

Item-level RFID technology redefines retail operations with real-time, collaborative capabilities.

“To a surprising extent, businesses operate today on information that has the quality of myths. The arrival of RFID will, in effect, turn on the lights and identify what is really happening.... It could eventually mean a whole new way of doing business.”

— Kevin Ashton, executive director and cofounder of the Auto-ID Center, Massachusetts Institute of Technology; and associate director, Proctor & Gamble Co.



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Executive summary

Faced with operational efficiency pressures, high employee turnover and dips in customer loyalty, retailers must either drive down cost or create new specialty niches. To stay ahead in this rapidly transforming industry, forward-thinking retail executives are asking how to keep up with competition and grow their businesses. RFID technology—tied to a customer, resource or asset at the item level—can generate higher revenues, greater customer service opportunities, wider margins and capital optimization. This brief explains why RFID matters for retailers, describes in-store RFID capabilities and illustrates the potential payoff of a fully RFID-enabled retail environment.

Envision a real-time, 360-degree view of information flow within your store environment. You know what products you have and where they are located. You know what and how much inventory is in your warehouse and storeroom and on your store shelves. Beyond inventory visibility, you track where your employees are within your store—and the tasks that they are performing—in real time. You provide them with the data and tools they need to be more efficient, productive and responsive to customers' needs. And you capitalize on sales opportunities—from the moment your customers enter your store—by bringing together their profiles, transaction histories and in-store activities with promotions, stock levels and seasonal events to determine the best way to engage them.

A behavioral scientist shopping in such a visionary retail store might describe this scene as a synchronous response environment—an ecosystem that can sense and respond dynamically to both the needs and preferences of its inhabitants as well as shifts in synergistic relationships

between actors within its physical space. Customers, employees and store merchandise are actors in these dynamic scenarios. Store assets are tools for delivering messages and sales opportunities. Actors and assets engage in interactive dialogue based on applied business rules as defined by the retailer. Actions, events and changes in condition trigger immediate reactions. Reactions, in turn, generate information about an object or inhabitant status. For example: a customer selects the last of a particular item on the store shelf; a restock notice instantly appears on a sales associate workpad; a nearby digital display promotes a likely substitute purchase to the consumer; and the customer's profile is updated to include the new purchase. This new data then impacts future actions and reactions. Such environments evolve and thrive by processing dynamic information throughout the system.

Advances in radio frequency identification (RFID) technology are making this organic vision possible; the increasingly competitive retail industry climate makes it an imperative.

RFID is a data-collection technology that uses electronic tags to store identification information, and a wireless device—known as a reader—to capture and transmit that data.

Retail industry trends driving RFID adoption

A review of market and industry trends reinforces the need for retailers to take a close look at RFID.

Consumers are more knowledgeable, diverse and demanding than ever

Today, retail customers expect a high level of individualization and choice in their shopping experiences. At the same time, consumers are fragmenting into microsegments as a result of pronounced shifts in demographics, attitudes and behavior patterns.¹ To address their needs on an individual basis, you will need rapid access to business information collected at an unprecedented level of depth and detail, and then filtered to meet the demands of a single individual customer. At the same time, consumers are demanding assurances that their personal information—gathered, used and stored by retail companies—will be conscientiously safeguarded.² This trend is generating a new industry-wide and governmental emphasis on safeguarding consumer data. You can earn your customers' trust by protecting the security and privacy of consumer data. And you can earn their loyalty by delivering value in exchange for the ability to leverage their personal information in the context of the retail experience.

Competitive and compliance pressures are gaining momentum

Companies have to stay ahead of the competitive market to succeed—and technology innovation is a key to survival. With this in mind, your competitors and partners are already implementing RFID (or soon will be). According to a recent survey of retail chief information officers, 55 percent of respondents reported they already had plans to implement RFID capabilities within three to five years.³ In fact, your competitors may already be implementing or planning to implement item-level tagging for big-ticket items—from washing machines to car stereos to diamond rings—to facilitate product authentication and support long-term, post-sale customer service. Industry analysts predict that adoption of RFID solutions will be a main focus of forward-thinking retailers over the next five years.⁴ Moreover, leading mega-retailers and government agencies have recently mandated that their suppliers implement pallet- and case-level RFID capabilities within a year. Organizations such as Wal-Mart, Tesco, the U.S. Department of Defense and the U.S. Food and Drug Administration are asking—and even demanding—that their partners implement RFID capabilities to track assets, products and materials.⁵

“The adoption of RFID technology is inevitable. It’s transformational promise, huge. But the success of RFID in your business depends on your infrastructure.”

—CIO, December 2003⁶



Technology innovation is fast becoming a crucial mode of differentiation

Leading retailers report that in 2004 they intend to spend more across the board on store technology outside of point-of-sale (POS) systems—aggressively replacing and upgrading core systems to better compete with their peers.⁷ Not only do they plan to invest more, they plan to invest smarter. This means that where and how you meld new technologies with your strategic business objectives will impact the success—and potentially survival—of your retail

organization. When coupled with a flexible IT infrastructure that supports business process and data integration, RFID technology can enable you to streamline operations, drive out costs, expand sales margins, increase revenues, command customer loyalty and target marketing to individual shopper needs. And as consumers increasingly recognize the value and convenience enabled by RFID, it will become a mainstream feature of tomorrow's retail world.

The future has arrived at a METRO Group supermarket in Rheinberg, Germany. METRO has redesigned one of its Extra grocery stores to create a showcase of transformational technologies. Among the store's many advanced features is an RFID-enabled inventory management system that controls stock levels via "smart" tags. As pallets of goods leave the distribution center, the smart tags are read en masse. The store manager can then track each shipment through the warehouse information system, knowing which products to expect and when they are due. When pallets arrive, another RFID tag reading reveals if any cases are missing, eliminating the need to physically check each pallet and count the shipment. Plus, METRO is experimenting with smart shelf technology, through which individual items are tagged. An RFID reader embedded on the shelf sends a message to the store's back-office system when items are placed on or removed from the shelves. This allows the store to restock inventory on demand and avoid lost sales due to empty shelves. In addition, the system tracks how quickly stock is sold, identifying the most and least popular items.



RFID technologies within the retail store

Technology infrastructure and application integration enable organizations to collect and leverage a vast store of real-time data about products, inventory, customers and business processes across multiple transaction points. Integrated technologies—tied to business rules that are driven by real-time information—transform the store into a dynamically responsive environment. RFID tags share information about the physical object to which they are attached and can be written and rewritten from remote locations. Already being piloted and implemented by some leading retailers at the pallet and case level, RFID tags are becoming an important means of improving visibility in the supply chain. Tag information is accessed using external readers positioned throughout the store. In-store wireless networks allow RFID-generated data to be communicated across all sensing software applications. Envision readers incorporated into in-store technologies and customer-owned devices:

- *Kiosks provide convenient access to product information as well as enable customers to independently access capabilities such as self-checkout and self-ordering. For example, an RFID tag embedded in a music shopper's loyalty card could trigger a CD listening station to display and play new releases by her favorite artists.*
- *Mobile devices, such as cart-mounted "personal assistants," workpads and back-door receiving PDAs, enable employees and customers to access information and perform tasks virtually anywhere, anytime throughout your store. Consider the hurried grocery shopper: he could quickly find and purchase the items on his list by using an item locator function in tandem with an RFID-enabled remote self-checkout application. Or that same mobile device could display location-aware messaging by identifying its position in the store and nearby products.*
- *Monitoring gates could identify customers with RFID-enabled loyalty identification technologies (IDs) as they enter the store, triggering selling processes and promotions tailored to the individual consumer; they could also help reduce shrink by signaling when tagged items are removed from the store without being purchased.*
- *Multimedia displays can deliver contextual marketing messages that target individual consumers. A customer identified via her customer profile as a new home owner might be shown aisle-specific advertisements for likely purchases such as bed linens, a lawn mower or houseplants.*
- *RFID-enabled POS systems support faster, more accurate transaction processing. Items and smart IDs could be read as a customer approaches the cashier lane, resulting in shorter checkout lines and the ability to process more sales transactions with the same size staff.*

- *Smart shelves enable dynamic, item-level inventory management by automating and making operational shelf restocking processes. An on-shelf reader might alert the stockroom system when only a few items remain on the shelf; and a department sales associate could be notified when products are incorrectly displayed in the store aisle.*
- *Unattended retailing machines provide customers with self-service access to products and services around the clock. For example, an after-hours customer could select from approximately two hundred convenience-store type products outside your store entrance using a smart-chip-enabled payment device.*
- *Customer-owned devices enable consumers to access information independently. Consider a customer entering the shoe department carrying his mobile phone with an embedded RFID reader. He can query information on a particular shoe that he is interested in purchasing to determine if it is in stock in the size and color he desires.*

The future of retailing: the sense-and-respond store environment

In today's typical retail store, opportunities to drive sales and cut costs are missed every second. Store operations encompass a spectrum of automated and manual processes. Decision making is driven by limited snapshots of information—that may or may not be timely or accurate—on products, inventory, procedures and customers. Employee decisions, job performance and customer interactions are unpredictable. Customer experiences are inconsistent, and their characteristics, needs and preferences are unknown. Sales processes and promotions are based on delayed data. Activities such as transaction processing, information gathering and inventory monitoring occur at only a limited number of locations within the store.

RFID technology can be a catalyst for change. Automated and enhanced store processes supported by a common store infrastructure solution can help you transform your stores into sense-and-respond environments. Data gathered from tag/reader interactions can be integrated into store applications and processes to allow dynamic changes. You can access a real-time view of product, operational and customer-profile data across your operations—from the warehouse to the point of purchase and beyond.

The visionary retail store environment

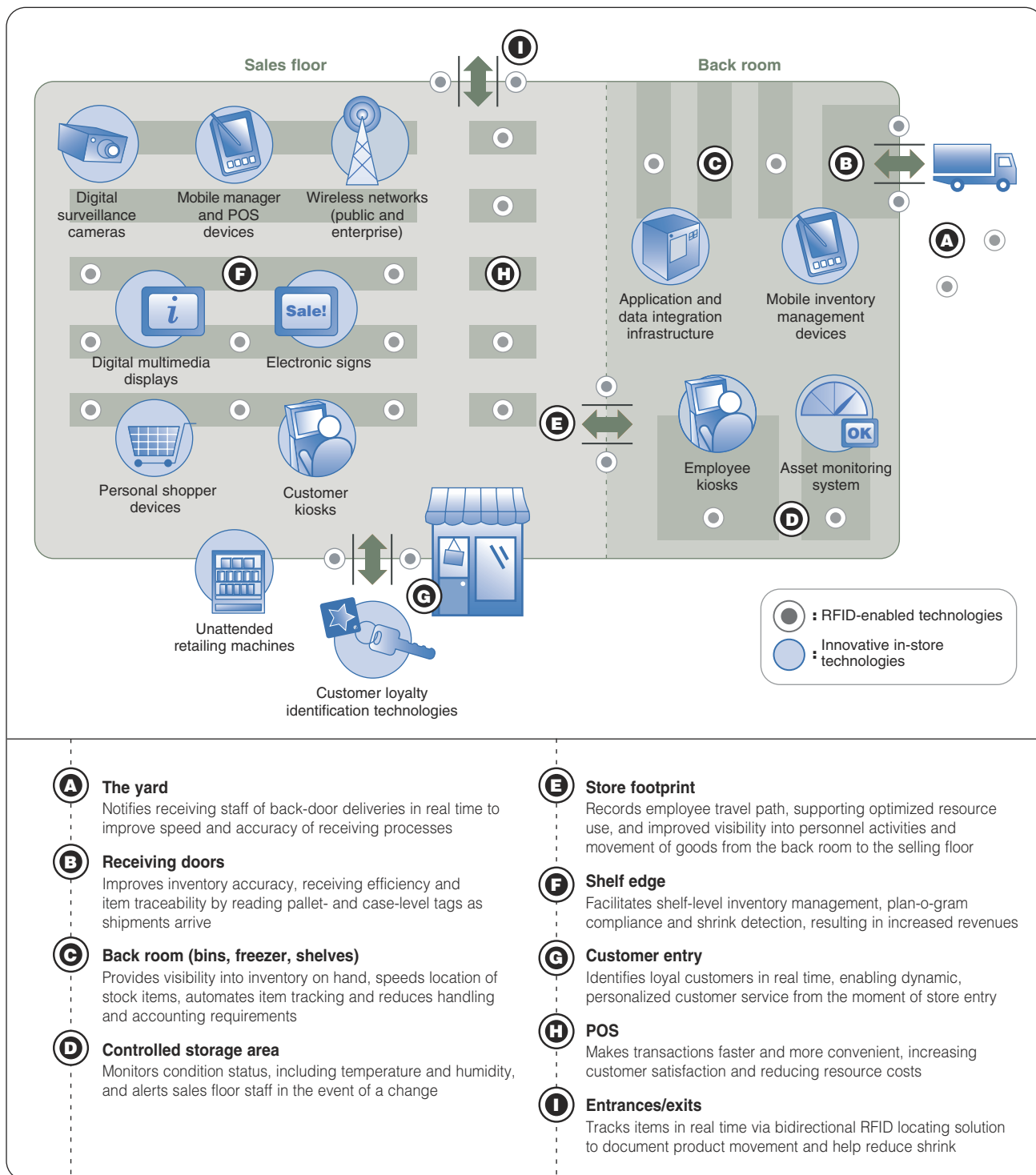


Figure 1: The sense-and-respond store environment, equipped with innovative technologies, including RFID-enabled systems, dynamic customer interaction solutions and a data integration infrastructure



Implications of item-level RFID for improving in-store operations

When implemented at the item level, RFID technology can help ensure that the right product is available, on the right shelf, at the right price—virtually all the time. If a product is not on the shelf, a customer will often abandon the purchase and shop somewhere else. And it's more expensive to win back customers than to keep loyal customers in the store. Information accessed and used through RFID solutions can help you raise service levels, optimize inventory investments—and improve efficiency in the way you leverage resources and personnel. It can allow you to deliver more personalized, convenient customer service. And it can enable you to dynamically manage margins to drive more revenue.

RFID tags and readers distributed strategically throughout the store, as shown in figure 1, can dramatically impact many important processes, including inventory management, shelf management, customer service delivery and shrink management.

Inventory management

Item-level RFID tagging enables you to manage your on-hand inventory more efficiently by providing real-time visibility into stock data. As a result, you can employ demand-based inventory management processes such as:

- *Optimized pricing through dynamic price-setting, to provide incentives to consumers to purchase certain items or services. Taking into account rolling inventory, item shelf life, stock levels and customer preferences, you can adjust prices to maximize your sales opportunities. For example, shelf readers can be used to track stock dates and automatically reduce the price of perishable produce items nearing the end of their shelf life or to offer personalized bargains on the fly to loyal customers.*
- *Real-time merchandising and demand forecasting by leveraging item-level tagging to enable a moment-to-moment view of shelf, back-room and warehouse inventory. You can optimize stock levels to minimize out-of-stocks (OOS) and reduce warehousing and labor*

costs. Inventory replenishment can be managed based on real-time transaction data instead of forecasts based on previous sales during a similar time period.

- Automated stock replenishment by initiating supplier orders when inventory dwindles, and expediting stocking shipments of OOS items the moment they arrive at the store's back door. You can offload inventory management responsibilities to your suppliers by providing them with real-time visibility into your stock levels. For example at a fast food restaurant, back-room RFID readers could track removal of bags of hamburgers and send a replenishment alert to the meat supplier when stock levels drop.
- Automated shelf replenishment via business applications to monitor product quantity, placement and activity at the shelf-level and automatically send messages to store resources to restock or rearrange items on a shelf. On a back-room shelf, the sensing application might even reorder an item when case levels dwindle.
- Consistent plan-o-gram compliance by automating shelf-level management of item placement and leveraging item-level tagging to ensure adherence to supplier plan-o-grams. For example, in the cosmetics area—where item adjacency significantly impacts customer purchase behavior—the “Rosy Red” nail polish would always be placed adjacent to the “Nearly Red” lipstick to maximize cross-selling opportunities.

Shelf management

Replacing visual checks by store staff, RFID-enabled shelf management leverages item-level tags, and shelf-level readers streamline stocking processes. These technologies allow you to conduct:

- Electronic labeling by encoding product information that can be dynamically updated or tracked using remote applications to provide real-time item-level views of inventory.

Analysts estimate that the United States retail industry loses approximately US\$30 billion annually due to products not being on the shelf.⁸



Customer service delivery

RFID-enabled customer self-service applications—accessed via kiosk portals, mobile cart-mounted devices or remote POS terminals—provide an interactive, convenient shopping experience, offering:

- *Rapid self-checkout by automatically scanning products as the consumer shops, speeding the purchase transaction. Customers don't have to unload their carts to pay, and the retailer doesn't have to employ a checker to unload, scan and bag customers' selections.*
- *Unattended retailing through conveniently located electronic vending machines that enable customers to purchase multiple items from a wide selection of products and services around the clock. These machines allow customers to pay using traditional cash or e-cash—non-paper payment types ranging from credit cards to RFID-enabled key tags, smart cards and biometric devices.*
- *Personalized marketing via dynamic digital displays designed to respond to unique cues from customer profiles, personal shopper devices or shelf-level solutions to deliver customer-specific, contextual messages.*

Shrink management

Human errors—such as unrecorded returns, checkout scanning mistakes, incorrect pricing and inaccurate inventory checks—account for a large portion of inventory shrink. Explicit product identification using RFID tags allows you to track products from the moment they are received at the back door across your sales floor via the following automated processes:

- *Product authentication enables you to verify item authenticity along the entire product sales cycle, from manufacturing to post-sale returns. Particularly for high-value items, such as designer label clothing and jewelry, and controlled products, such as pharmaceuticals, cigarettes and alcohol, item-level RFID solutions can help you reduce costs associated with product counterfeiting and theft.*
- *Article monitoring helps reduce the risk of goods being taken from the store by leveraging item-level RFID tags to notify store systems when a product being removed was never purchased. It also helps reduce returns fraud by identifying returned products that were never purchased.*

The vision in action: an employee experiences the on demand store

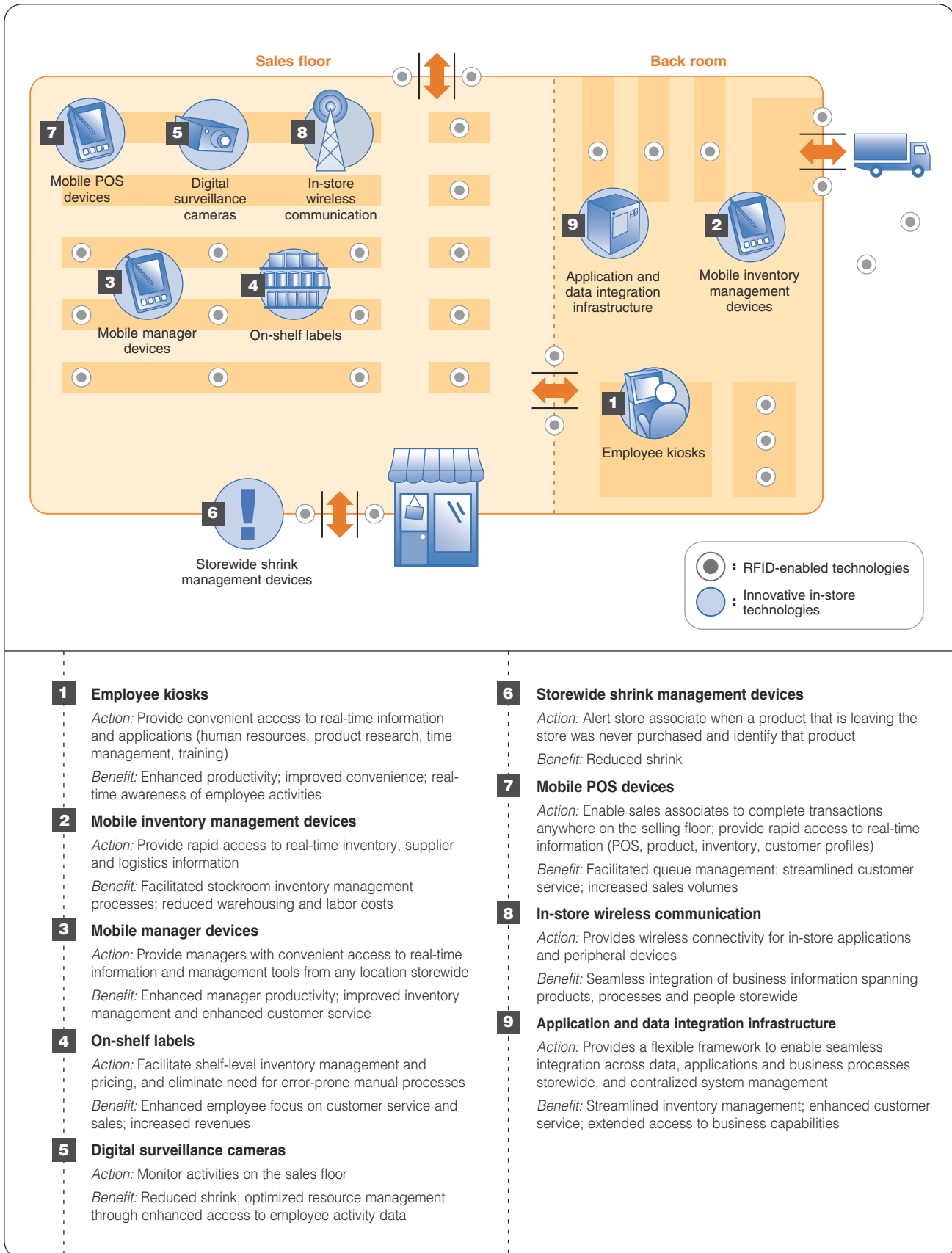


Figure 2: Transforming the employee workday with a sense-and-respond store environment



Technology in action: the on demand store

In an on demand store environment, employees are empowered with access to dynamic, real-time information as they perform their tasks. Figure 2 shows how retail store personnel can improve productivity and service delivery by leveraging access to RFID-enabled technologies.

Now, consider a shopper's experience in our visionary store environment. Figure 3 depicts how RFID solutions can impact consumers—from the moment they enter the store to their final purchase transaction.

RFID-enabled stores: the big-picture payoff

Visionaries see the vast potential of RFID in retail. It's more than simply a streamlined supply chain. It's faster, more convenient and more personal customer service. Optimized inventory and resource management. Reduced shrinkage and improved security. Fewer out-of-stocks and more targeted marketing. The ability to serve more customers with the same size staff. Better informed up-selling and

cross-selling. A complex network of actions and reactions, dynamically adapting to changing conditions while expanding revenue. Selling customers what they want, when they want it, how and where they want to buy it. Interaction is driven by applied business intelligence, which enables you to know your customers better and deliver beyond their expectations.

While providing new opportunities, RFID-enabled store ecosystems can also present your organization with information management challenges. You will need to handle increased levels of data collection, storage, filtering and communication, as well as tune your operations to react to real-time information. To this end, you will need to deploy in-store architecture and infrastructure solutions that address the dynamic future state of technology—flexible, scalable and able to manage increased amounts of data and data filtering capabilities.

“Technologies, such as wireless point-of-sale and RFID, are enabling retailers to deliver new applications and services to consumers, transform their relationships with suppliers and fundamentally change the way retailers bring products to market.”

—Executive Technology, August 2003⁹

The vision in action: a customer experiences the on demand store

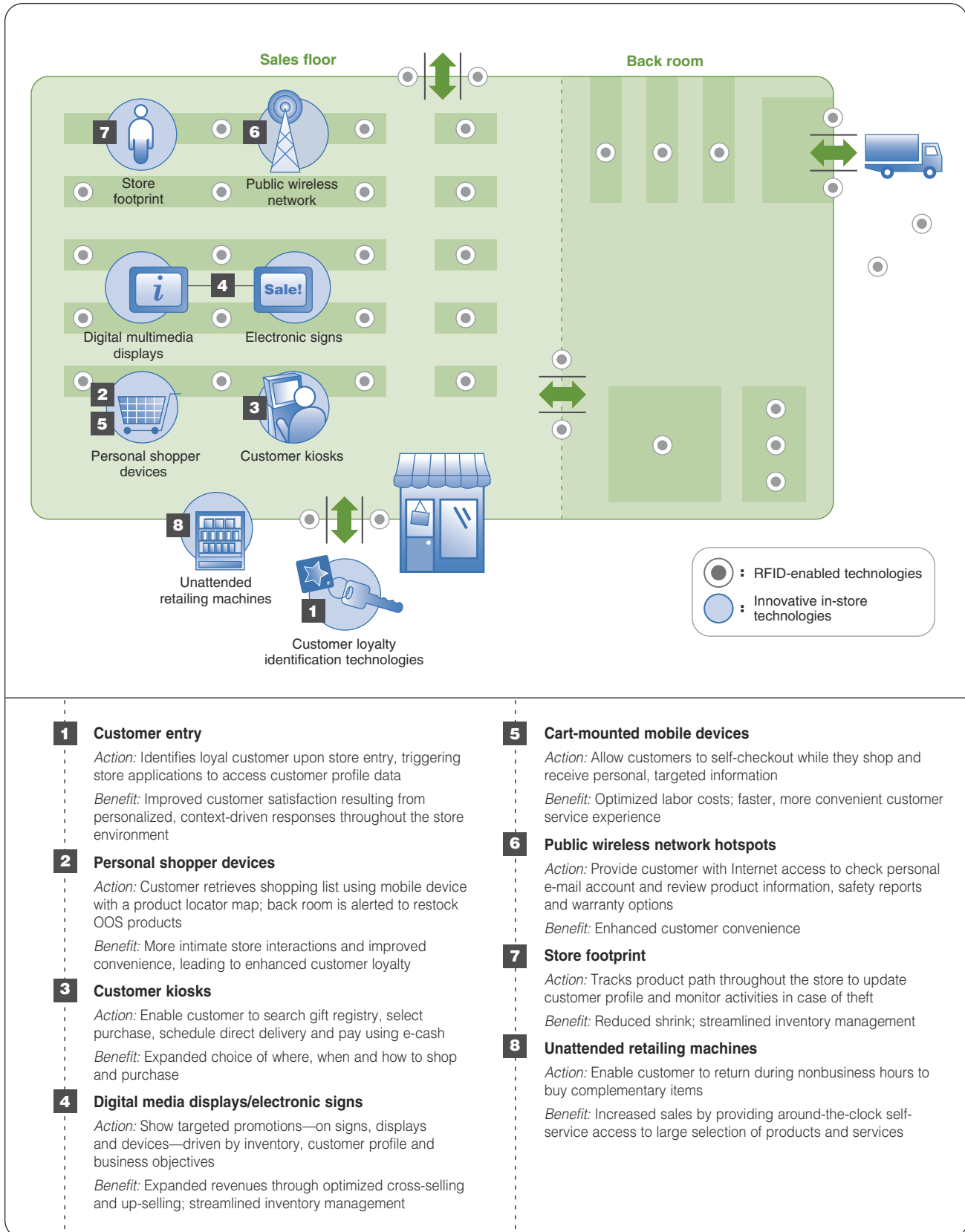


Figure 3: Delivering a dynamic customer shopping experience via a sense-and-respond store environment



The right provider for your RFID needs

IBM provides consulting, design, implementation and integration services that deliver an end-to-end RFID solution. To offset capital fixed costs, we can manage your solution and enable you to pay for it via a variable cost structure.

We know RFID

We can leverage insights gained through a legacy of RFID experience to help you streamline supporting processes, justify investments and then design, develop and deploy the optimal solution for your business. We have been a leader in RFID technology innovation for more than a decade. We developed many patented RFID technologies that are integral to practical business applications today. We have provided business case development, as well as pilot implementation services to pioneering RFID technology adopters. Using expertise gained through spearheading RFID installations, we have forged an implementation roadmap for transforming the retail store environment with RFID.

- *IBM is the systems integrator for METRO Group's RFID-based "Future Store" initiative.*
- *IBM and the Global Commerce Initiative (GCI) recently published an RFID adoption roadmap for companies in the consumer packaged goods and retail industries.*
- *IBM research laboratories are actively involved in RFID technology development; our innovations include more than 60 technology patents.*

We know infrastructure and information management

We have combined the proven capabilities of IBM WebSphere® business integration software with our expertise in POS solutions to create the IBM Store Integration Framework—a store-level Web services architecture that helps connect consumers and employees to critical information in real time. Based on open industry standards and a common systems management infrastructure, Store Integration Framework enables you to extend your POS applications and data throughout the store.

We know retail

Today, IBM works with more than 7,500 retailers worldwide. We have helped revolutionize the retail industry through more than 60 patented innovations, including the barcode. We are the premier worldwide supplier of POS terminals, with approximately two million systems installed in over one hundred thousand stores across more than one hundred countries. We provide advanced technology, a vast services organization and a global network of more than 1,500 IBM Business Partners in the retail industry. So you have one comprehensive, convenient and cost-effective source for your store infrastructure needs.

"IBM is emerging as the leader in RFID integration and consulting services."

—AMR Research, January 2004¹⁰

For more information

To learn more about RFID-enabled solutions from IBM, visit:

ibm.com/industries/retail

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