they spend money instead of staring at the baggage area," Vistisen says. "And, of course, everyone believes this will give customers a better experience of being in the airport. That's important because today airlines are focused on customer satisfaction and loyalty, and they are looking for ways to win customers from competitors, versus a few years ago when they were focused more on cost savings."

Focus: Customer Service

Airports are also exploring the use of Bluetooth Low Energy beacon technology to help reduce travel hassles. The battery-powered devices can enable a variety of applications that provide passengers with real-time information via their

PHOTOS: KLM

smartphones and tablets, such as updated departure times and promotional offers at nearby shops. Passengers are more relaxed when they know where to go and when, and they are likely to do more shopping on the way to their boarding gate or while waiting for a flight.

In 2014, Miami International Airport installed hundreds of Bluetooth beacons across its facilities, from check-in gates to valet parking zones. "Airlines that fly to Miami are already working on their apps so passengers will start seeing the benefits very soon," says Maurice Jenkins, the airport's division director of information systems, in a statement announcing the deployment.

Hong Kong International Airport also has trialed beacon technology, and the airport spokesperson says it's working with different partners to move things forward in this arena. "With this beacon infrastructure in place at HKIA in the near future, mobile applications can be built by airport, airlines, handling agents and other service providers that will improve passenger experience and operational efficiency," the spokesperson says. "For example, passenger way findings, boarding alerts and proximity marketing will be enabled at HKIA."

Key to these and other beacon initiatives is the Common-Use Beacon Registry, established by SITA Lab, the research and development arm of industry-owned air transport IT and communications specialist SITA. The registry defines standards for deployment to ensure interoperability among airports worldwide. In addition to Apple's iBeacon technology, Google and Samsung introduced beacon formats for the Android OS. This will spur adoption, says Kevin O'Sullivan, who has spearheaded the SITA Lab beacon research.

But, he adds, "incompatible formats and integration hassles awaited if airlines and airports all went in their own directions. To enable beacon technology to be adopted by our industry,

eTrack lets passengers flying with any airline track their bags and bag status during travel via a smartphone application.

we needed some sort of standardized way to deploy these devices. That way, an airline flying to Heathrow gets the same experience as one flying to JFK or Singapore or wherever."

To simply adoption, the registry establishes a common-use beacon infrastructure, functioning as a directory listing of all the beacons at airports worldwide, along with standards on how to deploy them, from major identification values to zone addressing values (check-in, security, retail, gates and so on). SITA also offers recommendations on beacon placement. This fall, a task force composed of SITA, IATA and the Airports Council International will publish a document recommending the Common-Use Beacon Registry as a recognized practice for the industry.

Airports should be the parties to authorize and enable the installation of beacon infrastructures, O'Sullivan says, but it may be airlines that become the principle users of the technology, simply because passengers are more familiar with airlines apps. Airlines will likely see fees for use of beacon technology rolled into their common infrastructure management charges. Retailers can also benefit if consumers install their apps. Passengers will have to consent to turning on Bluetooth and giving an app permission to use their locations.

There are still a few kinks to be worked out, given all the airline, airport and operational systems data. "There are so many different versions of data floating around on everything from when a flight leaves to where boarding is, so there is an individual offshoot project under way as a SITA-brokered solution to come up with a single version of truth across the industry and its multiple stakeholders when it comes to this and other relevant data," O'Sullivan says. "It will include things like coming up with ways to define and measure wait times at security lines in a consistent way so we can provide the right data at the right time to passengers."

Once that is in place, the goal is to help travelers better visualize the information that can be delivered with the help of Bluetooth beacons. Instead of just a text list of location or itinerary, SITA wants "to give passengers a rich experience of apps providing a guide about where to go using up-to-date itinerary data from airlines and operational data from airports, with map information to help visualize their journey," O'Sullivan says. "That's a great experience to offer distressed passengers, providing reassuring information so they don't have to stand under a screen for an hour waiting for updates and running to the gate because they don't know how far away it is."

An airline could also use beacon technology to improve workforce operations, by, for example, combining operational data with maps and task assignments to send the employee closest to an available wheelchair to a gate where a passenger needs service. "It can optimize how you allocate those tasks and assist passengers, as well as deliver cost savings and provide more efficient use of staff," O'Sullivan says. "Those in airport operations control are in a complicated area, so it's a great way to try to give them a better understanding of what happens on the ground."

The SITA Registry, Miami International Airport's Jenkins said, "makes it simple for us to collaborate with our partners, both domestic and international, and let them take advantage of this new technology, too."

McCarran Airport hasn't installed Bluetooth beacons yet, but, Ingalls says, "We are keeping our finger very closely on the pulse and thinking of various possibilities and applications of that technology." There's great potential, he adds, but the airport is still looking for the real killer app that's going to deliver a significant business and customer service benefit.

Meantime, he's pleased the foundations are in place for RFID technology to have an even bigger impact on air travel in the coming years. "I think the accuracy benefits and data benefits of having all the data points on the bags and the realistic possibility of not even needing to have a consumable-type tag, which takes the cost down considerably, are all coming together." he says. "And it's happening in a fashion that really makes me think that RFID is primed for takeoff now."

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What You Need to Know About RFID

Patient-Management Solutions

BY BOB VIOLINO

ILLUSTRATION: ISTOCKPHOTO

Monitoring patients in real time can improve services and safety, increase operational efficiencies and boost a hospital's reputation.

HOSPITALS AND OTHER health-care facilities faced with too many patients and too few beds, nurses and other resources have turned to RFID-based patient-management real-time location systems (RTLSs). By identifying and tracking patients from the time they arrive at a hospital's admitting department or emergency room, or at a clinic, through their stay and discharge, health-care facilities can improve patient care and safety, decrease patient wait times, and increase operational efficiencies and the bottom line.

Texas Health Harris Methodist Hospital Alliance in Fort Worth, for example, deployed a patient-management RTLS from CenTrak, in conjunction with an asset-tracking system, to automate the discharge process and locate patients for friends and family. The Joint Implant Surgeons of Florida, in Fort Myers, boosted efficiencies by implementing a standalone patient-management RTLS from Ekahau to track patients and clinic staff members. It improves appointment scheduling and flow, enabling the clinic to serve patients with shorter wait times.

These solutions can also monitor health-care workers to, for instance, see how long a nurse spends with each patient, identify potential exposure to infectious illnesses and enable a caregiver to call for help. Ekahau's badge tag, for example, has a duress feature that lets a caregiver signal for help if he or she is injured while lifting a patient or a patient becomes violent, says Emily Nardone, director of product marketing. "The alarm not only alerts personnel to a problem but also supplies the location of the incident, which helps reduce response times and, in turn, can save lives," she says.

Sanitag's RTLS platform includes a nurse-call feature that lets patients in need of assistance push a button on their RFID tag. The alert is received at the nurses' desk, says Özgür Ülkü, director of global operations, and since the system knows patient location in real time, the nurses can send help to that precise location.

Enhanced patient safety and security are also key capabilities of these solutions. They can help staff members monitor patients who are at risk of wandering off or losing their way in a hospital. "It's especially important to know the whereabouts of dementia and psychiatric patients," says Ralph Jarmain, managing director SecuriCode, which offers a patient-management RTLS.

Some hospitals use a patient-management RTLS to improve patient-care throughout within the facility—the system may alert nurses or transport staff when a patient is ready to return to his or her room after an X-ray or other test, for instance. It may also alert workers when an operating room or other procedure area is no longer occupied, so they can begin preparing it for the next patient.

In addition, a patient-management RTLS can automate the bed-management process, by identifying when a patient is discharged and alerting admissions that a room has been vacated. In some cases, cleaning personnel carry RFID tags so they can alert the system that a room is ready for the next patient. SecuriCode's OccuTag can be affixed to a bed and used to signal personnel that a bed is

"For true workflow automation, health-care facilities must have the ability to segment spaces into clinically meaningful zones."

Adam Peck, CenTrak

Sanitag's long-range readers are installed in a large hospital's hallway.

CentTrak's battery-operated devices can be positioned wherever accurate location data is needed, such as clipped to a ceiling tile grid.

unoccupied, needs to be cleaned or is ready for the next patient.

"For true workflow automation, health-care facilities must have the ability to segment spaces into clinically meaningful zones including patient rooms, beds, bays, chairs, nursing stations, hallway segments and other relevant areas," says Adam Peck, CenTrak's senior director of marketing.

DEPLOYMENT OPTIONS

An RFID patient-management RTLS can be deployed as a standalone system or part of a solution that includes asset tracking. CenTrak's platform is often deployed solely to support use cases that require tracking of people, Peck says, but asset-management RTLS applications have traditionally been able to demonstrate the quickest, most tangible return on investment. "Once a health-care facility begins to realize significant cost savings from the ability to reduce and/or eliminate equipment rentals and shrinkage," he says, "they explore other ways to leverage their RTLS investment, such as staff locating, patient tracking and hand-hygiene compliance monitoring."

Sanitag's RTLS Platform offers four modules: patient management, asset tracking, staff safety and management, and infant security. "The hospital can deploy all four modules together or start deploying module by module," Ülkü says. They share the same database and can be fully integrated, he explains. "Some hospitals would like to focus on a specific floor or clinic, and others would like to focus on the entire facility," he adds.

"In some hospitals, deployment is just in obstetrics, neonatal and pediatrics—mainly baby-related," says SecuriCode's Jarmain. "Other hospitals include day care, observation, psychiatry, morgue, visitors and other areas."

Similarly, Ekahau's patient-safety solution can be deployed as a standalone system, often along with the staff safety solution, or in conjunction with the company's asset-tracking and/or temperature-monitoring solutions.

PHOTOS: SANITAG (LEFT) AND CENTRAK

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SUPPLY CHAIN BRAIN

"Some hospitals would like to focus on a specific floor or clinic, and others would like to focus on the entire facility."

Özgür Ülkü, Sanitag

Ekahau's RTLS deployments typically cover an entire facility or hospital, Nardone says.

LOCATION ACCURACY

All four leading providers offer active RFID tags and readers, often in conjunction with infrared (IR) technology. In general, active RFID is the main technology for long-range and site-wide location identification within health-care facilities. IR tags can provide room-level and bed-level accuracy. Passive solutions are being adopted in hospitals for applications such as automatic replenishment for low-value medical supplies, consignment product management, and tracking medical instruments and laundry.

All four solutions also operate over Wi-Fi networks, because the networking technology is so common in health-care facilities. By using Wi-Fi for RTLS, Nardone says, clients typically cut installation time in half and save thousands of dollars in costs, because it is wire-free and does not require infrastructure changes. The data travels directly over Wi-Fi.

But active Wi-Fi tags on their own do not provide location accuracy to anything much less than 100 meters (328 feet), unless secondary technologies such as RF exciters, IR beacons, location appliances or specialized network operating systems are incorporated, Jarmain says. SecuriCode doesn't provide Wi-Fi tags but supplies Wi-Fi readers that act as tag "hubs," communicating with Wi-Fi networks, he explains.

SecuriCode's solution can be used to divide rooms into zones, but generally only for large, open spaces such as waiting rooms. Tags communicate with nodes, which then communi-

SOME LEADING PROVIDERS OF
Active RFID Patient-Management Solutions

COMPANY	APPLICATIONS	HARDWARE	SOFTWARE
CenTrak centrak.com	Patient safety and security; nurse call; clinical operations and workflow	Hybrid RFID and infrared badges; IR modules for room and hallway location; LF exciters for chokepoints; operates over Wi-Fi network; Bluetooth enables communication with tablets and smartphones	Middleware; integrates analytics software provided by partners into the platform
Ekahau ekahau.com	Patient and staff safety and security; workflow	Wi-Fi B4 badges with customizable buttons and an LED screen for two-way communication; IR beacons for room-level accuracy	Cloud-based software provides floor-plan maps, dashboards and reports
Sanitag sanitag.com	Patient and staff safety and security; nurse call; workflow	RFID wristbands and staff badges; room-level readers for bed-level accuracy and long-range readers for hallways; routers that transmit data to Wi-Fi network	Software suite includes dashboards and reports; modules for psychiatric clinics and elderly care
SecuriCode securicode.co.uk	Patient safety; nurse call; bed management	RFID bracelets and readers that transmit data via Wi-Fi or Power-over-Ethernet; OccuTag for bed management	Atlas RFID and application server; reports data to third-party software
Stanley Healthcare stanleyhealthcare.com	Patient safety and security; workflow	Wi-Fi patient wristbands and staff badges; ultrasound exciters for room- and bay-level accuracy; LF exciters for chokepoints	MobileView software platform and analytics; dashboards and reports; modules for outpatient clinics, emergency rooms and operating rooms

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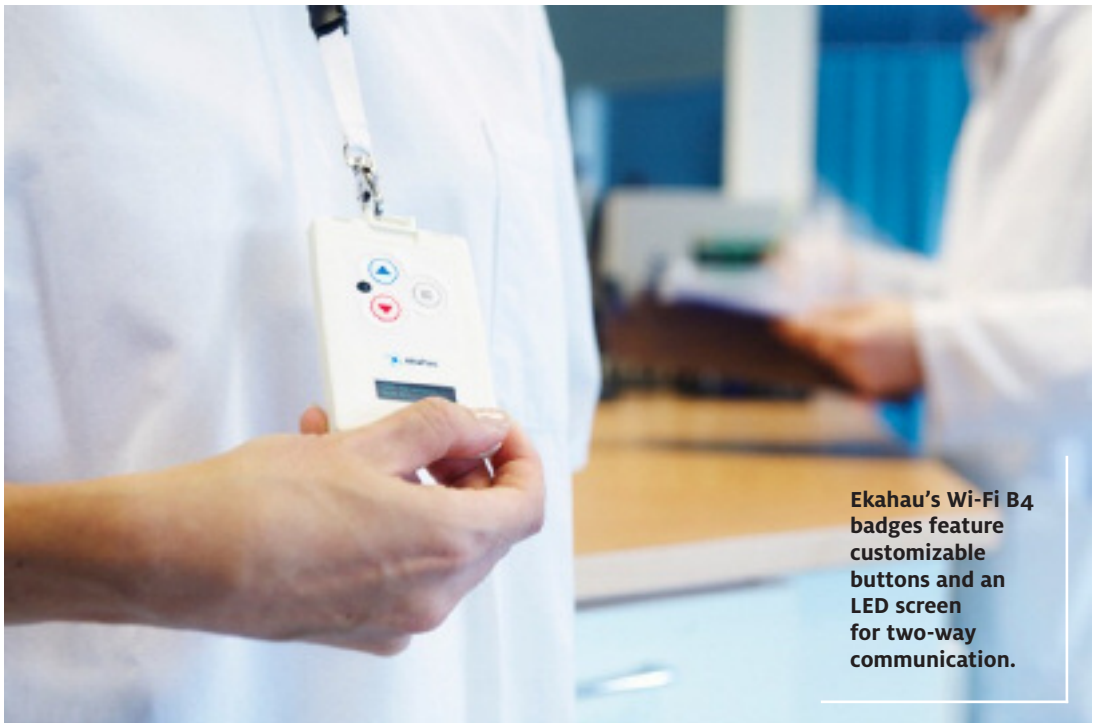
"We can do bed-level location, with specific nodes at each bed, but most hospitals do not have the budget for this and it is generally not necessary. Ward and room level is more than adequate for most."

Ralph Jarmain, SecuriCode



Ekahau's Wi-Fi B4 badges feature customizable buttons and an LED screen for two-way communication.

cate with the company's Atlas application server. "We can do bed-level location, with specific nodes at each bed, but most hospitals do not have the budget for this and it is generally not necessary," Jarmain says. "Ward and room level is more than adequate for most."

Ekahau's Vision software lets users divide their floor maps into zones, Nardone says. Wireless beacons identify the locations of tags within a given zone and can provide sub-room-level accuracy, she says.

CenTrak's solution uses Gen 2 IR devices to accurately divide rooms and separate beds or bays. The battery-operated devices can be positioned wherever accurate location data is needed, Peck says, such as clipped to a ceiling tile grid. Low-frequency exciters capture tag movement at department threshold doors and other chokepoints. With this level of location granularity, he says, workflows present opportunities to favorably impact clinical efficiency and quality, staff safety, patient satisfaction and cost compression.

BUSINESS INTELLIGENCE

Most patient-management solutions include software that collects location data and displays it on dashboards, so hospital staff members can monitor patients. The software also features reports, so hospital administrators can analyze the data to track trends and improve processes.

Location data from Ekahau's RTLS can be saved into the Ekahau database located on client servers. Its Vision software includes more than 30 standard reports and the ability to customize reports. Some of the reports are related specifically to patient flow, Nardone says. A Dwell Time report, for example, is used to signify the amount of time a patient or caregiver spends in an area, such as a waiting room or triage. A hospital could use these reports to identify changes needed in operations or workflows. The Forensic Replay feature can replay the location of various tags after an event occurs, so administrators can understand how long it took to get assistance to patients or caregivers who triggered alarms.

SecuriCode's Atlas server enables data to be saved both in a relational database and in log files. It supports browser-based reporting or transmission of reports data to third-party systems. The solution includes a browser-based administrator that runs on workstations and in some locations via Wi-Fi on iPads. "Depending on the administrator login, users can add and monitor floors, define zones and

PHOTO: EKAHAU

SecuriCode's patient bracelet comes with an alert button and an optional accelerometer for free-fall detection.

access rights, monitor and acknowledge alerts, search for assets and run reports," Jarmain says. Most reports related to patient management are customized for particular hospitals and are confidential, he adds.

The Sanitag platform provides several analytics reports and executive dashboards.

CenTrak's solution does not include end-user software, Peck says. "Our partners offer this and sell our tags and infrastructure as a complete solution," he says. The solution does include a server that feeds location data to its partner end-user applications, he adds.

THE AGE OF PATIENT SATISFACTION

Most health-care facilities are not taking advantage of these features and their potential benefits, according to the providers of RFID-based patient-management RTLS solutions. But that may be beginning to change.

In Europe, SecuriCode sees approximately five new installations each year, with no signs of apparent growth, Jarmain says. In Africa and Asia, there is more interest, while in the United States and Canada the installed base is small. Yet, he says, the business benefits are clear. In the United Kingdom, for example, health-care organizations are penalized financially if they don't meet response, waiting, treatment and aftercare times, he explains, so these systems could help them avoid fines.

Interest in RTLS to support patient-flow initiatives and other operational enhancements "is certainly on a steady rise," Ekahau's Nardone says. Health-care facilities are interested in understanding where bottlenecks in their operations exist, so they can make decisions to help speed up admission processes, reduce wait times and enhance the safety of those onsite, she says.

Sanitag views its patient-management offering "as a comprehensive solution that includes infant safety, patient safety, and staff and medical asset-tracking systems," Ülkü says. "When you look at it that way, the savings to the hospitals are huge. The patients are served much better; the system improves quality of service at health-care institutions and, therefore, helps in competition."

CenTrak's Peck says sales of its solution are "definitely on the rise. We're seeing a big jump in [volume] as IT departments are looking for ways to get even greater value from their EMR [electronic medical records] investment," he says.

The platform can integrate with billing by time-stamping associations of medical equipment, staff and patients. "This is a future use case, Peck says, "but definitely possible with the technology available today."

In addition, Peck says, "improved patient management will likely increase their satisfaction and improve outcomes," which will elevate Hospital Consumer Assessment of Healthcare Providers and Systems scores. In the United States, results from HCAHPS—a national, standardized survey of patients' perspectives of hospital care—factor significantly in the amount of government reimbursement a health-care facility receives.

Increasingly, health-care facilities are focusing on patient satisfaction. In fact, some hospitals, such as Cleveland Clinic and Johns Hopkins Medicine, are employing chief patient experience officers. RFID patient-management solutions can improve patient care and enhance the reputation of health-care facilities.

Interest in RTLS to support patient-flow initiatives and other operational enhancements "is certainly on a steady rise."

Emily Nardone, Ekahau

PHOTO: SECURICODE

Beyond Inventory Visibility

Retailers should use RFID data to improve business processes and enable a true omnichannel shopping experience.

By Bill Hardgrave

RETAILERS THAT are tagging and tracking apparel items in stores are seeing that RFID does increase inventory accuracy and improve sales. But as beneficial as that is, they are not realizing the full value of RFID. And they are not taking the steps necessary to fulfill their promise to customers to provide an omnichannel anytime, anywhere shopping experience.

The problem is that retailers are not using all the RFID data they collect. To harness the power of RFID, retailers must change two things: One is a business process and the other, which may prove more difficult to address, is a way of thinking.

First, current retail data is built around the Universal Product Code. The UPC is "group"-level data, which means each stock-keeping unit is represented by one UPC. All men's shirts brand XY, size 16/34, blue, for example, are UPC 1234567.12345. If a store has 20 of these shirts, the system shows 20 of UPC 1234567.12345 on hand. And all previous and future shipments of these shirts will have the same UPC.

Now, consider the same shirts identified with RFID EPC tags. Each tag has a unique serial number, and the system shows each shirt individually. This makes it easy to store information such as country of origin, manufacturing facility and cost in a database linked to that particular EPC. The data could reveal, for instance, that the shirts manufactured six months ago at Plant A had fewer defects than those received recently from Plant B.

Most retailers are unprepared to capitalize on the new RFID "master data." Instead, they handle the situation by collapsing the EPC data into UPC data and lose the richness of the EPC information. Retailers must develop a software strategy for storing all the RFID data so it can be analyzed and used to develop a better understanding of—and, ultimately, improve—store processes. RFID data can also be used to enhance the customer experience by, for example, making it easier to return an item to a store.

Second, to provide complete visibility of products required by today's omnichannel environment, all supply-chain partners must share data. Suppliers must let retailers know when and where products were manufactured and when they shipped. Retailers must tell their suppliers when products were received at distribution centers, shipped to stores, put on sales floors and sold. Traditionally, retailers do not like to share this data. But the old mentality of "us vs. them" is counterproductive in an omnichannel world. Furthermore, when suppliers get maximum value from RFID, they are more likely to comply with retailers' requests to tag at the source.

ILLUSTRATION: ISTOCKPHOTO

The RFID data must be shared using a common architecture, because it would be disastrous for suppliers to have to develop a different system for each retailer. Fortunately, GS1 has already thought of this and developed the Electronic Product Code Information Services standard for sharing data with business partners (see Ken Traub's column Supply Chain Visibility for more information). It's now time for supply-chain participants to adopt and use EPCIS.

Bill Hardgrave is dean of Auburn University's Harbert College of Business and founder of the RFID Lab. He will address other RFID adoption and business case issues in this column. Send your questions to hardgrave@auburn.edu. Follow him on twitter at @bhardgrave.

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The Obvious—and Hidden—Benefits of RFID Hand-Hygiene Solutions

They can reduce HAIs and save hospitals millions of dollars.

By Ygal Bendavid and Harold Boeck

HEALTH-CARE ASSOCIATED infections (HAIs) are plaguing hospitals worldwide. The Centers for Disease Control and Prevention says that, on average, one in every 25 hospital patients will acquire an HAI. Most hospitals are aware of the relationship between hand sanitation and the transmission of germs that cause HAIs, yet they struggle to enforce hand-hygiene compliance.

Hospitals that have deployed RFID solutions that automatically monitor health-care workers' hand-hygiene behavior and use the data to identify and address problems have increased hand-washing compliance and reduced HAIs. Yet, these obvious benefits alone may not justify the cost of such a solution.

Hospital managers must consider the hidden benefits when they determine the return on investment. Let's examine the chain of events to see how an RFID hand-hygiene solution can impact the bottom line, based on the quality performance indicators hospitals use to measure the efficiency of their operations.

A patient who contracts an HAI will increase the expected patient length of stay. Occupying a bed for a longer period means an impact on capacity management and a reduction in hospital bed turnover rate, which results in a greater need for beds, medical staff and other assets. Reduced patient discharges per week likely impacts revenues by reducing admissions.

Hospitals also need to consider that a patient with a communicable infection could contaminate other patients and the medical staff. That would increase the probability of an outbreak, which would generate decontamination costs. In addition, they must take into account the resulting damage to the hospital's reputation.

What's more, U.S. hospitals stand to benefit from a financial incentive related to the Hospital-Acquired Condition (HAC) Reduction Program established in the Affordable Care Act.

When building a business case, hospital managers must link the original objective—reducing HAIs—with the related key performance indicators to assess the true ROI. Quantifying these savings will be different for each hospital, depending on the number of patients, beds and scope of the RFID implementation, as well as on previous hand-hygiene compliance rates and other variables. Nonetheless, documented experiences are convincing.

Some hospitals that have implemented hand-hygiene solutions have reported more than doubling their compliance rate performance, in some cases reaching well over 90 percent compliance, leading to an HAI reduction of more than 20 percent. Following the chain of events, these hospitals reduced patient length of stay by hundreds of days per year, which resulted in significant cost savings, sometimes reaching millions of dollars.

ILLUSTRATION: ISTOCKPHOTO/RFID JOURNAL

Ygal Bendavid and Harold Boeck are professors in the school of management at the Université du Québec à Montréal, and members of RFID Academia's research board.

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Three Boosts for EPCIS

ISO ratification, new guidelines and free tools will propel adoption of the Electronic Product Code Information Services standard.

By Ken Traub

GS1's ELECTRONIC Product Code Information Services standard, published in 2007, enables interoperability between companies that want to exchange supply-chain data. The Core Business Vocabulary, which provides common definitions for data that populates EPCIS, became a global GS1 standard in 2010.

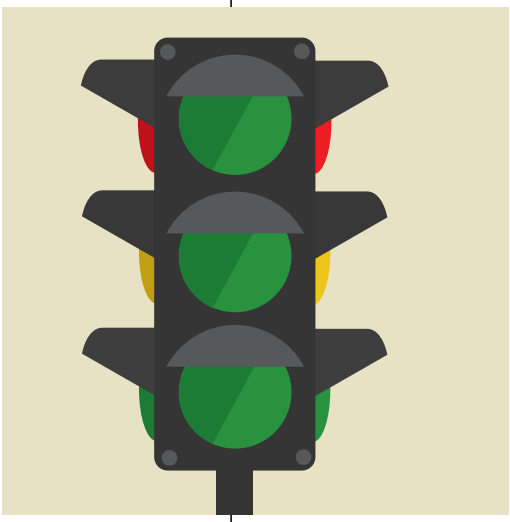
As I've written in past columns, EPCIS and CBV provide an effective way to capture information from RFID and bar codes and to share that information with business applications and trading partners (see How to Deploy EPCIS, EPCIS for Internal Projects and Supply-Chain Visibility). Companies that adopt EPCIS can maximize the return on investment from their RFID deployments.

But the benefits of EPCIS are most widely known in the industry sectors served by GS1—consumer goods, fresh food, pharmaceuticals and transportation/logistics—and primarily to those companies actively involved in the GS1 community where they can find EPCIS expertise. Three recent developments will help expand adoption.

In September, the Organization for International Standardization announced that both EPCIS and CBV have been published as ISO standards—EPCIS as ISO/IEC 19987 and CBV as ISO/IEC 19988. The ISO and GS1 versions are word-for-word identical. But ISO publication brings awareness of the standards to companies and sectors outside the GS1 community. This is especially helpful in sectors in which supply-chain traceability initiatives stem from government regulation (typically aimed at improving consumer safety), as virtually all governments are familiar with ISO and accept its role as the world's ultimate standards authority.

Also aiding adoption is the publication of guidelines that provide step-by-step instructions for applying EPCIS to specific business situations. GS1 US has published the GS1 Healthcare US Implementation Guideline for the pharmaceutical industry, and GS1 Brazil is finalizing the Brazilian Medicine Traceability Using GS1 EPCIS Implementation Guideline to help companies meet local traceability regulations.

In October, GS1 published its EPCIS/CBV Implementation Guideline, a comprehensive methodology and tutorial for applying EPCIS to a variety of business situations, including shipping and receiving, aggregation, transformation of raw materials into finished products, electronic coupons and vouchers, and returnable-asset management. The guide explains in detail how new adopters of EPCIS should design their traceability data in conformance with the standard to achieve supply-chain visibility and interoperability. GS1 will likely publish more sector- and locale-specific guidelines as adoption increases.



Many commercial products have out-of-the-box capability to send and receive EPCIS data, as do many free and open-source software tools. The software options are increasing as developers step up to meet the demand arising from growing EPCIS adoption. Free open-source EPCIS software includes the venerable Fosstrak and newcomer Oliot. FREEPCIS, a free cloud-based EPCIS server just launched by my company, Ken Traub Consulting, is complemented by my Visibility Data Workbench, a free tool for working with EPCIS data.

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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