

From the **RETAIL TECH BULLETIN** Third Quarter 2019

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Platt Retail Institute (PRI) is an international consulting and research firm that focuses on leveraging technology to impact the consumer experience and store operations. Central to this is building actionable data models that aid retailers and technology companies in gaining insights into their customers and operations. In addition to its global consulting expertise, PRI also publishes pioneering industry research. [Learn more.](#)

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The Retail Analytics Council (RAC) is the leading organization focused on the study of consumer shopping behavior across retail platforms and the impact of technology. Established in August 2014, RAC is an initiative between Medill's Integrated Marketing Communications department, Northwestern University and the Platt Retail Institute. [Learn more.](#)

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Retail Robotics and AI Conference: Five Retail Technology Trends to Watch

By Zoey Ren, M.S. Candidate, Medill School, Northwestern University



The opportunity for conversation in small groups between presentations is a valuable part of attending the RAC Retail Robotics & AI Conference.

The second annual Retail Analytics Council Retail Robotics and AI Conference brought together more than 125 senior-level retailers and academics for a unique educational event addressing current and future robot and AI trends.

Topics addressed included: U.S.-China Retailers, Consumer Trends, and AI; Observations on the State of Retail Technology and AI; How to Implement a Retail Analytics Function; Advanced Analytics in Customer-Centric Strategies; AI Use Cases; How Bayesian Network Learning is Applied in Marketing; Data Privacy; Current Retail Robot Applications and Benefits; Robots in Retail Competition; Robust Perception for Robotics Systems; Intelligent Automation; and Future Retail Robot Applications.

Retail technology is constantly evolving, and innovations may remain in development for a very long time. Many of the hottest retail technologies are iterations of earlier technology that finally is reaching an adoption tipping point.

Here are five key retail technology trends conference panelists identified.

1. Growing mobile shopping

The future of retail relies on creating frictionless shopping experiences, and mobile continues to be of key importance for retailers to make the shopping experiences smooth and convenient.

U.S. consumers are becoming more active in mobile activities, such as messaging and video watching, and there is a growing adoption of mobile payment, according to Dr. Martin Block, Executive Director of the Retail Analytics Council and Professor, Northwestern University. Retailer apps continue to be popular among consumers, especially millennials and Gen Z, and the apps are not only designed to allow online shopping but also to deliver appealing content and drive loyalty through community marketing. Retailers are also integrating social media platforms, such as WhatsApp and YouTube, as additional purchasing channels.

The new experiment is using mobile to enable automated checkout/cashier-less shopping. Amazon Go is seeking a rapid expansion in airports by 2021. Others are aiming to deploy automated checkout platforms in pharmacy, convenience, and grocery stores.

2. New in-store experience with AR/VR

Retailers are merging in-store experiences with online platforms and new technologies. In addition to the “Buy Online, Pick Up In-store” (BOPIS) strategy, augmented reality (AR) and virtual reality (VR) are being used increasingly in the retail space. In late 2017 and early 2018, for example, AR applications were used by furniture and home décor retailers to help consumers visualize items in their homes.

AR and VR are expected to become more prominent for in-store operations and omnichannel shopping. Walmart, for example, has developed an AR-based product comparison scanner for its mobile app that can be used in-store to scan entire shelf sections to compare product details.

3. Customization enabled by AI and Big Data

Smart retailers know consumers better than consumers know themselves, and Artificial Intelligence (AI) allows retailers to provide personalized recommendations drawn from previous purchases, shopping behaviors, or preferences. Big data can help retailers understand consumer trends in great detail and identify new preferences much quicker. The data can be used to predict the top selling products in a specific category accurately, and retailers can expand their assortment based on the prediction.

At the end of the day, it’s still about giving consumers exactly what they want. Target manages to predict demand based on consumers’ shopping history and demographic areas to adjust merchandise on an individual store basis, while Macy opened its One Below basement at its flagship New York store to offer “selfie walls” to attract millennials walking around downtown.

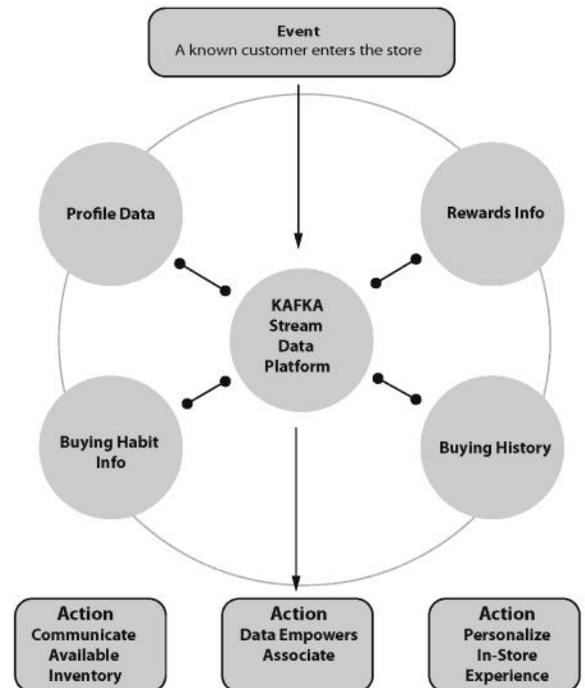
AJ Sutera, EVP and CIO/CTO at Finish Line, attributed the company’s success to advancing hyper-local and personalized customer experiences by using predictive technologies to deliver an enhanced customer experience at the right moment. For consumers, AI provides customized options. For retailers, it helps to uncover cost savings and effective ways to deal with more frequent, smaller orders.

4. Smart warehouses with robots

Using robots in warehouses to reduce cost and speed up processing times is not new for many retailers. JD.com is one of the leaders in using robots to enable same-day or next-day delivery. According to Deborah Weinswig, CEO of Coresight Research, JD.com applies robots in a fully-automated sorting system that loads packages onto the right vehicles. It also developed unmanned storage units that integrate intelligent logistics technologies to improve fulfillment accuracy and speed.

Besides using robots for lifting and transporting products, some retailers use drones equipped with RFID scanners to perform inventory checks outside of working hours. Managers can cross-check the data against other inventory management systems.

Finish Line Data-driven Ecosystem



5. Expanding visual and voice search

Visual and voice search is becoming the new normal. Consumers can find and buy a product by snapping a picture with a smartphone, and visual search technology can help them identify the product across multiple sites and retailers in just a click. When used via mobile, it can be an omnichannel enabler, driving in-app purchasing and bringing consumers to stores to find products in nearby stores.

With the growth of smart speakers in homes, voice search is also on the rise. Currently, consumers use the technology to find items in store and get instant product feedback. It might not be enough to save a dying store because it can't offer a full range of content consumers can get from other search forms, but as the technology gets better, it is expected to be used by more retailers.

The Bottom Line

Knowing “what is trending” is only part of the equation. Understanding how to apply these technologies strategically to align with a retailer’s mission and business objectives creates ultimate success. The five trends summarized from the RAC conference panelists present five directions for the future of retail, which represent only a small fraction of the innovations currently shaping the consumer landscape. These trends also offer tremendous opportunities for retailers to create the next retail product or experience and stay ahead of the competition.

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The Cerebral Side of Robotics

By Tim Rowland, CEO, Badger Technologies

From warehouse floors to grocery aisles, autonomous robots are gaining a lot of attention. They safely move parcels, assemble components, or spot weld with unmatched dexterity, keenly perform repetitive tasks, and have a tireless work ethic.

Still, robots should not be judged just by their strength and endurance. They have a cerebral side, too. Multi-purpose robots in the retail sector are being taught to traverse store aisles safely alongside shoppers while collecting inventory and safety data to improve operational efficiencies and enhance the shopping experience.

Teaching Robots to Think

Consider the example of teaching a robot how to spot and identify a spilled liquid. At Badger Technologies, this challenge was tackled head-on when showing our multi-purpose robot how to recognize the difference between a clean floor and one containing a potential hazard. Nuance is critical, as the robot must be taught that a scuff on a tile floor is fine, but spilled liquid, coffee beans, or flour constitutes a hazard warning.

Akin to its human counterparts, Badger Technologies' robots went to school for some serious (machine) learning. Hundreds of scenarios – and potential hazards – were reviewed in our working lab to help the robots understand seemingly end-

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less possibilities, such as the differences between spilled water, oil, vinegar, and syrup as well as potential risks associated with stepping on a fallen piece of plastic versus paper. Floor surfaces are equally important, so the robots were trained to look for potential hazards on different types of flooring, including tile with grout, tile without grout, concrete, wood, or parquet.

Humans may pick up the subtleties immediately, but it's complex for a machine.

hundreds of hours to train a robot. Luckily, the effort paid off. The lab work, followed by in-store trials and testing, enabled the autonomous robots to get smarter and more proficient.

Test and Refine through Agile Development

Exposing the robots to real-world situations in live store environments is the best on-the-job training. For Badger Technologies, a focus on agile development ensured that early testing results from in-store deployments were quickly assimilated into system refinements and operational improvements. Introducing these autonomous robots to heavy consumer-oriented environments, with lots of different people, personalities, and age groups, required equal effort at every crossroad.

The speed at which the robot moved, the sound it made, and how close it could come to shoppers was tested exhaustively during focus groups held by Badger Technologies as well as various retail partners. Not only was the robot taught to respect a person's "body bubble" by maintaining a three-foot distance, it also learned to go around a person to continue on its way.



Updates to the robot's software algorithms improved decision-making capabilities, along with speed, sound, and lights, so it would stand out without being disruptive. In some cases, a little trial-and-error went a long way, such as changing the initial sound of wind chimes to indicate a robot in motion to the more recognizable grocery store checkout beep.

Giving the robot the proper voice was another area that went through lots of testing. Would consumers prefer a male or female voice? We started with a male voice, but one partner preferred a female voice as it was considered "less intimidating." The necessity for the robot to speak English and Spanish was the result of early testing in certain demographic areas. The addition of other languages and/or accents will be considered as rollouts scale globally.

Robots Mind Their Manners

Multipurpose robots capable of finding spills can be equally adept at spotting missing, misplaced or mispriced inventory, which is a common complaint among grocery retailers. The key is to integrate robotic functionality in steps, so shoppers, employees, and management better understand how the robot's presence can improve store operations and customer experiences.

Consistent training and continuous feedback are essential to bringing robots into retail environments. It's critical to monitor and manage how they perform around people, as well as carefully assess how people react to them. Teaching robots to be smart – and polite – is the key to continued adoption.

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Robot Supply Will Not Keep Pace With Robot Demand

By Andra Keay, Managing Director, Silicon Valley Robotics

“It is the best of times, it is the worst of times” for robotics and retail, to paraphrase Charles Dickens. Right now, robotics is becoming the buzzword in many industries. Only a few years ago, retailers had the pick of the crop of emerging robotics companies. Very few in the retail industry were ready to seize the advantage. We



(Left-right) Tally from Simbe Robotics, BossaNova's robot, and Fetch Robotics at Trax

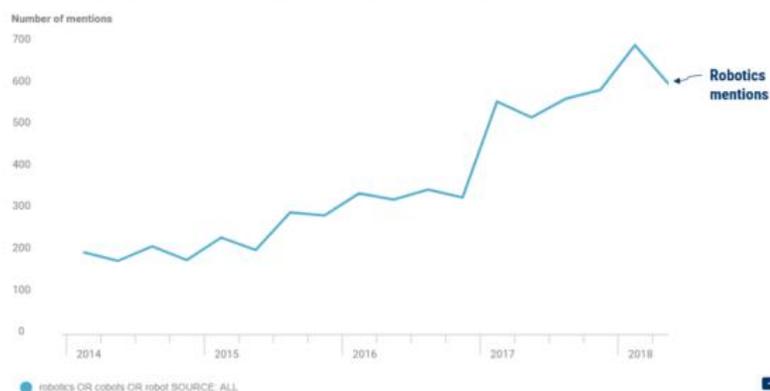
are all familiar with some of those case studies, via early adopters Amazon, Walmart, Kroger, Target, and Lowe's, who have all showcased trial deployments of various robots in retail.

In Silicon Valley, we are seeing a number of new robotics companies in the retail industry, but also a number who are looking at other industries like construction, health, hospitality, food, and agriculture. This is not a purely

Silicon Valley phenomenon. The robotics market has moved very rapidly as shown on the chart below. This is a graph of keyword mentions from the quarterly earnings calls of Fortune 500 CEOs, shared by CBInsights.

Bots on the mind: C-suites are showing interest

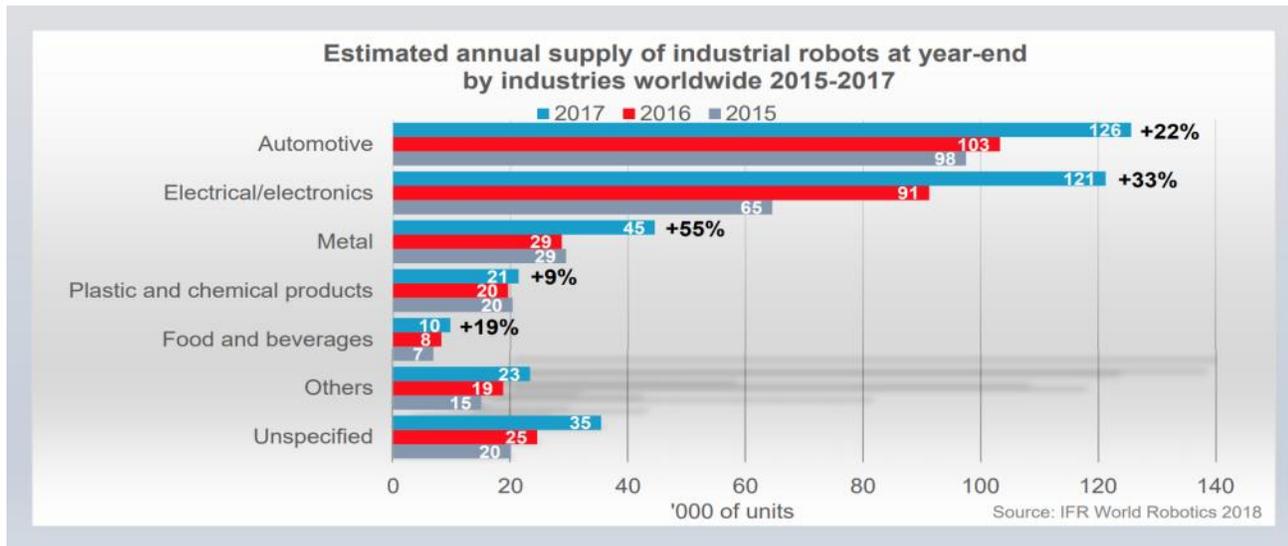
Mentions of robotics keywords on quarterly earnings calls. Q1'14 - Q2'18



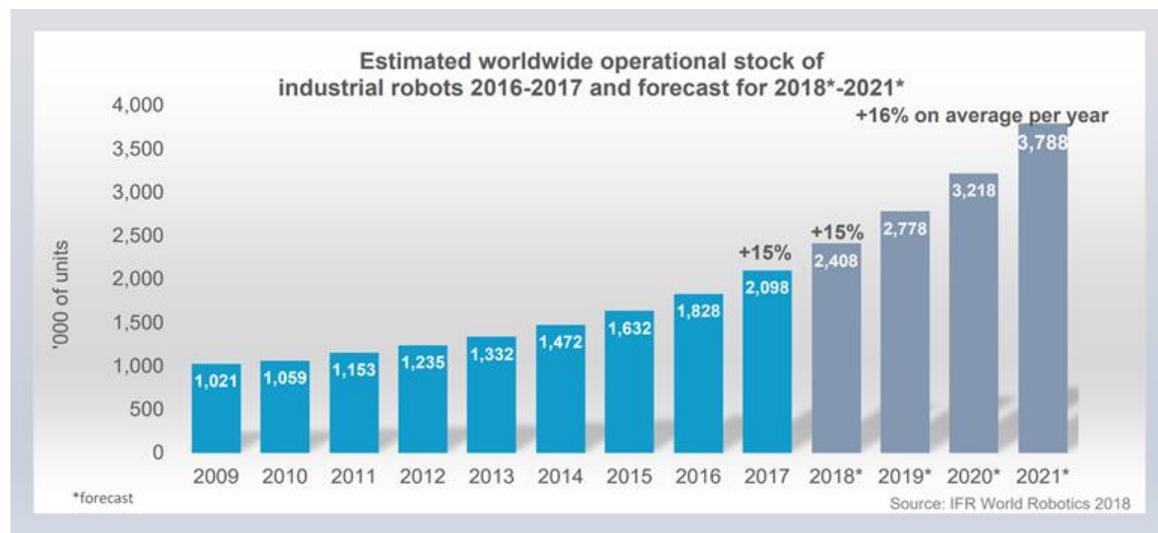
This is where the problem for most retailers will really start. There is a limited sup-

ply of all of the components of the retail robotics industry, whether we are talking about front-of-house, customer-facing robots, warehouse and logistics automation, or kiosk-style robots. There are simply not enough robots, including: robotics startups; robotics talent to work in these startups as they scale up; and robots produced by these startups.

For the last 50 years, the Robotics 1.0 industry that manufactures “dumb” robot arms has been dominant. The majority of these companies are now Japanese or Chinese, with very few based in the U.S. or Europe. These robots have to be kept separate from human operators and require extensive and expensive reprogramming whenever their tasks change. There are approximately 2 million of these robots deployed internationally and they are largely in the automotive industry, followed by metals, machining, plastics, and the food industry.



According to the major robotics statistical body, the International Federation of Robotics (IFR), while the supply of robots is increasing rapidly, it is certainly not rapidly enough to have met Foxconn Technology chairman Terry Gou’s pledge to “have 1 million robots in Foxconn factories by 2014.” By the end of 2014, the total global supply of robots was less than 1.5 million and Foxconn was producing only 30,000 robots per year. In 2018, Foxconn’s robot production figures are starting to come closer to 300,000 robots per year. The IFR predicts that the worldwide stock of industrial robots will increase to 3.8 million robots in the world’s factories by 2021, a significant increase.



But what about the robots we see doing e-commerce logistics and store inventory? Robotics 2.0 describes a qualitatively different kind of robot that is smarter, safer, sensor-based, and capable of limited social interactions, i.e. navigating safely around people. The best Robotics 2.0 robots are also simple, doing one task or with one physical focus. The majority of Robotics 2.0 companies are new companies, between one and 10 years old, building self-driving vehicles for logistics, hospitality and retail robots, and the miscellaneous other things required for retail.

We must not underestimate the difficulty of building all these new robots or the difficulty retailers will face finding those emerging startups or small companies working at the forefront of deploying these new technologies. There has been a tipping point in the available technology stack (cheaper computing power, cheaper and more ubiquitous sensor deployment, greater connectivity, etc.), but to expect the venture capital industry to find, fund, and scale startups in the best interests of the retail industry is overly optimistic.

Fellow Robots is a great example of the best and the worst of times. They were one of the first movers in the retail space and as such, they over-equipped their robot. Most of the features that seemed so important on the hardware have been either written off the product development roadmap (i.e., scanning customers' samples) or have been subsumed into the development of software that integrates with store management systems.

That means that instead of the Fellow robot replacing a store associate physically, it now accompanies store associates or provides raw data so that store associates and managers can take actions. Fellow's robots are becoming more highly specialized now in their physical functions, but the interlocking array of software is far more powerful, supporting stock replenishment, inventory management, or actionable smart data.

Real robots for retail do ONE SIMPLE THING!



Robots for social interaction

Catalia Health, Samsung, Sanbot, SoftBank Robotics, Bots&Us, MetraLabs, Furhat Robotics

Increased and targeted consumer engagement is possible with robots

Automation inside the box

Amazon Go, Alibaba, JD.com, Hema Supermarket, Café X, Creator, Blendid, Chowbotics, Bear Robotics, Spyce Kitchens, Zume Pizza, Zoom Systems

Many building blocks in automation technologies can be reapplied in house to create custom solutions

Arms and grippers

Kindred, Kinema Systems, Fetch Robotics, Right Hand Robotics, SoftRobotics, Modbot, Hebi Robotics, IAM Robotics, Universal, ABB, Kuka etc.

These are exceptions to Robotics 1.0 – Collaborative arms are safe around people.

Wheels (not feet yet)

Fetch Robotics, Fellow Robots, Simbe, BossaNova, Canvas, DHL, Otto, Quiet Logistics, Grey Orange Robotics, Clearpath, LG, Starship Technologies, Nuro, Marble, Kiwi Campus, Kiva Systems, Avidbots, Postmates, BrainCorp, LG Clui, Five Elements, Badger, Savioke

Autonomous delivery on roadways is still very limited. Navigation inside is most developed (depending on wifi connectivity)

*not an exhaustive list

“Customers don’t want ‘Robots as a Service.’ They really want ‘Data as a Service,’” says Tessa Lau, founder of Dusty Robotics and previously CTO of Savioke. The first mover in hospitality robots, Savioke has now extended its offerings into office deliveries, while Lau has moved on to found Dusty Robotics, which provides actionable data for the construction industry by way of a robot.

You could also describe what we are seeing as the emergence of the “hands-free power tool,” rather than “robots.” These are devices that perform a task alongside the worker but that are much more accurate and don’t require hands-on operation. This frees up skilled human hands and brains to do much more valuable and enjoyable tasks.

If there is one single takeaway from this piece it should be that while the retailers are ready, and so are the robots, the scale of the demand is enormous compared to the production cycles for complex physical products.

Robot supply will not keep up with robot demand, in spite of the massive capacity change happening right now in the robotics industry. Retailers must be proactive and move rapidly to secure partnerships with robotics startups to ensure that internal innovation systems are agile. An “A team” of roboticists internally can help retailers deploy available technological building blocks into a sensible overall automation, robotics, and AI strategy.