



TECHNOLOGY SPOTLIGHT

How Infrared Technology Enables the Digital Transformation of Store Product Positioning

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Leslie Hand

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As retailers digitally transform their businesses, several technologies are forming the new fabric of store infrastructure, enabling real-time interactions with products, people, and processes. These technologies, described by IDC as the 3rd Platform and 3rd Platform accelerators, include mobile, big data, social, cloud, and the Internet of Things (IoT). Enabling a new era in consumer engagement, these technologies underpin new retail experiences that leverage real-time data, analytics, and connected devices to enrich and contextualize hyper-relevant interactions between consumers and products on the retail store floor. Light-based infrared technology will play an important role in technologies that bring product positioning to life in brick-and-mortar retail. The instrumentation of the shelf and intelligent application of product positioning open up significant opportunity for more efficient retail execution in the store as well as better customer service for omni-channel retail on the sales floor. This Technology Spotlight explores these trends and the role that Pricer (a well-established vendor specializing in electronic shelf label [ESL] solutions) plays with technology that trilaterates product position for an improved "measured" shelf position.

Introduction

Today, consumers expect retailers to provide rich product information such as location, availability, specs, and reviews as a component of new omni-channel shopping experiences. Some of the scenarios that mimic online information are relatively easy to make available as a part of the store experience, but cracking the code on enabling automated real-time indoor product location positioning with high accuracy can be a bit more difficult.

A fast and energy-saving technology, infrared (IR) communication accomplishes this task in conjunction with algorithms that calculate the position of products using trilateration. IR technology can literally map where products have been placed on the sales floor, which can help companies engage customers in-aisle, help customers find products in-store, and manage product placement compliance.

Many technologies that address indoor asset positioning have been available for some time but are limited to industrial applications and have not been suitable for an in-store environment, where the multitude of devices (SKUs) combined with the habitual lack of electrical power at the shelf edge has made an automated wireless product positioning system impractical. At the same time, we are now seeing an explosion of interest from retailers for indoor positioning system (IPS) technologies as both business needs and customer needs powered by smartphone technology advancements conspire to drive adoption. Some of the IPS technologies that are commonly applied to identify device location/smartphone position are Bluetooth Low Energy (BLE/beacons), WLAN, and ZigBee, as well as magnetic, optical, and even acoustic technologies.

This paper focuses on how IR technology enables the digital transformation of store product positioning. It discusses the benefits of IR-based product positioning systems from a business perspective and a technical perspective as well as how product positioning is one of the three legs of retail IoT infrastructure, connecting people, products, and things. The paper also explores how the digital transformation of retail is accelerating adoption of IR-based product positioning.

Some Key Definitions

Operating model digital transformation (DX). According to IDC's definition for retail, this is the reshaping of the organization's mode of ongoing operations through investment in:

- Digital technologies that connect products, assets, people, and processes (instrumentation)
- Analytic tools to speed operational decision making and improve customer engagement
- New organization structures that converge operations and information technologies to take advantage of changing markets and new business opportunities

The operating model is a subset of an enterprise digital transformation effort.

Infrared. IR technology addresses a broad variety of wireless applications, especially in the areas of sensing and remote control. IR radiation extends from the nominal red edge of the visible spectrum at 700 nanometers (nm) to 1 mm. This range of wavelengths corresponds to a frequency range of approximately 430THz to 300GHz. Below infrared is the microwave portion of the electromagnetic spectrum. Bottom line: There is no overlap with commonly used wireless devices that use other areas of range electromagnetic spectrum, including radio waves, microwaves, visible light, and ultraviolet light.

Location-based product placement identification. Near location-based services (NLBS) based on local-range technologies such as Bluetooth Low Energy, WLAN, ZigBee, infrared, and/or RFID/Near Field Communications are used to identify the location of people and things.

Trilateration. Trilateration involves working with distances, which are typically computed using some kind of signal strength whereby a strong signal is closer. The position of the object can be determined by using distances from several known points.

Triangulation works with angles. Positions of the points of interest are computed based on measured angles at two or more known points. From those angles, distances are computed that are in turn used to calculate coordinates for the target points.

Key Benefits of IR Approaches

As retailers digitally transform their businesses, several technologies are forming the new fabric of store infrastructure, connecting products, assets, people, and processes (instrumentation). These IoT, mobile, cloud, social and data/analytics technologies speed and automate operational decision making and improve customer engagement.

IR, one of the technologies that provides the connective fiber of this infrastructure, is enabling a new era in product positioning, driving improvements in both employee efficiency and consumer engagement. Specific benefits identified by retailers using IR technology include the following:

- **Accurate information.** Infrared technology improves the accuracy and reliability of product position information because trilateration improves location accuracy.
- **Responsiveness.** This includes accurate floor plans, redrawn and presented in real time as a result of fast bidirectional (two-way) communications and trilateration. This capability enables a variety of apps accessible to employees and/or customers. Consumer apps that leverage product location can guide consumers to specific product locations.

- **Operational execution excellence.** With this capability, speed of execution at the shelf improves, with significant improvement in operational performance metrics. One retailer reportedly can update 90,000 product labels in an hour. Retailers improve management and compliance for internal (reset and promotional) and external (planogram, price and fixture) product execution purposes.
- **Customer/associate interaction.** With this capability, the shelf becomes fully responsive to specific consumer needs when ESL lights are turned on to identify product location. The store further supports efficient click-and-collect capabilities for product fulfillment processes such as pick list sequencing, task management, and picking.
- **Connecting digital and physical shopping journeys.** With this capability, retailers can offer social sharing at the shelf edge by leveraging the use of NFC tags or QR codes to redirect shoppers to online content such as Facebook pages, branded Web sites, or video demonstrations. In addition, retailers can offer targeted benefits and discounts to shoppers who provide and share their opinions while they are in the store.

Key Market Trends

Digital Business Transformation

We're entering an era in which the technologies and processes that businesses deploy are so tightly linked to their customers and markets that the boundary between the internal operations of the enterprise and its external ecosystem (e.g., customers, markets, competitors, partners, regulators) is rapidly disappearing. Business leaders are challenged to move their enterprises to the next level, that of digital business transformation, employing digital technologies coupled with organizational, operational, and business model innovation to create new ways of operating and growing businesses. (See IDC's published research series on digital transformation maturity and *IDC MaturityScope: Digital Transformation*, IDC #254721, for more information.)

Retailers are responding to this call to action by, at minimum, digitizing internal operations to connect products/services, assets, and processes and automate decision making and execution. Industry and individual company operating models are well honed and tested. However, the increasing connectedness of things makes an organization's processes, assets, and even products a living ecosystem of communication, cognition, and collaboration. To compete, retailers must transform operating models. The transformation will include assessing and investing in the following areas:

- **Connected products/services:** Digitally connecting products and services to enable higher levels of customer satisfaction and information-based revenue opportunities
- **Connected assets:** Connecting corporate assets to improve effectiveness inclusive of efficiency, reliability, and availability
- **Connected processes:** Digitally connecting processes, both intracompany and intercompany, to create a more responsive operating capability and improve productivity
- **Decision making:** Understanding the next best action based on digitally delivered situational awareness and machine learning (This capability includes the ability to connect operational decision making to strategies and tactical plans.)
- **Organizational structure:** Shifting responsibility for technology governance to operational leadership while maintaining fidelity to corporate IT standards and guidelines

Physical Product Positioning

Location-based product positioning is a core component of the infrastructure fabric of physical spaces and is a critical component of digital transformation. As a result, investment in location-based services to connect people with products and product information is accelerating.

Retailers report that IR reduces the friction in retail execution and improves execution speed and responsiveness. IR technology automates bidirectional communication to product shelf identifiers that enable automated information sharing at the shelf, shelf interaction, wayfinding, pick route optimization, and compliance. The impact for retail business includes better use of assets and better customer service — both of which are paths to better profitability.

Considering Pricer's IR Platform

Pricer, a new player of in-store digital product positioning solutions, sells software, hardware, electronic shelf labels, and services that enable improved in-store retail execution and shopping experience. Pricer's infrared platform is designed to offer retailers fast, robust, and scalable capabilities centered on the digital representation of product location, a fundamental element of the digital transformation of in-store system infrastructure.

Pricer's proprietary IR-based technology stands out because of the bidirectional communication speed and efficiency achieved and the location accuracy achieved with trilateration. The company has more than 14,000 installations in over 200 different retailers and 130 million electronic shelf labels installed in over 50 countries.

Customers including Carrefour, Leroy Merlin, and Delhaize have collectively installed thousands of connected nodes, highlighting that IoT is more than just a concept; it is already in place for retailers around the world. These retailers are embracing digital transformation, enabling basic price automation, and unlocking new opportunities for process control and improvement.

According to the company, customers have reported that hardware simplicity, reliability, speed, data accuracy, ease of use, and support were all factors in selecting Pricer over competitors. Most important is the company's ground-breaking approach to trilateration, leveraging data feeds from multiple nodes to identify — batched or on demand — product location. Product location accuracy improves with the number of transceivers installed.

Technical Advantages of IR

IR offers a number of technical benefits, including:

- **Stable, fast communication with reduced latency.** With infrared, an organization can transmit up to 90,000 updates in 1 hour, or 30,000 updates every 20 minutes. Each update is bidirectional, ensuring shelf-edge data integrity.
- **Energy-saving technology.** Low power is required. This is ideal for portable, mobile, and remote interaction. Batteries can last up to 10 years.
- **No disturbance from other radio signals.** Infrared uses a spectrum that is separate from the spectrum of other radio frequency devices and has high noise immunity. It does not impact other radio communication, nor is it as likely to have interference from signals from other devices.
- **Safe technology.** Infrared has no hazardous emissions and no regulatory issues. Infrared technology is license free and in use worldwide unlike varying radio regulations limiting maximum power output in ISM frequencies.

- **Secure technology.** Local coverage with diffused light helps ensure that data isn't leaked or spilled to nearby devices as it is transmitted and can't be accessed from the exterior.
- **Diffuse IR.** IT has an equal luminance in all directions using a multitude of diodes and mirrors. It behaves like light, the signal bounces on any surface, and the communication spreads like light. It does not act like a remote control where one diode is used in a line-of-sight application.

Market Challenges

Pricer is targeting the world's top retailers, small and large alike: grocers, DIY, electronics, and specialty stores. IDC expects that the market for IoT solutions including ESL will grow to \$28 billion by 2020. A variety of competitors with BLE/beacons, WLAN, ZigBee, and RFID/NFC-based solutions will challenge infrared solutions for dominance in the indoor product location market. Ultimately, retailers will leverage several of these technologies to match the best technology to each purpose while optimizing cost, performance, and supportability.

As with all retail technology initiatives, limited budgets and resource constraints impede progress. Retailers are increasing technology budgets to accommodate omni-channel and digital transformation initiatives, but sometimes the fundamental capabilities that underpin the bigger picture take a back seat to projects that promise faster return, particularly if revenue growth and customer loyalty are at stake.

In addition, return on investment for these projects can take as long as 18–24 months, which is beyond current project expectations. That said, retailers that have a vision for the future and a road map for how to get there are investing tens of millions of dollars in improving in-store retail execution and laying the fabric for product positioning.

Technical Challenges with IR

- **Diffuse IR.** Transmitters and receivers must be installed in a grid configuration, and coverage is affected by grid height. Pricer has combined the transmitter and receiver in one unit (transceiver), and the range is between 1,000 square feet and 2,000 square feet. Effective trilateration requires every ESL to be heard by at least three transceivers.
- **Store configuration.** Walls and height affect the diffusion of IR. The number of transceivers must be adapted/increased to eliminate this challenge.
- **Speed.** Data rate transmission is lower than typical wired transmission but faster than other radio frequency transmissions.
- **Short range communications.** Performance drops off with longer distances, but increasing the number of receivers eliminates this challenge.
- **Light sensitive.** Direct sunlight, dust, and pollution can affect transmission; however, this is not a problem in closed environments such as stores, even with skylights or windows.
- **Unpopular technology.** IR is not a very common technology in device communication. It is used mainly in highly demanding specific areas and is often considered too complex. In a radio-oriented world, IR can be seen as a disruptive technology when, in fact, it has been the preferred communication system in tier 1 retail.

Conclusion

As retailers digitally transform their businesses, several technologies are forming the new fabric of store infrastructure, enabling real-time interactions with products, people, and processes. These technologies, described by IDC as the 3rd Platform and 3rd Platform accelerators, include mobile, big data, social, cloud, and the IoT. Enabling a new era in consumer engagement, these technologies underpin new retail experiences that leverage real-time data, analytics, and connected devices to enrich and contextualize hyper-relevant interactions between people and products on the retail store floor.

Light-based infrared technology will play an important role in technologies that bring product positioning to life in brick-and-mortar retail. The instrumentation of the shelf and intelligent application of product positioning open up significant opportunity for more efficient retail execution in the store as well as better customer service for omni-channel retail on the sales floor.

Pricer, a well-established vendor specializing in electronic shelf label solutions, deploys IR-based product positioning capabilities with technology that trilaterates product position for an improved "measured" shelf position. Pricer's infrared platform is designed to offer retailers fast, robust, and scalable capabilities centered on the digital representation of product location, a fundamental element of the digital transformation of in-store system infrastructure.

Pricer's proprietary IR-based technology stands out because of the bidirectional communication speed and efficiency achieved and the location accuracy with trilateration. The company has more than 14,000 installations in over 200 different retailers and 130 million electronic shelf labels installed in over 50 countries. IDC believes retailers are accelerating investments in product positioning and that this market will continue to grow. Pricer is well positioned to address the challenges described in this paper and has a significant opportunity for success.

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Global Headquarters: 5 Speen Street Framingham, MA 01701 USA P.508.872.8200 F.508.935.4015 www.idc-ri.com