RESEARCH REPORT

SMART PLACES:
The Digital Transformation of Location

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Includes input from brands, retailers, and technology companies

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EXECUTIVE SUMMARY

Technology continues to spread its impact on society and commerce in ways that disrupt how people and businesses interact. The growing adoption of Internet of Things (IoT) consumer electronics — such as smart thermostats and digital assistants — has paved the way for brands to use connected devices in their physical spaces too. The same sophisticated technology that powers "smart home" devices is slowly finding its way into stores, hospitals, and other public spaces, creating "smart places."

To compete with digital-only brands, location brands (i.e., brands that serve customers primarily in a physical space like a retail store or hospital) have invested in websites and mobile apps in ways that mimic their competitors while neglecting their most-prized asset: their real estate. As e-commerce giants like Amazon are now investing in brick-and-mortar, the battle for the customer has shifted to the ground, literally. Location brands in any industry can take the battle offline by investing in technology-rich locations that raise the bar for Customer Experience (CX).

But as location brands adopt smart place technologies, they will need to balance the value of the consumer insights and operational efficiencies they stand to gain against the risk that their reputation might be harmed if consumers think their privacy is violated. Consumers still think physical spaces like retail stores are safe from the kind of tracking they experience online (e.g., through targeted advertising). While they might perceive online tracking as a somewhat abstract invasion of privacy, they might interpret that same level of tracking in a physical location as a more personal intrusion. The public is already shocked by the amount of personal data businesses collect online — and that is increasingly released through hacks. The growing number of physical locations rich with tracking technology will only add fuel to the growing privacy fire.

For this report, we sought to understand the opportunities for location brands that invest in smart place technology and the barriers they face. While location brands can achieve many goals with smart place technology — e.g., increased revenue, efficiency, and safety — the focus of our research was on its use to improve CX. To that end, we interviewed early adopters, device makers, industry groups, and vendors who focus on CX management in physical locations.

As we delved deeply into this emerging area, we found no dominant term defining the use of IoT devices in the service of location brand experience. To remain consistent with the "smart home" movement, we opted for the term "smart place,"[1] which we define as:

"A physical space — public or private, indoors or outdoors — where connected, sensing technology is used to gather insights into the actions, intent, and behavior of people in it to support customer experience. Smart places can be 'active' when people opt-in; 'passive' when people's actions are tracked and their behavior intuited in an unobtrusive way or without their knowledge; or a combination of the two."

KEY FINDINGS

Consumer IOT Bandwagon

Smart, small, AI-assisted tech adopted by consumers as IoT wearables and smart home devices are finding their way into businesses in every industry — including retail, healthcare, and transportation — where brands serve customers. The growth of smart places will heighten consumer awareness of the tradeoffs between value of personalized experiences and privacy in public places.

Market Maturity

The technology market for smart place devices is early and, therefore, fragmented and complex. This tech ecosystem is broad — spanning personal consumer mobile devices, on-site sensing beacons, cloud-based AI and data systems, and systems that integrate on-site and enterprise customer data.

Focused Use Cases

The hundreds of devices we reviewed exposed many CX use cases, but they can be boiled down to:

- managing location access,
- wayfinding,
- delivering personalized content that drive the sales funnel,
- facilitating payments,
- tracking key assets (including products, consumers, and employees),
- enabling on-location staff, and
- gathering new insights from on-site activity.

Regaining Relevance

The digital transformation of locations into smart places presents an opportunity for legacy brands invested in real estate ("location brands") to deliver omni-channel customer experiences online-only brands can't. In retail, location brands still have time to slow revenue lost to online competitors, as 85% of all purchases still occur in stores vs. online.[2] Aware of this consumer preference and the opportunities it presents, online retailers like Warby Parker[3] are opening bricks-and-mortar stores to provide customers holistic shopping options, adding pressure to location brands to act.

Challenges Ahead

The digital transformation of location is not without substantial challenges that will slow adoption. Location brands planning this evolution of place will have to face hurdles, such as developing new internal team skill sets, tackling consumer privacy concerns, operating in an early market, orchestrating complex data connections, and navigating the uncertainty that comes with making capital investments in quickly evolving smart place technologies.

EVOLVING TO SMART PLACES

By offering better convenience and abundant product choices, e-commerce has slowly chipped revenue away from brands invested in physical locations. In an effort to stay afloat, location brands in retail, for example, have taken on significant debt.[4] Mounting debt coupled with the snail's pace of technology deployment to support the digital transformation of their locations has challenged location brands' attempts to compete.

While e-commerce has largely replaced the creation, distribution, and use of products easily digitized (like music and news), it has less of a foothold on physical products that consumers still crave to touch and feel before buying. Until now, location brands have had few options to take advantage of this weakness and respond to the needs of connected consumers who bounce between both online and offline worlds. To attract consumers to their physical location, they have deployed technology focused on digital advertising, websites, and apps. They have also invested in early precursors to smart place technologies — such as door hinge sensors and security video monitoring — that focus on improving the efficiency and convenience of payments, managing inventory, and increasing security. But now, both the shrinking footprint and expense of consumer electronics technology (epitomized by IoT) has made it possible for location brands to use smart place technology to improve CX in ways that online-only brands can't.

This evolution toward smart places represents an exciting opportunity for location brands — and many are taking the plunge. Industry firm Gartner expects significant growth in smart place deployments. It estimates that the market for indoor location platforms and services could grow from $7.2 billion in 2017 to $12.5 billion by 2020[5]. Wireless Registry, a kind of search engine for detecting IoT devices, measured a doubling of signals from these devices in a three-month period.[6] Consumer personal use of IoT devices — as well as increased use of smart place tech in public and private spaces — is creating a data rich environment and new use cases that location brands can use to their competitive advantage.

Designing Smart Places

When designing smart places, location brands must consider a complex array of devices, use cases, and data management options. Technology might range from tracking devices placed directly in front of a customer — e.g., a smart shelf to track product inventory — to a location brand's data center. That range, combined with the nascent IoT market and shifting industry standards, complicate the design of smart places.

Some device manufacturers rely on continuous network connections to cloud or other remote analytical engines, while others favor pushing as much computing power on location as possible. In some cases, the choice of where compute power resides is dependent on a location brand's security and privacy concerns. For example, telling a consumer that the location they are in is monitored but not "shared on the Internet" may increasingly be a way to lessen consumer privacy fears but also a way for brands to mitigate the damage they could experience if massive amounts of centralized consumer tracking and behavior data were to be hacked and released (or held at ransom, as is increasingly the case today[7]).

Smart Place Devices and Use Cases

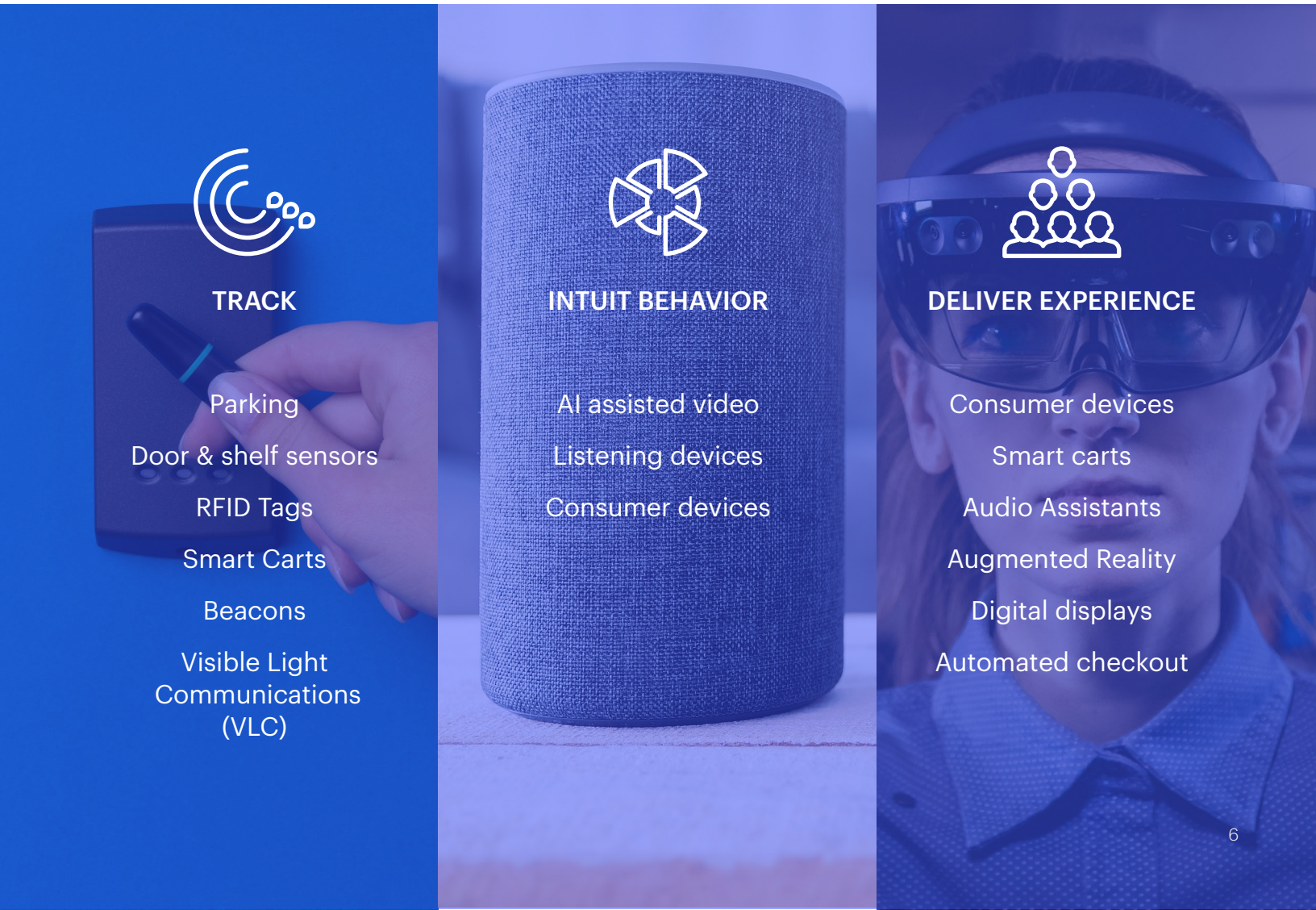
As a technology in its early phase, smart place devices vary widely and are produced by a wide array of manufacturers — from start-ups to today's leading enterprise technology companies. Location brands can choose among solutions ranging from simple, single-use case devices to complex, integrated systems of smart place technology. To decide what approach to smart place design makes the most sense to them, location brands should focus on the use cases with the greatest potential. While these use cases are quickly evolving, we found that most fall into one of seven general categories. Common among them is a thread that starts with tracking activity, understanding behavior, and using both to deliver the most relevant experience to customers on location.

Smart Place Devices Ecosystem

Location brands can count on a diverse range of connected, sensing devices to configure a smart place. Our research shows that most devices fall into one or more of these three categories: (1) devices that track, (2) that intuit behavior, or (3) that deliver experience. In a sign the market is evolving, we discovered that the use cases and applications smart place devices support often overlap significantly.

Although we've categorized these devices and developed a hierarchy for the categories that ultimately delivers on CX objectives, we realize some devices track, intuit behavior, and deliver experience as one integrated system (e.g., IBM Watson Retail[7] or Intel's Responsive Retail Platform[8]).

Figure 1: Smart Places Track Assets and People and Intuit Consumer Behavior that Supports Personalized Customer Experience



To better understand smart place tech options, we'll explore the three categories of devices in detail.

TRACKING

The key advantage of a smart place is that it allows brands to know who and what is in it and their movements. Tracking devices in the following three categories play one of the most critical roles in the smart place technology ecosystem.

FACILITY TRACKING

These devices are planned into a location brand's building architecture (starting just outside the location, in the parking lot) for energy efficiency, security, and, increasingly, tracking people and assets. They might include devices that manage access (like employee card readers at entrance doors) or that manage the environment like controlling a building's temperature based on where people are in it.

OBJECT TRACKING

These devices track "objects" — whether customers, employees, or products — at the location. Like lighthouses, ceiling-mounted beacons mark a location with a broadcast signal that supports the equivalent of indoor GPS tracking. The range of a beacon transmitter can vary from a small area (5m radius) to an entire business location (inside and out). Mobile phones — or other devices like smart shopping carts — are capable of receiving beacon signals that can then be used to trigger events or simply collect location data actively (e.g., through branded mobile apps) or passively (e.g., by triangulating WiFi reception).

Figure 2: NEDAP Transform Canadian Libraries with Intelligent Shelves

These beacons then transmit information picked up by cooperating devices, such as a mobile phone or RFID tag. For example, Google's Eddystone beacons have been installed throughout the city of Amsterdam, such as in its rail cars. Making signals from these beacons available to any developer allows for a myriad of applications to be built, supporting open government data hacking (in a good way!). By installing beacons in public places, in this case an entire city, the cache of public data available to foster innovation and competitive services, such as BarDoggy, Art Whisper, or Wayfindr, increases significantly.

Beacons are usually Bluetooth LE-based (e.g., Bluetooth 5) ceiling mounted devices, but that's changing as dual-purpose devices emerge, such as lighting and audio systems that also track objects. A surprising range of manufacturers make tracking beacons that can be detected by various technology platforms, like Apple's iBeacon, Google's Eddystone, and open-source Arduino (the three most common).

Some object tracking devices are industry specific. For example, in retail, weight mats and "smart shelves" are used to track product inventory levels to avoid out-of-stock situations (the number one pain point consumers report in physical locations[9]). For example, Powershelf allows retailers to detect out-of-stock products and create smart digital labels that can be used to update pricing in real time. Tracking technology is also often built directly into product packaging, supporting complete object tracking from manufacturer to consumer. For example, Levi Strauss & Co. uses RFID tags to track the location and movement of all products, which can support website features that allow consumers to check whether a product or size is available at a particular location.

PEOPLE TRACKING

Of course, the essence of smart places is the people who inhabit them. Tracking people allows location brands to better understand their customers and gain new insights they can then apply to both better serve customers on location and improve location design.

No matter which is employed, the core of tracking people at a location is the practice of geo-fencing,[10] i.e., tagging a moveable object (either connected through a typical network standard like WiFi, Bluetooth and Zigbee, or observed on location, such as AI-assisted video cameras) within a virtual map for the purpose of triggering an action or to simply gather information. For example, businesses who offer WiFi to their customers can use it to triangulate the specific on-site location of customers who are connected to their network (often without those customers being aware of it).

Some businesses use learning algorithms to generate a "WiFi fingerprint" of their physical spaces, allowing them to pinpoint even more accurately the location of a person. By taking into account WiFi signal attenuation created by walls, for example, this technology allows a business to understand which side of a wall or divider a customer is on. According to Intel,[11] WiFi fingerprinting can pinpoint a person's location by two to five meters. Sound is also used to track people, as it emits an acoustic signature that can be traced to a specific location. Devices that capture ambient audio can help pinpoint a person's location in a mall, for example.

In addition to tracking people through their smartphone's connection to a WiFi network, emerging technologies use other components of a person's smartphone to track them, including:

CAMERA

The camera in a smartphone can be used for tracking when the location employs Visible Light Communication (VLC) systems (GE [12], Philips [13]) and LiFi [14] (pureLiFi [15]). The light in these systems emits a code specific to a location and detectable by the phone camera. Lighting is emerging as an effective beacon technology for broadcasting location, especially as antiquated lighting systems are replaced with low-power LED systems.

MICROPHONE

Location brands are testing audio systems that determine where a customer is based on the audio signals (such as music) that are broadcast within their property and picked up by the microphone in customers' smartphones.[16]

ACCELEROMETER

Our phone's internal accelerometer can be used to determine the inertia and movement of a person — which, for example, can sense whether they are in a rush or taking their time.[17]

COMPASS

Smartphone devices create a magnetic field that — similar to WiFi fingerprinting — uses its digital compass to determine location based on other magnetic fields present in the location.

Figure 3: Several Components of Mobile Phones May be Used to Track People in Smart Places

INTUITING ACTIONS AS BEHAVIOR

Smart place technology can not only track or observe a person's activity — they can, with the help of AI machine learning systems, analyze that activity to make assumptions about the human behaviors that are driving it. Smart place devices that seek to make sense of people's behaviors include the following:

AI-ASSISTED VIDEO

At retailers, video that used to be used for security purposes is being replaced by AI-assisted video devices that not only track people, but also capture their actions to decipher their behavior and to profile them in terms of gender, age, group affiliation, and other characteristics. On-site video devices (e.g., AiFi, RetailNext) track shoppers' behavior, including whether they're shopping in groups, what items they pick up and put back, their gait and body poses, where they go in the store, and whether they're doing something abnormal, like shoplifting. Similar video technology is in place at Amazon Go convenience stores, where video analysis assists in determining which products customers pick up and place in their shopping bag.[18]

AI-assisted video technology is evolving fast. Industry group ActivityNet ran a challenge in 2017 to "stimulate the computer vision community to develop new algorithms and techniques that improve the state-of-the-art in human activity understanding."[19] Chinese search leader Baidu won 2017's challenge by developing technology that correctly labeled the actions of people recorded in 300,000 videos with 87.6 percent accuracy. These actions included putting on shoes, applying sunscreen, and playing rock-paper-scissors.[20] In addition to capturing and understanding actions, facial recognition features of AI-assisted video devices will be used in the future to grant people access to event venues or even to pay for goods and services.

AUDIO

Like video, human audio can be analyzed to interpret people's intent and behaviors, and some devices are already in the market to help brands tune into customers' needs and their state of mind. Watson Tone Analyzer, for example, is an AI-based tool often used in call centers to measure the depth and range of emotions customers express on a call.[21] According to the Motley Fool, IBM's AI-assisted natural language analytics can interpret vocalized consumer reaction in retail locations.[22]

CONSUMER DEVICES

The connected devices people carry with them can be both a source of intelligence and a tool for location brands to interact with customers. Since personal mobile devices broadcast a unique Media Access Control (MAC) address to manage data communications with other networked devices, smart place devices can use these addresses to discover the brand of a customer's device (such as a phone or smartwatch), what other devices or what type of devices the customer is connected to, and, sometimes, personally identify the customer. For example, a sensing device that can detect that a consumer is wearing a Fitbit can help a location brand profile that consumer as health conscious. Or smart place devices that connect with customers' smartphones can be used to authenticate individuals, for example, in cashier-less retail stores, such as Amazon Go.

Since app makers have been known to create apps with a seemingly innocent purpose (e.g., Meitu's app that transformed photos to anime characters) to collect information for another purpose, such as collecting analytics for ad networks,[23] mobile device makers like Apple have stepped in to prevent network devices from having access to MAC addresses.[24] This might limit how smart place sensing devices can interact with consumers' smartphones.

DELIVERING EXPERIENCE

Delivering personalized experiences to consumers based on context (captured by tracking devices and made sense of by devices that intuit behavior) is the final leg of the smart place ecosystem journey.

CONSUMER PERSONAL DEVICES

Consumers' own electronics can connect with smart place devices to deliver personalized customer experiences. For example, at a grocery store, a consumer's smart phone can connect with a smart shelf, such as Powershelf. As the smart shelf detects what products the consumer picks up, it sends the phone real-time coupons or product information.

AUDIO ASSISTANTS

Increasingly, location brands are exploring the use of on-site assisted audio to deliver personalized experiences. It's easy to predict that the use of voice-activated digital assistant technology (like Amazon's Alexa or Apple's Siri) in smart places will be accepted by consumers who are increasingly familiar with this mode of interaction. For example, Amazon's "Alexa for Business" can be integrated with existing audio infrastructure, like teleconference lines and meeting rooms, to listen in and assist employees by answering questions or controlling equipment in conference rooms.

Employees at retail stores like Neiman Marcus and The Container Store use workforce communication systems that can connect them by voice to other employees in the store to better serve customers on site.[25] We also envision that in the future audio assistants will be used to connect employees on location to the best experts anywhere in the company.

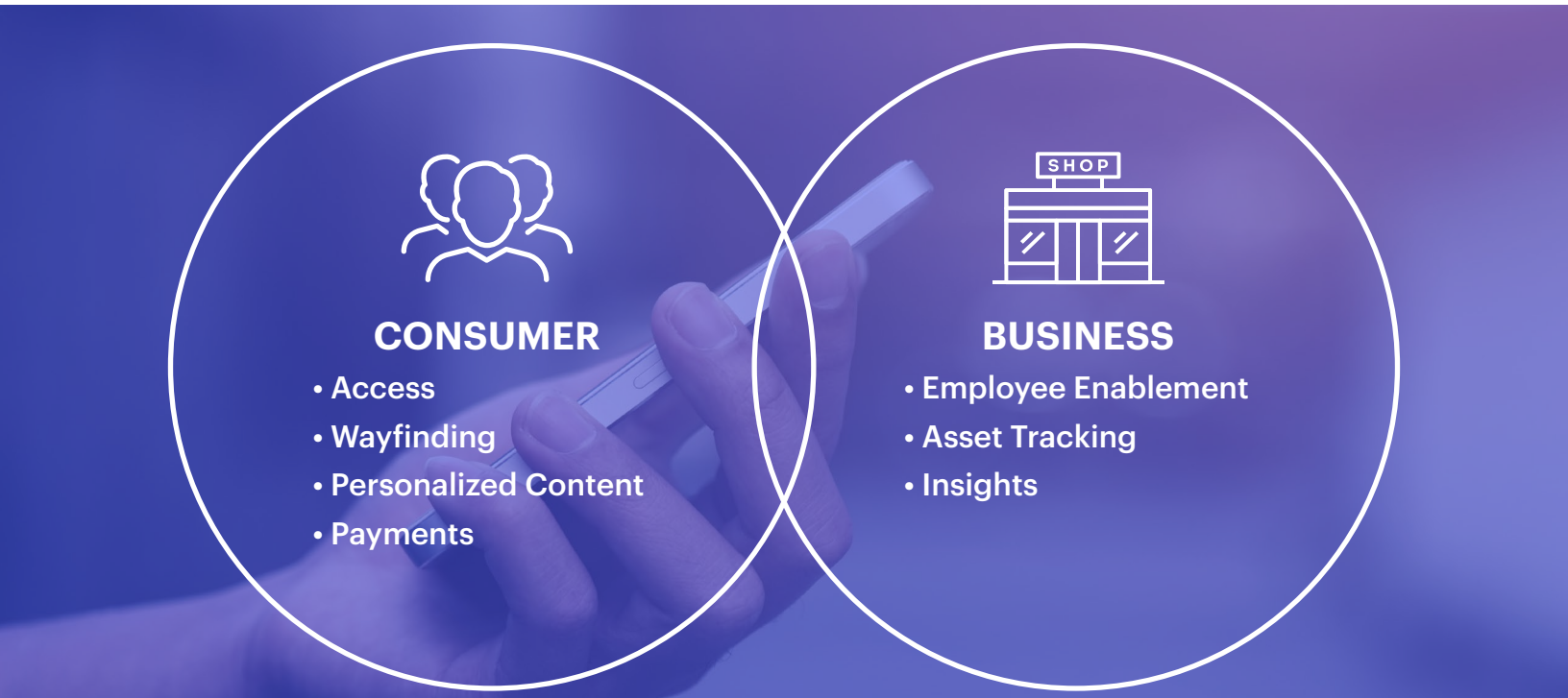
DIGITAL INFRASTRUCTURE

Many location brands are deploying devices that help consumers on-site — such as interactive signage to navigate the place, virtual AR mirror systems, and smart carts to ease checkout. One brand blazing this trail is Adidas, which sought to extend its inventory on the showroom floor to every available product through virtual shelves. Customers can view 3D images of shoes and read detailed specifications and user reviews in the store. Retailers we spoke with exercise caution when adopting digital tools to avoid frustrating their less digitally savvy customers.

SMART PLACE USE CASES

Smart place devices deliver a win-win: Consumers benefit from location services — such as access control, wayfinding, personalized content, and efficient checkout and payment services — while businesses benefit from real-time employee enablement and tracking of employees, customers, and assets, such as products. These use cases allow brands to acquire consumer insights and a better understanding of the design and function of their physical locations (Figure 4).

Figure 4: Smart Place Use Cases Deliver Customer Experience and Business Insight



Our research showed the following primary uses cases for the smart place devices.

Access

By creating a location boundary (geofencing), smart places can use tracking devices (such as mobile or card NFC/RFID chips that pinpoint a specific person and location) or even biohacking technologies (such as employee body implants) to control admission to their location. But beyond providing access, these devices allow brands to deliver location-specific services and content that improve CX, such as allowing consumers to pay for a snack at a vending machine. Consider access the start of a smart place. Once enabled, it delivers a kind of real-world tracking method analogous to web browser cookies on websites.

A hospital in Australia uses sensors like these in their parking garage to manage prioritized access to parking locations by vendors, frequent patients, and employees.[26] But perhaps the best example of this use case is Disney's MagicBand. An option for visitors of Disney Resorts, these wrist bands support fast check-in and entrance to the resort's hotels and theme parks, grant guests access to their hotel rooms, and allow them to pay for food and merchandise and to receive targeted discounts and offers.

Today's devices that pair identity authentication with specific access rights are typically niche and custom to specific location brands (e.g., Disney's MagicBand can only be used to access Disney Resorts). But if a reasonable level of privacy and security can be worked out, in the future, a single device could be used to authenticate access to several locations where access must be controlled.

For example, imagine your smart watch granting access to toll roads, concerts, a hospital room housing a relative, your work office, or your garage door when you arrive home.

The benefits of this use case are clear: Customers value the ease and convenience of access enabled by smart place technology, while businesses stand to gain insights to help them improve their locations — such as measuring wait times, improving traffic flow, and understanding mobility patterns.

SAMPLE TECHNOLOGY

- NFC/RFID chips in cards, wearables, or implants
- Beacons that broadcast location
- Sensors that identify an identifiable object (person, car, etc.)

Figure 5: Disney Resorts MagicBand

[CC BY-SA 3.0 (**http://creativecommons.org/licenses/by-sa/3.0**], from Wikimedia Commons

Wayfinding

Analogous to a website search box or site map, wayfinding tech helps customers, employees, and even robotic devices navigate locations.

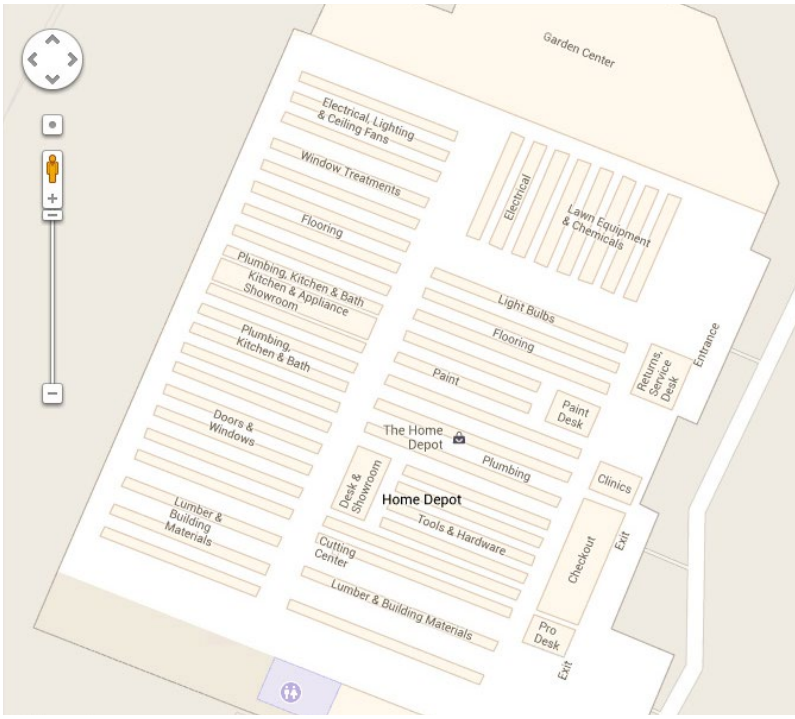
Easily finding one's way in a large location — whether a retail store or hospital — is a common pain point for consumers. Smart place technologies empower them to navigate a space with a self-service approach, rather than by asking an employee for directions. For example, beginning in 2012, The Home Depot's use of indoor Google Maps have helped customers navigate its huge warehouses by using Google Map's My Location feature indoors.

Businesses benefit from wayfinding as they are able to gain insights into customer intention (e.g., in The Home Depot example, guessing the type of home improvement project a customer is undertaking based on where they've been in the store) and on how to direct optimal flow, prioritize routes that support product discovery to increase basket size, and direct staff to locations where customers most need them to improve service. But location brands must use caution when deploying smart place devices for wayfinding purposes, as the hacking of consumer location routes could have serious implications. Disclosure of routes a person may take in a hospital, for example, could reveal what medical ailments they suffer, violating privacy rules in many countries (including HIPPA[27] in the U.S.).

SAMPLE TECHNOLOGY

- Indoor beacons paired with mobile apps
- Google Maps indoors
- Digital interactive signage

Figure 6:
Indoor Google Maps at the Home Depot



Personalized Content

A popular use of smart place devices is the delivery of real-time, personalized content, such as digital circulars, offers, rewards, user ratings/reviews, and augmented reality experiences, to inform consumers and drive them to purchase. Smart place vendors, like beacon-maker Swirl, for example, deliver such personalized content based on consumers' location and their profile information (Figure 7). This use case extends proximity marketing[28] from outdoor to indoor smart places. For example, brands that have started proximity marketing using mobile apps such as Snapchat's geofilters can go a step further to deliver content at a specific indoor location.

Currently, many brands rely on their own apps to deliver personalized content on location. For example, when a customer steps into a retail store, sensing devices connect with the brand's app installed in the customer's mobile phone and pushes a notification welcoming the customer into the store or offering her a coupon (Figure 7).

But we see this trend evolving to mobile device operating systems themselves pushing personalized content to its users. For example, Apple's iOS could someday have the AI smarts — together with user permissions — to notify its users of content that may be helpful to them based on where they are and their circumstances. This approach is already in use for emergency notifications (such as Amber Alerts in the U.S.). As machine learning/AI gets better at identifying users' intents, an operating system that is able to deliver personalized content based on any topic of interest isn't far off. If this vision were to be realized, location brands would need to partner with publishers and device makers to deliver appropriate content in much the same was as digital advertising is delivered through complex networks of data partners.

SAMPLE TECHNOLOGY

- Beacons (Swirl, Estimote, Honeywell)
- Custom mobile apps
- Smart lighting (Philips)
- Smart shelves (AWM)
- Smart tags (SMARTRAC)
- Augmented Reality apps

Figure 7: Delivering Personalized Content

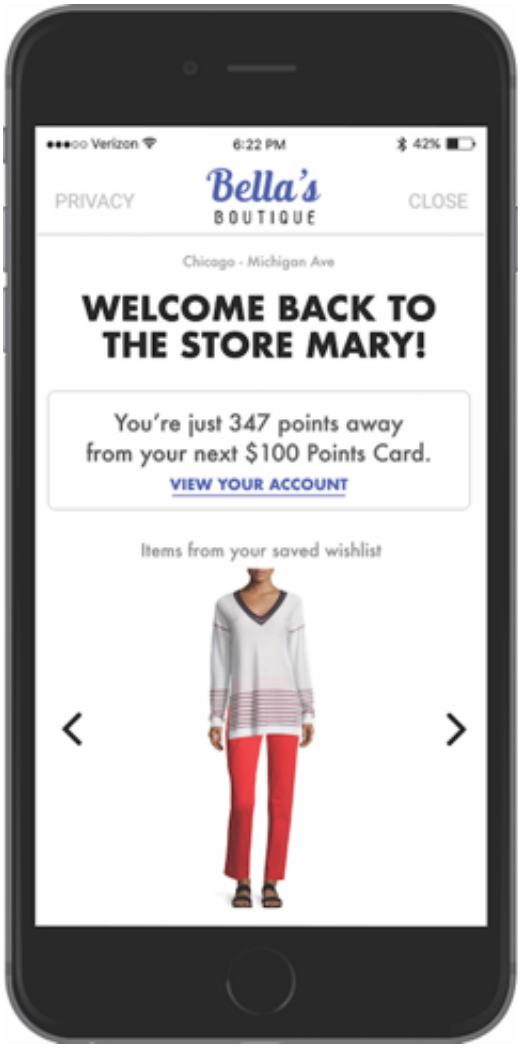


Image courtesy of beacon platform Swirl

Payments

The final customer touchpoint at many locations is payment. Today, one of the most rapid smart place device adoptions by location brands are on-site payments that don't require traditional credit cards, such as Apple Pay.

This use case is evolving to incorporate check-out-free experiences. These frictionless payments are expected to go beyond RFID-enabled mobile devices and wearables to any device that can be tied to a specific, authenticated individual. In-vehicle infotainment systems, for example, have the components necessary to facilitate paying at gas station pumps through proximity. Imagine pulling up to a pump (or charging station) and never touching a credit card. And in Asia, where mobile payments far outpace North America and Europe, location brands are adopting biometric recognition to authenticate customers and letting them pay without any devices, such as Alipay's facial recognition-enabled payments at a KFC in China.[29]

Businesses that adopt smart place payment technology benefit by redirecting on-site staff from check-out functions to higher-value personal service interaction with customers. Customers benefit by bypassing checkout lines where purchased items are scanned and various non-digital payment forms are accepted.

SAMPLE TECHNOLOGY

- Square
- Apple Pay
- Google Pay
- Venmo
- Zelle
- Alipay

Figure 8:
Mobile Payments Ease Checkout Process

Asset Tracking

Smart place technology and devices are increasingly used to track assets such as medication at hospitals, buses within transit systems, or inventory at retailers. Tracking is made possible by sticker-size RFID tags or smart shelves, often coupled with AI-assisted video monitoring of spaces. Tracking assets allow location brands to create efficiencies in inventory management, while consumers benefit by avoiding out-of-stock situations in stores or by being able to find out if a product or service is available at that location.

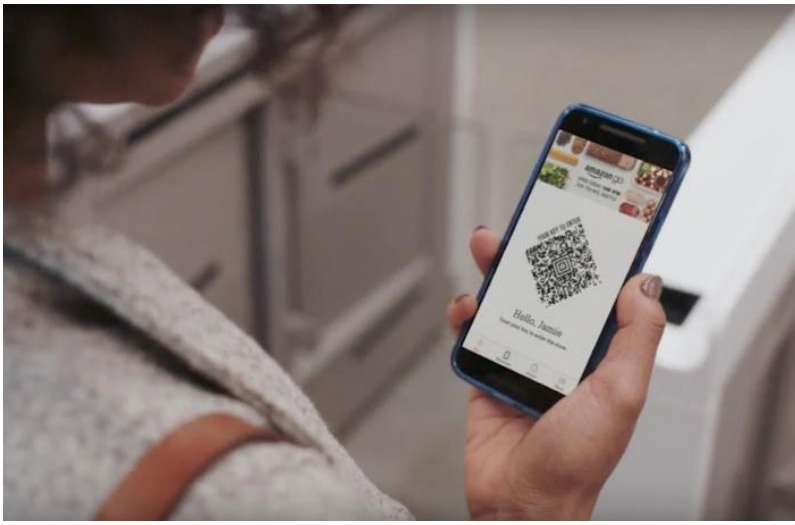
Smart place devices that track assets are even making check-out shopping experiences possible as we described earlier. At Amazon Go convenience stores, technologies that track assets on location together with AI-video technology has made it possible for customers to enter the store and leave without checking out (their Amazon account is charged automatically) in perhaps the most frictionless CX in retail.

These bleeding edge executions haven't been without technological and consumer behavioral challenges. The computer vision and machine learning required to enable tracking at scale depends on significant distributed computing power, ranging from on-site devices to cloud-based analytical infrastructure — not always easy to orchestrate. Even Amazon had to delay public access to its stores because its technology had difficulty tracking more than 20 people at a time.[31] Also, as smart place devices are increasingly used to track assets in cashier-less stores, brands will need to take a leading role in helping consumers adapt their behaviors as well. In early tests, Amazon discovered, for example, that consumers were concerned about shoplifting and hesitated to leave the store without an obvious checkout system, necessitating the need for additional signage.

SAMPLE TECHNOLOGY

- Smart shelves (Smart Shelf, Nedap, 4brands Replay)
- Smart tags in product packaging (Evrythng, Smartrac)
- AI-assisted video (RetailNext, Zebra)

Figure 9:
Amazon Go App Tracks Products in Shopping Bags for automated Checkout and Payment



Employee Enablement

An expensive and critical asset, on-site employees serve customers and present an important relationship-based face for location brands. Smart place devices provide employees contextual information that makes them more effective and valuable to customers. For example, by tracking where customers are on location, employees can focus their attention in the right places. These devices can also relieve them of mundane tasks that can be automated (e.g., the access, wayfinding, asset tracking, and payment use cases described above), allowing them to focus on tasks best suited to the social, personal, and more human aspects of the experience. And with location-specific chat bots, experts in far-flung locations can assist customers on site — no matter where they are.

By deploying smart devices for this use case, location brands not only benefit from efficiency, but reduced turnover (an expensive problem in today's retail world[30]). Freed from mundane tasks, employees are happier and less likely to leave.

Smart place technology can also help brands monitor how well their employees comply with policies and regulations — particularly important in regulated industries like healthcare and financial. General Sensing, for example, makes employee badges that monitor individual compliance in healthcare, such as monitoring how often staff wash their hands.[31] Worn like an identity badge, its MedSense Clear solution monitors compliance of care givers, as well as detecting their location within a beacon-equipped healthcare facility.

SAMPLE TECHNOLOGY

- Mobile apps and devices (Zebra)
- Connected headsets (Theatro)
- Compliance (MedSense)
- Chat (Intercom Live Chat)

Figure 10: Hospitals Use smart Place devices to Track Healthcare Worker Hygiene

Image courtesy of General Sensing

Consumer & Place Analytics

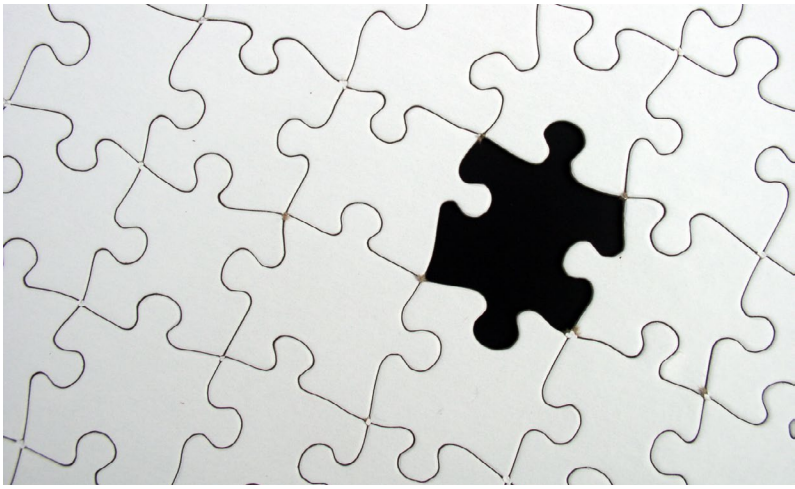
Using smart place devices to collect detailed metrics and analyze how a place is used in practice allows brands to fine tune merchandising, make best use of on-site employees, and better understand how customers behave in locations. One sophisticated retailer, for example, deploys hundreds of video cameras in each store to understand foot traffic and learn whether customers shop in groups or alone; to create customer profiles (such as gender, age, race, etc.); to study behavioral signs, such as gait (are they in a hurry or taking their time?) and body poses; and to detect unusual behavior, such as shoplifting.

While this use case of smart devices will help location brands gain valuable insights into their customers behaviors, it's not without its challenges. Just as brands have struggled to make sense of the plethora of new data available through digital transformation, location data will create another source of data to make sense of in context with online data and enterprise data sources (such as CRM and consumer insights).

SAMPLE TECHNOLOGY

- Video (RetailNext, AiFi, Zebra)
- Beacons (Swirl)
- IBM Watson Retail
- Esri
- SAS

Figure 11:
Smart Place Data Will Add to an Already Complex Mix of New Data Sources



OPPORTUNITIES FOR SMART PLACE TECH ADOPTERS

While digital-only businesses have enjoyed remarkable growth through technology (often at the expense of location brands), smart place tech finally offers location brands the opportunity to compete and increase return invested in real estate to serve customers locally. Our research shows that location brands can realize four key opportunities by investing in smart place technology: They can reclaim relevance, optimize cross-channel CX, improve their physical location efficiency, and acquire insights into their customers.

SMART PLACE OPPORTUNITIES

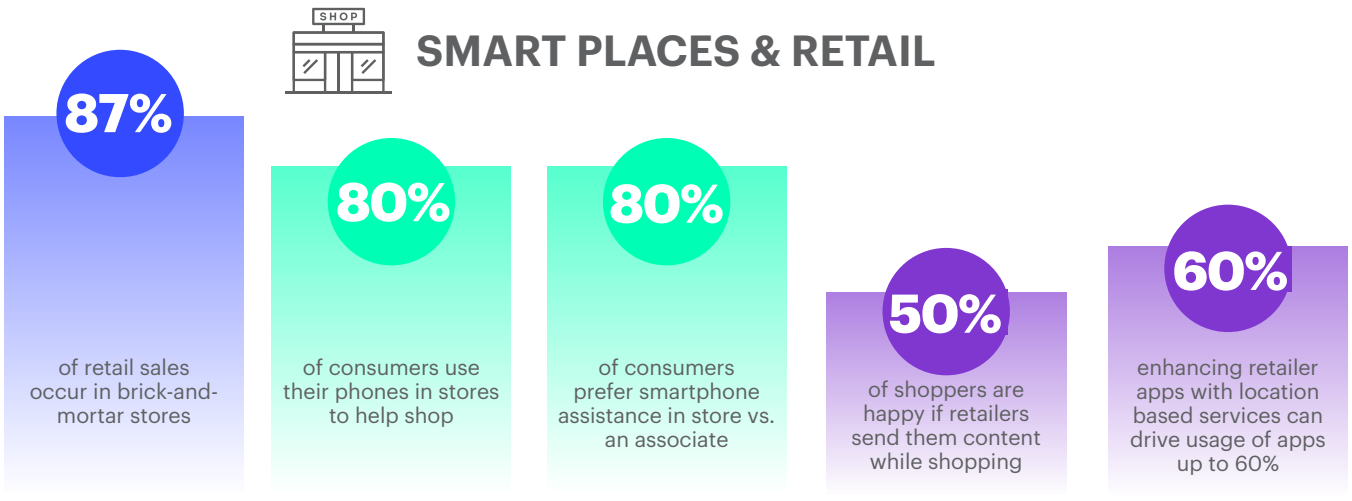
- **Reclaim Relevance**
- **Cross-Channel CX Optimization**
- **Improve Location Efficiency**
- **Acquire Insights**

Reclaim Relevance

At the dawn of the web and e-commerce, many believed physical locations such as retail stores and other public spaces would die out. But the socialization needs of people are simply not going away. People like to interact with others. They like to touch and feel products. And they need to use physical spaces when taking care of basic needs, like traveling or getting a medical procedure. If locations can deliver personalized customer experiences and be as useful and efficient as their online counterparts, they stand to regain relevance in a way that online-only brands may have trouble competing against. The tables could finally be turned.

Location brands that have invested in tech solutions outside their physical footprint — like new websites and "mobile-first" strategies and tools — should now extend that investment into smart place technology that offers the best of both worlds, the physical and the digital. Online brands clearly realize that there's enormous opportunities in doing so, as they themselves invest in physical locations (such as Amazon's Whole Foods acquisition). Perhaps most importantly, brands need to regain their confidence. They must avoid simply viewing their physical footprint as fulfillment centers for online sales, but rather as an opportunity to offer customers a unique, holistic experience.

Figure 12: Consumer Technology Use Behavior Justify Smart Place Tech in Retail



Sources (in order shown above): US Dept. of Commerce, OCE, 2015; Google Shopper Marketing Council, 2014; Deloitte Digital, 2014; Cisco IBSG, 2013; and Philips/TNS, 2015

Optimize Cross-channel CX

The primary opportunity for location brands to regain relevance lies in achieving cross-channel CX optimization. By combining data and insights collected from smart place devices with data collected from other channels, like their website or mobile apps, location brands can "connect the dots" to understand their customers. Retailers, especially, can use in-store consumer data collected by smart place devices to understand their customer's needs and tastes, effectively running a limited size but perpetual focus group that they can then use to tune merchandising strategies both online and offline.

For example, Fabletics, an "athleisure" retailer that started as an online-only brand but now also operates several brick-and-mortar stores, collects data about customer activity in its stores to better serve online shoppers. When a shopper selects clothes to try on, the product codes are scanned and connected to their online shopping cart, allowing Fabletics to track which products customers are responding to. In addition to monitoring product popularity, the retailer is able to detect quality issues much sooner than online sales channels and reduce return rates. "In our retail stores, we receive that product a week to 10 days before it goes online," reports Ron Harries, Fabletics Vice President and Head of Retail. "We get the opportunity to touch and feel it. We get the opportunity to see how well it's going to do with the customer. We can react quickly based on those initial reads."[32]

Improve Location Efficiency

Smart place technology can help location brands improve the efficiency of locations in a number of ways, from better enabling employees to improved management of on-site assets.

Zebra Technologies found that "among respondents that have IoT-enabled-CX initiatives in place, 65% showed an increase in employee productivity while 67% experienced improvements in operational efficiency. Around 68% of participants surveyed perceived their IoT-enabled-CX initiative as improving their brand equity and having a positive impact on the development of new disruptive business models." An example of how smart place technology can improve efficiency is inventory management. Zebra Technologies found that out-of-stock situations have the biggest negative impact on retail customer satisfaction.[33] Technology like smart shelves that detect stock issues not only improves inventory management, but also allows staff to focus on the most valuable one-on-one customer interactions.

Acquire Insights

Investing in smart place technology provides location brands with the opportunity to gain insights about their products and customers that cannot only help them improve their CX and bottom line, but can help their entire supply chain. One retailer we spoke to, for example, passes on the insights it collects to its suppliers, who otherwise too often experience blind spots when it comes to in-store shopper activity and behavior, such as knowing which competing products a shopper considered, whether the shopper requested a product demonstration, how long she stood in front of their product, and so on. Leveraging the insights from quantitative data collected on location, suppliers can build better products and create new opportunities for both the manufacturer and the location brand selling them.

CHALLENGES FACING LOCATION BRANDS PLANNING SMART PLACES

Updating People's Skills

Managing "the human side of transformation" continues to be a key challenge for companies trying to adopt technology — and smart place tech is no exception. As locations build in smarter CX touchpoints, these physical spaces become part of a broader digital strategy process, making planning them that much more complex. When it comes to orchestrating the successful design, implementation, and ongoing operations of a smart place, teams that have traditionally been outside digital technology practices — and teams with no facilities or operations experience — must learn new skills and learn to partner closely with departments they might never have before.

SMART PLACE CHALLENGES

- People
- Privacy
- Consimer Consent
- Market Maturity
- Customer Journey
- Capital Investment

According to Himanshu Khurana, Director of Engineering, Global Innovation Leader at Honeywell, smart place tech requires multiple integration points with broader, enterprise systems, making it a particularly challenging endeavor. As part of this transformation, he is seeing a shift from the Facilities department planning smart places alone to it partnering with digital, IT, and marketing teams, among others.

In addition, for smart places to succeed, employees must evolve from being on-site specialists to omnichannel-informed professionals who can effectively link online and offline worlds in areas such as product fulfillment and personalized CX. This raises the bar on skills required on-site to effectively use handheld or wearable devices that make navigating both worlds possible. We're clearly not there yet. Forrester's research[34] reports that just 29% of retail shoppers "feel that sales associates are knowledgeable and helpful." Smart places will require location brands to invest in training their employees in smart place tech to make them more effective.

Navigating Privacy Issues

Privacy is another clear area of concern. In their quest to remain relevant, brands risk going too far when using smart place tech — tracking customers or connecting with customer profiles in ways that invade their privacy or that run afoul of government regulations. For example, if a smart place location is able to determine a shopper's age, ethnicity, gender, or group affiliation and use that information to offer custom pricing, they could be accused of price discrimination. Balancing the benefits they stand to gain from smart places with respecting their customers' privacy is a key challenge for location brands, especially when regulations and standards are murky.

At the core of making people feel their privacy is protected is proper disclosure and consent, both of which are currently sorely lacking in locations where businesses serve the public using smart place tech. While many locations disclose video surveillance to discourage shoplifting, they often don't reveal the type of monitoring that they are increasingly engaging in. Members of the U.S. Congress have alerted regulators[35] like the FTC about the need to disclose to consumers the existence of on-site tracking devices. But other than groups such as the Future of Privacy Forum releasing smart place guidelines,[36] little has been done.

Around the world, the EU and UK General Data Protection Regulation (GDPR) offers the strictest and most specific rules and recommendations for consent and protection of personal information. This law is multifaceted and includes the right of individuals to object to the use of personal information for "aspects concerning [those individuals'] work performance, economic situation, health, personal preferences, interests, reliability, behaviour, location or movements."[37] Among the protections the regulation extends to individuals is a "Right to Explanation," which gives consumers the right to review their personal information and object to published information they consider inaccurate or private.

Despite the lack of clear regulations in the U.S., it may be time for brands with a physical footprint to adopt a kind of location "Terms of Service" (TOS). And why not? Websites and mobile apps that track consumer activity already disclose their privacy policies and their use of browser cookies. If location brands were to follow current online tracking precedent, they would need to disclose what information is captured and how it is used and follow related existing regulations, such as COPPA (Child Online Privacy Protection Act). And they would need to do so in the form of signage or some other means that customers can read before entering a location that uses tracking devices. Of course, an obvious logistical hurdle is that it would be challenging for location brands to disclose in a physical sign, for example, the large amount of information that is typically disclosed (and let's face it, typically ignored) in online privacy policy or TOS statements. But, ultimately, disclosing their tracking activities seems an inevitable consequence of adopting smart place technology that brands should get ahead of.

Securing Consumers' Consent

As our use cases have shown, brands can implement passive smart places that rely on unobtrusive tracking or — with consumer consent — engage customers directly through mobile apps that work with on-location sensing devices. But getting consumers to opt in to participate can be a considerable challenge.

The challenge starts with convincing consumers to install the location brand's app. Consumers who already suffer from "app fatigue"[38] must be offered significant, tangible value to be convinced to download yet another app. This challenge may be addressed by integrating instead with existing apps consumers already use, such as retail loyalty app Shopkick or Google Maps Indoors. When it comes to engaging customers directly through mobile apps, online brands that are expanding to bricks-and-mortar have a significant advantage. Consider Amazon: If it integrates its mobile app with physical location capabilities, it doesn't have to convince consumers to install a new app — it only needs to update its mobile app TOS to include physical location tracking disclosures.

Beyond convincing consumers of the value of an app, though, is the challenge of convincing them that your brand can be trusted with their data. Consumers are understandably wary of giving consent, given companies' poor track record of securing their personal data (as evidenced by the recent scandals involving Facebook, Equifax, Target, etc.). Location brands face an uphill battle; a survey conducted on behalf of Gigya reveals that 68% of consumers don't trust brands with their personal information.[39] Companies that don't follow culturally accepted behavior or government rules (such as a high-profile FTC case against InMobi[40], which was fined for breaking child privacy laws in the U.S.) not only pay the price with both fines and damage to their brand reputation, they further erode consumers' trust in brands and reduce consumers' willingness to consent in general.

To address this risk, location brands have several means of obtaining consent from consumers to participate in smart places: 1) through third-party shopping apps or their own custom mobile apps' TOS; 2) loyalty programs (e.g., tied to the consumer's phone number); 3) TOS for their on-site WiFi; or in 4) on-site disclosure signage.

Operating in an Early Market

The consumer electronics market for IoT smart devices is relatively early; the market for IoT smart place devices is even earlier and more complicated and fragmented.

The risk of failure is high: In its 2017 research, networking tech leader Cisco found that 60% of IoT initiatives stall at the proof of concept stage and only 26% of companies have had an IoT initiative that they considered a complete success.[41] To compete and realize smart place opportunities, location brands will have to make calculated risks and invest in technologies that are evolving and that might quickly become obsolete. The anticipated arrival of new WiFi standards in 2020 (802.11az), for example, will dramatically increase tracking accuracy, possibly making obsolete current on-site sensor technology.

In our review of smart place tech, we also found a lack of standards adoption that allows interoperability of devices — another drawback of operating in this early market. Not only does this lack of standards make planning a smart place challenging, it could add another expense. Brands we spoke to report developing their own data connectors (e.g., between on-location data and enterprise data) or adding their own AI engines to analyze and interpret consumer behavior inside their smart place locations.

Expanding the Customer Journey

Whenever smart place technologies are incorporated into digital transformation efforts, the latter inevitably become more complex, as brands must not only focus on new business models and corporate technology planning for their digital channels, but also for their on-site locations. This means location brands must reengineer the CX journey to smooth out the transitions between online and offline — a complex undertaking.

For example, one device manufacturer we spoke to shared the story of a retailer's challenge to seamlessly bridge online and offline experience. The retailer's corporate office would send offers to subscribing customers via email. But when these customers would bring the offer into the store, they had trouble finding the product or in-store staff who were familiar with it. The offers the corporate office were emailing were likely highly targeted, not necessarily those listed in the retailer's printed circular. On-site staff could not keep up with these personalized offers. By installing sensing devices and updating their mobile app with wayfinding technology to allow the customer to navigate to the product, the retailer was able to significantly increase the activation of personalized offers.

One of the challenges brands face when trying to smooth an increasingly complex customer journey experience is a lack of accurate data about locations. When it comes to wayfinding systems, for example, many retailers don't have sufficient data in place to pinpoint the precise location of products.

Taking On Risky Capital Investment

Traditional retailers are already desperately trying to find ways to keep stores open and evolve their staff's skillsets to respond to consumers' shift toward mobile and online channels — none of which has come cheap. Replacing lighting systems and adding beacons and other smart tech devices in locations can create further, significant capital investment for retailers. This investment is particularly risky as it involves implementing tech that could quickly become obsolete. Businesses have also reported challenges with early implementations, including unstable performance, low accuracy, and high latency. Given that many traditional retailers already struggle with overwhelming debt,[42] they should proceed with caution by deploying limited store pilots — a best practice followed by The Home Depot, which opened a pilot smart place store[43] in Kennesaw, Georgia.

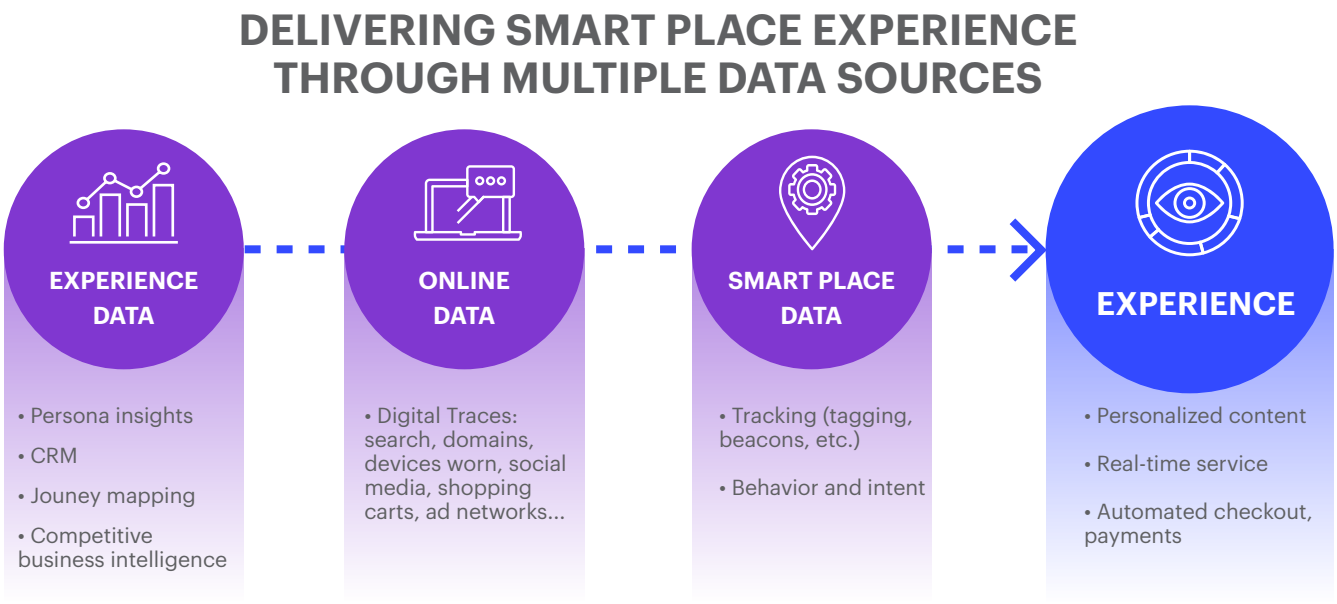
Smart place device makers report that investment in smart place tech is often initiated by the marketing department, which understands the many levers that move a particular type of customer toward a particular product or service. Since the marketing department is constantly faced with evolving tech, it may be the right place to start.

Connecting Data to Inform Customer Experience

To realize its full value, a smart place should not be an island. Instead, data collected from smart place devices should be combined with data from existing consumer touchpoints online and customer enterprise data in order to inform and deliver the best CX (Figure 13).

This isn't easy, especially when much of this data analysis must be available in real time. Until now, most locations haven't had access to the same rich data that they typically have to engage online customers in their offline locations — or have the data collection and analysis computing power on location. Smart places promise to level the playing field. But as they plan these smart places, brands will have to grapple with challenging questions about physical data architecture (e.g., should on-site data be stored there or in the cloud? What are the privacy and security implications of those choices?) and how to give employees on-site access to real-time data so they can deliver the best omnichannel experience (e.g., do you equip them with handheld or wearable devices?).

Figure 13: Many Data Sources can be used to Improve Smart Place Location Experience



RESPONSIBLE PERSONAL DATA MINING

At this point in digital evolution, it's more culturally acceptable for online sites like Amazon to get personal (in the form of highly targeted product suggestions, for example), but less so for physical locations. As a result, brands risk going too far when connecting smart places with customer profiles.

But consumers might become more accepting of brands that mine their personal data to deliver a better experience if they are able to get substantial value from it. For brands to deliver that value and experience, they must gather contextual and highly relevant data about that consumer to begin with. The Wireless Registry SignalGraph™ database[44] is one example of technology that may provide sufficient context. The database aggregates data signals of where a consumer has been and who a consumer is near. This data can be used as a source of consumer intelligence to understand context, needs, and intent when entering a location.

Their registry creates context based on locations. This forms a picture of the consumer's lifestyle based on the network traces of the consumer's personal devices (e.g., Fitbit, Nest, Echo, Tesla) and based on data about where the consumer has been — amount of time spent at home, at work, at a transportation hub, at a hotel or retail store, etc. — gathered through tracking.

This is powerful technology, but with that power comes responsibility. Location brands should use consumer profile data with caution, always considering what is culturally acceptable and striking the right balance between customer value and business results.

LOOKING FORWARD

Without deployment of smart place tech, physical locations will continue to be the "Achilles heel" of omnichannel CX and fail to meet consumers' high expectations for the kind of personalized content and service that their online competitors have been delivering for years. But location brands will face significant challenges if they make smart place investments in this early market. Despite these challenges, almost everyone we interviewed agreed that smart place tech can be the start of a successful new chapter for location brands battling to regain relevance and better compete against online counterparts.

Steps You Can Take

While no single path to effectively creating smart places will fit every location brand, consider the following steps:

EDUCATE

Start by raising internal awareness of what smart places could mean to your business, perhaps through short "lunch & learn" sessions across the departments you'll need to partner with. We rarely see the spark for smart place initiatives come from the top. Instead, you'll need to identify savvy leaders from various functions to build a groundswell.

FORM A TEAM

Form an inclusive, multidiscipline team with an executive sponsor to devise a smart place plan. The team should include people from the Facilities/Real Estate, Legal, IT, Marketing, and Digital departments (presumably the CX team is embedded in either the Marketing or Digital departments).

UNDERSTAND THE MARKET

Evaluate the smart place market for devices specific to your industry and country to understand their capabilities and inform your options. It's important that the market not drive your requirements but inform them of what's possible.

EXTEND CUSTOMER JOURNEY

Analyze your customer journey for on-location touchpoints (review our use cases as a starting point). Which touchpoints cause your customers the most pain? Where can you increase your own efficiency? Which device solutions could solve your challenges? Extend customer journey maps to start with hypothetical uses of smart place devices in on-location journey steps. Baseline key customer metrics like loyalty, but also identify niche measures (such as wait time, out-of-stock situations, etc.) that together combine for greater impact.

MODEL DATA INTEGRATION & DISTRIBUTION

Analyze data required for smart place devices to be effective, and understand how these data will combine with online, digital traces (e.g., website tracking, ad network data) and enterprise data. Get closer to understanding physical data requirements, e.g., will local, on-site data storage and analysis be required or cloud services? What enterprise product or customer data is needed real time on location to enable each use case?

DEVELOP CONCEPTUAL ARCHITECTURE

Develop a proposed technology (process and data) architecture to create a smart place, most likely in a limited pilot location. As a planning instrument, socialize with key stakeholders in CX design, site merchandising, physical security, regulatory compliance, marketing, and your digital team — among others.

MAKE A BUSINESS CASE

Once you have a better understanding of the market, customer journey impact, and possible technology implementation scenarios, make a business case to your executive sponsor (or steering committee).

TEST & LEARN

We found no brand that attempted a full-scale implementation of smart place tech at all locations at once. Plan incremental pilots, starting with single use, limited sensors and evolving to multiple use cases using a collection of integrated smart place tech. Have KPIs in place to compare assumptions with results and fine tune deployment over time. Refine your plan as needed and evangelize results to build momentum for making smart place deployment a regular part of doing business.

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METHODOLOGY

To inform this report, we reviewed third-party quantitative and qualitative research, experienced smart places through site visits, and interviewed key players in this ecosystem, from retail brands to device makers and enterprise CX vendors.

Ecosystem Input

This report could not have been produced without the generous input from the following brands (input into this document does not represent a complete endorsement of the report by them):

- **AiFi** (device maker)
- **Beta** (retailer)
- **Future of Privacy Forum** (industry group)
- **Honeywell** (device maker)
- **Philips** (device maker)
- **Salesforce** (CX software)
- **Swirl** (device maker)

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Ed Terpening is an Industry Analyst at Altimeter, a Prophet Company. A Silicon Valley vet and a social-media expert, Ed has been at the forefront of digital transformation for 30 years.

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When he's not mastering digital landscapes, he's painting real ones. An award-winning artist, his accomplishments include a cover story in American Artist. His art is in collections worldwide.

Charlene Li, Principal Analyst

Charlene is a principal analyst at Altimeter, a Prophet company. As one of the foremost experts on business and technology, Charlene's deep knowledge of leadership, strategy, interactive media, and marketing makes her an indispensable ally in today's rapidly evolving marketplace.

She was the Founder and CEO of Altimeter Group prior to its joining Prophet, and she is the author of the New York Times bestseller Open Leadership. She is also co-author of the critically acclaimed, bestselling book Groundswell, which was named one of the best business books in 2008. Her most recent book, The Engaged Leader, is a call to business leaders to adapt to the digital landscape and revolutionize their relationships by connecting directly with their followers.

Before starting Altimeter Group, Li was a Vice President and Principal Analyst at Forrester Research, worked in online newspaper publishing, and was a consultant with Monitor Group. She was named one of the Top 50 Leadership Innovators by Inc and one of the 100 most creative people in business by Fast Company.

Charlene is frequently quoted by leading media channels, such as the Wall Street Journal, the New York Times, USA Today, Reuters, and the Associated Press. She has shared her insights on 60 Minutes, the McNeil NewsHour, ABC News, CNN, and CNBC. A highly sought-after public speaker, Charlene has inspired a wide audience as the keynote at conferences such as the World Business Forum, World Economic Forum, American Society of Association Executives, and South by Southwest.

Charlene is a graduate of Harvard Business School and received a magna cum laude degree from Harvard College. You can follow her blog at **charleneli.com/blog.**

Aubrey Littleton, Researcher

Aubrey Littleton is a researcher at Altimeter, a Prophet Company, where he works alongside a team of analysts to understand the business implications of the latest disruptive trends in technology. Some of his areas of focus include customer experience, the Internet of Things, AR/VR/MR, artificial intelligence, social business, and digital transformation.

Aubrey has a deep-seated interest in technology, as well as a passion for international cultures, travel, and world affairs. His diverse background includes experience in research, marketing, teaching, and IT.

Prior to joining Altimeter, Aubrey brought an innovative edge to a leading specialty construction firm, where he led operational innovation and digital transformation initiatives across the business.

Aubrey earned a B.A. of International Relations and French from UC Davis.

HOW TO WORK WITH US

Altimeter research is applied and brought to life in our client engagements. We help organizations understand and take advantage of digital disruption. There are several ways Altimeter can help you with your business initiatives:

Strategy Consulting

Altimeter creates strategies and plans to help companies act on business and technology trends, including AI and data strategy. Our team of analysts and consultants work with global organizations on ideation and priority-setting, needs assessments, strategy roadmaps, and pragmatic recommendations to address a range of strategic challenges and opportunities.

Education and Workshops

Engage an Altimeter speaker to help make the business case to executives or arm practitioners with new knowledge and skills.

Advisory

Retain Altimeter for ongoing research-based advisory: Conduct an ad hoc session to address an immediate challenge or gain deeper access to research and strategy counsel.

To learn more about Altimeter's offerings, please contact **sales@altimetergroup.com**.

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