THE SECOND ERA OF DIGITAL RETAIL

A vision for the future of shopping and the smart shelf

A FUTUREXCASTING report by

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THE STORE WPP

THE WPP GLOBAL RETAIL PRACTICE

THE SECOND ERA OF DIGITAL RETAIL

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ONLY THE BRAVE WILL WIN

The $15 trillion retail sector is about to undergo a major round of disruption as it experiences a second wave of digital transformation. Retailers will need to learn new skills, embrace new technology, and take big risks. They will all need to be much braver than in the past; and only the bravest will win.

Shopper expectations are evolving faster than retailers are innovating and over-capacity in the retail sector has put shoppers in control. Shoppers want their needs met faster. They are demanding more efficient, higher quality, personalized, and omni-channel shopping experiences. They want products and services tailored to their individual tastes and desires. They are demanding increased transparency into pricing, retail operations, and products, and want a bigger say in how products are developed and sold.

But retailers have been slow to innovate and are furiously discounting as they fight for every dollar. The spaces they occupy are too big and in the wrong places. Urbanization is only piling on the pressure. Unless something changes, the race to the bottom is on.

Technology will remake the face, the bones, and the brains of retail. Specifically, computing capability will come at costs, physical sizes, and performance levels that will quickly disrupt retail. Historically, retailers have focused IT spending on the "bones" of retail: manufacturer-facing efforts designed to optimize the supply chain, manage inventory, and handle secure transactions. In response to new shopper expectations, retailers are rebalancing their IT spend to include customer-facing technologies that improve the "face" of retail: technology to improve the shopper experience, to make mission shopping more efficient, and experience shopping more enjoyable.

Computers that can see, hear and understand the world around them will enable brands and retailers to hold new types of interactions with shoppers, and tell stories in new ways. Wearable computing will help shop assistants to deliver much better customer service. Giant data centers will amplify the effectiveness of both the "bones" and "face" by connecting them to the "brains" of retail: analytics and intelligence at every stage of the retail machine that multiplies the effectiveness of the bones and face. This added intelligence will help retailers to drive operational efficiency, better understand their customers, and deliver personalized experiences, personalized offers, dynamic pricing, and customized products and services.

In the coming decade, smart cars will navigate down smart streets in smart cities. Smart products will be delivered by smart trucks to smart stores inside smart packaging. These smart products will create new revenue streams built around new business models that enable retailers and manufacturers to build new service businesses. Smart stores will be filled with smart infrastructure and smart shelves that bristle with a myriad of sensors that gather vast amounts of data. In-store automation will free up labor to focus on customer service and enable human touch connections that can't be replicated online. Giant computers will analyze this data so retailers can optimize operational efficiency, gather valuable insights for manufacturers, and deliver compelling personalized experiences to shoppers.

At the center of all this innovation is the smart shelf, able to facilitate the conversation between manufacturers and shoppers and actively participate in the selling process. The smart shelf will revolutionize the level of service retailers are able to offer to manufacturers and shoppers alike. They will interact with the shopper in a way that is natural, comfortable, and fully respectful of shopper privacy.

SHELVES WILL DELIVER PERSONALIZED EXPERIENCES TO THE SHOPPER, REWARD SHOPPER LOYALTY, CREATE DATA-LED SALES AND MARKETING OPPORTUNITIES FOR MANUFACTURERS, AND MAXIMIZE PROFIT FOR THE RETAILER BY OPTIMIZING PRICING DYNAMICALLY.

Shelves will understand natural human language, context, and even sense emotional states. They will serve shoppers intelligently by assessing whether they are stressed, relaxed, in a hurry, confused, in discovery, or close to making a purchase decision. Like any good sales person, the shelf will have a personality that combines deep product knowledge, trustworthiness, great shopper insight and strong selling skills. It will navigate a wide range of conversations, make choosing easier for the shopper and move them towards purchase. Smart shelves will also handle loss prevention, and manage samples, inventory and assets. To unlock maximum value, smart shelves will need to be supported by a sophisticated back-end server infrastructure able to gather, store, and analyze data, and deliver media and other services to the shelf. The will be deployed as part of a wide variety of new business models that allow retailers to optimize the experience for shoppers, for manufacturers, or both. Proprietary, vertical solutions that initially flood the market will eventually yield to lower-cost solutions based on open standards, APIs and building blocks. This will lead to an explosion of value creation as it enables developers to collaborate across standardized platforms.

Networked shelves in homes will enable retailers of consumables to anticipate demand and optimize the position of products within the supply chain, increasing availability, reducing spoilage, and minimizing the need for discounting. Retailers will be able to anticipate local community demand not just by looking to historical consumption patterns but also by understanding aggregate in-home inventory in real time.

The sharing economy creates an opportunity for retailers to monetize goods and services in new ways but also threatens existing retail business. Shoppers are finding more efficient ways to consume. In a fast-growing trend that could limit future consumption and that could spread to nearly every sector of retail, some shoppers now aspire to merely have access to products rather than to own them.

Local just-in-time manufacturing, led by ever-improving 3D printing technology, will reframe the economics, supply chain and customization capabilities of retail. 3D printing promises to offer shoppers maximum choice and immediacy inside the minimal physical store footprint.

The shift to online has remade the retail landscape and the availability of high-speed delivery services could accelerate the trend. “Next hour” delivery capability is emerging and will eventually become widespread, removing the immediacy advantage for traditional retailers.

AUTONOMOUS DELIVERY VEHICLES, DRONES, AND ROBOTS WILL SLOWLY EMERGE AND BOOST ONLINE DELIVER SPEED AND CONVENIENCE EVEN FURTHER.

Traditional retail will need to focus on highly emotional products where the buying process is highly experiential. Consumable will be automatically ordered by smart homes and scheduled for delivery.

Membership shopping clubs are becoming wildly popular with shoppers. For retailers they alter shopper’s behavior and create lock-in. Shoppers love the added value they derive from a broader ecosystem offering and reward retailers by giving them “first option” selling advantage. Retailers that get this right will enjoy deeper customer insight and will be able to sell across and up as they delight customers with a broad ecosystem of personalized value.

The retail sector is about to be disrupted by a set of technology and business forces that will reshape the retail landscape in the next decade. Winners in this era will partner broadly and make the short term and long term investments necessary to embrace these disruptive forces and create new value for their customers, their suppliers, and their shareholders. Losers will fight or ignore these unstoppable trends and ultimately they will disappear from the high street forever.

Retailers that want not just to survive but to thrive through this period of transformation will find a set of highly actionable next steps and recommendations throughout this document. These are all summarized together in chapter 10.

WELCOME TO THE SECOND ERA OF DIGITAL RETAIL. LET’S JUMP IN.

Steve and David

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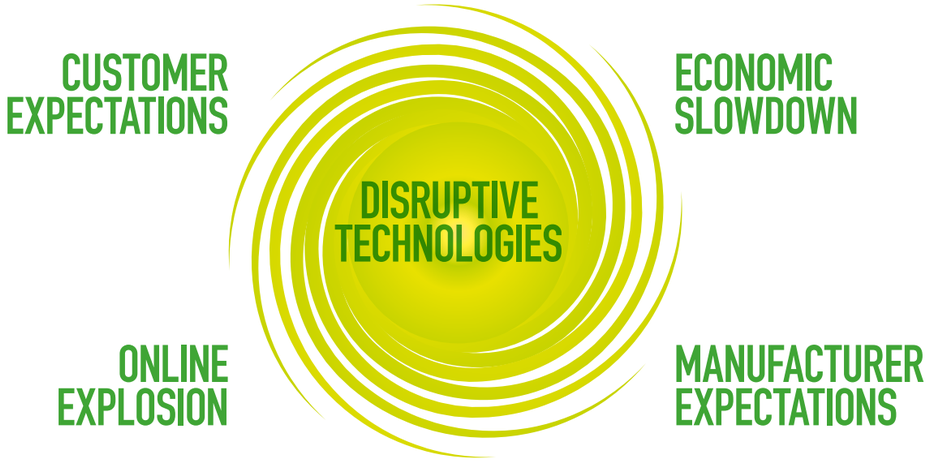
INTRODUCTION

THE $15 TRILLION RETAIL SECTOR IS NOW EVOLVING AT THE SPEED OF THE INTERNET.

To thrive and survive in retail, companies now need to innovate at that same pace. That means businesses increasingly need to be virtual, not just physical. By digitizing the entire business flow, retail will become more responsive to customer needs, able to personalize the shopping experience for each and every customer, and be able to continually tune and optimize their businesses over time.

WHY NOW? A PERFECT STORM IN RETAIL

Why is retail bracing for major change? And why is the change coming now? The answer is that retail is about to experience a perfect storm of change fueled by a wide set of powerful technological, social, demographic, ecosystem, business, and economic forces.



In the next decade, this perfect storm will drive a massive reimagining of retail. This will present both huge opportunities and huge challenges to all the players in retail, across all sectors. This report explores these forces and the specific actions retailers will need to begin planning NOW. These actions will ensure retailers are best positioned to be the winners in all this change, rather than the losers.

The major forces on the future of retail are:

- **Customer expectations** – Changing shopper demographics, increased choice, and exposure to new technology mean that customers now have rapidly evolving attitudes towards shopping. Shoppers have a new set of expectations related to omni-channel shopping, customization, efficiency, transparency, and the quality of the experience itself.
- **Manufacturer expectations** – Suppliers want increased visibility into retail operations and expect new services from retailers including shopper analytics, targeted advertising, and other analytics and insights.
- **Disruptive technology** - Moore's Law is now delivering amounts of computing capability at costs and physical sizes that will soon disrupt retail and other sectors.
- **Global economic slowdown** – Retailers are operating in an increasingly over-saturated and highly competitive retail sector. They are playing a zero-sum game where an increase in sales for one retailer comes at the loss of a competitor. Competitive forces are therefore on the rise.
- **Online explosion** – The shift to online sales has remade the retail landscape forever and requires totally new thinking in the omni-channel, 24/7 shopping landscape. The shift towards online will continue to disrupt retail as increased delivery speeds remove immediacy as a channel advantage for traditional retail.

The resulting combination of these forces is leading to one of the biggest transformations in retail in decades and is ushering in the Second era of Digital Retail.

THE FACE, BONES, AND BRAINS OF RETAIL

A helpful way to think about the future of retail is to consider the face, the bones, and the brains of retail. These constructs will occasionally be referenced throughout this report.

The Face

All the customer-facing elements of the store used to maximize the shopper experience in a way that makes mission shopping more efficient, and experience shopping more enjoyable. These include merchandising, signage, and other look and feel elements of the store. Future advances in this area might include interactive brand experiences, virtual shopping assistants, and spectacular holographic displays. The face is also the place that data is gathered on the shopper and fed to the brain.

The Bones

All the retail elements that sit behind the face to feed the store and shopping experiences. Today these include things like fixtures and fittings, the supply chain, inventory management systems, loyalty card and reward systems, and point of sale terminals. Future advances in the bones of the store might include smart infrastructure, indoor location tracking, 3D printers, robots, delivery drones, and automated and reconfigurable store fixtures.

The Brains

All the data analytics and intelligence that is deployed through every stage of the retail machine. This intelligence helps retailers to drive operational efficiency and better understand their customers. This knowledge is then used to deliver a personalized set of experiences, offers, pricing, services and products.

Thinking about the face, bones, and brains of retail is a valuable way to reframe the conversation on the future of retail. It offers a helpful way to let go of old notions that are tied to tired retail formats. And it's a productive way to frame ideas for future innovation and deployments.

This report explores many ways for stores to differentiate their brand proposition and gain competitive advantage through the deployment of technology that transform the face, bones and brains of retail.

These include technology designed to:

- Personalize the shopping experience (section 5.3)
- Deliver personalized or customized products (section 6.2)
- Create new business models and revenue streams (section 6.1.2)
- Enable retailers to embrace the sharing economy with new selling models such as sharing, bartering, and renting (see section 6.5)
- Create interactive experiences in the store that make shopping either more efficient, more fun, or more personal (section 7.5)
- Free up sales staff in the store to deliver better customer service by automating non-value added activities that can be mechanized or handled by algorithms.
- Augment and improve sales staffs' selling capability using wearable technology and assistive AI (section 6.1.3)
- Generate the maximum profit from each customer over time by using dynamic pricing that varies by location, by customer, by minute, and by product (section 7.5)

AMPLIFY YOUR INVESTMENTS BY FEEDING THE BRAIN

It's worth noting that investment in the brains of retail can be considered as multiplicative to the other two elements. Improving the brains can make the bones and the face of the store much more intelligent and thus more effective.

For example, dynamic pricing at the shelf won't truly hit the mark unless it's backed up by cutting edge analytics and comprehensive customer data held in the brain. Personalized experiences won't be very personal unless the brains can direct and choreograph them. And supply chains will only be as streamlined and efficient as the quality of the insights distilled from operational data allow them to be. Without a fully functioning retail brain—a brain fed by vast amounts of data and powered by sophisticated analytics software—investments in the retailers' face and bones won't yield maximum returns.

SHOPPER EXPERIENCE = (FACE + BONES) x BRAINS

HOW TO GET THE MOST OUT OF THIS REPORT

In this paper, we will explore the output of a futurecasting session held in July 2014 at Intel's campus in Hillsboro, Oregon. We will describe the futurecasting process itself, reveal the team's findings, and then explore the conclusions of the session in detail.

Retail strategists, retail planners, chief innovation officers will want to absorb this whole report front to back. The full report will also be highly valuable to systems analysts and other IT personnel hoping to serve the retail sector.

C-level readers should read the executive summary and may then wish to skip directly to section 10 which provides a cheat sheet summary on the main findings of the report together with a set of recommendations for retailers. Future-looking readers should definitely absorb the contents of section 7 regarding the smart shelf.

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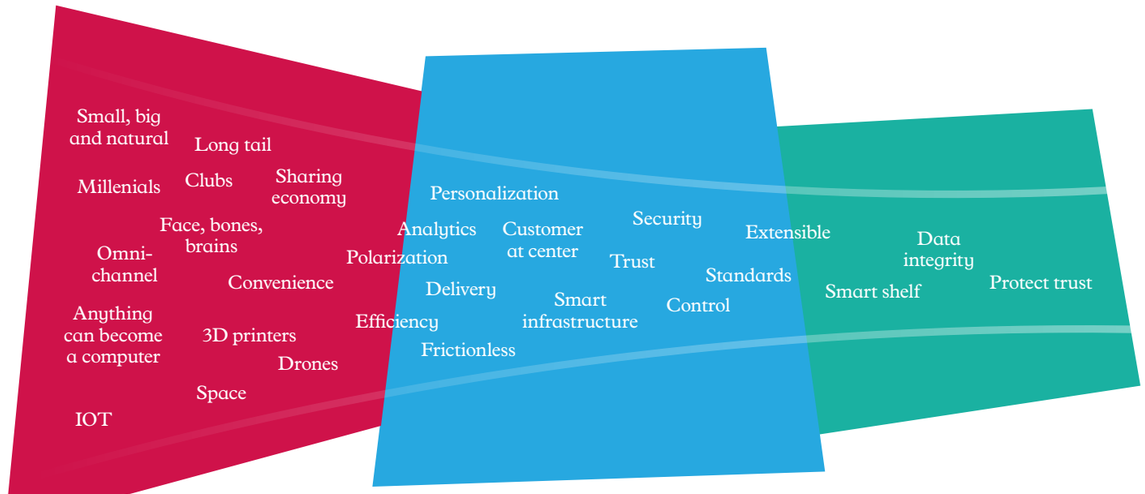
THE FUTURECASTING PROCESS

The futurecasting process is designed as a structured thought exercise to explore the likely changes coming to a particular sector or area of focus. In this case the focus was the retail sector in mature markets.

Futurecasting uses a combination of expert consultation, science-fiction prototyping, and backcasting to come to conclusions about the likely future. During a multi-day creative workshop, participants combine a wide range of insights to build actionable models of the future.

Futurecasting is also not a passive exercise. The aim is not to predict the future, but to decide what future we want to build, and to define concrete initial steps we can take to begin on that journey. It also seeks to anticipate possible scenarios such that companies are able to prepare their strategic responses should these scenarios come to pass.

The diagram below illustrates how insights are boiled down through the futurecasting process and turned into actionable next steps.



KEY TRENDS

The process starts with expert testimony spanning a broad range of disciplines. Accurately modelling the future requires the combination of a diverse range of insights. These include:

- **Social trends** - What people love, what they are scared of, what their challenges are, what their aspirations are, how and where they derive meaning, and what their attitudes are.
- **Demographic trends** – Shifting attitudes, habits, and values, by age, gender, location and other factors

SYNTHESIS

- **Technology trends** – Disruptive technology, influential technology trends, and timing for mass market viability and impact
- **Economic trends** – Global earning and spending, manufacturing supply data, energy prices
- **Business and ecosystem trends** – Retail ecosystem and broader business model trends
- **Infrastructure** - Consideration of existing infrastructure and other barriers to change

BACKCASTING

Once experts have shared their insights on important and salient trends, teams synthesize what they have heard and boil it down to the most important points they think will shape the future of the subject at hand.

Finally, by using science-fiction prototyping, attendees build out models of the future and then use them to step backwards in time toward the present using an approach known as backcasting. This allows them to extract the main focus areas for future innovation needed to get us from today to the imagined future.

THE PARTICIPANTS

A huge thank you to all the experts that generously gave their time and passion to contribute to the three-day futurecasting session held at the Intel Jones Farm campus in Hillsboro, Oregon in July 2014.

Rachel Antalek	Vice President	Starbucks
Jose Avalos	WW Director, Visual Retail	Intel
Megan Bednarz	End User Marketing	Intel
Jon Bird	Managing Director	Y&R Labstore
Brett Blundy	Managing Director	BB Retail Capital
Steve Brown	Futurist, Intel Labs	Intel
Dick Cantwell	Vice President	Cisco Consulting Services
Diane Collins	Vice President	Meads Johnson
Francesco Cordua	Vice President	RTKL
Nicolai Gerard	General Manager	Pepsi Co
Ed Halla	Managing Director	Eye Level
Jack Hanrahan	Retailer Relations	Westfield
Maroun Ishac	Business Development	Intel
Ray Itaoui	Owner	Sanity
Brian David Johnson	Futurist, Intel Labs	Intel
Graeme Kelly	Enterprise Architect	Myer
Scott Lamensdorf	Vice President	Kantar Retail
Ryan Lester	WW Director, End User Enablement	Intel
Robert Pettit	Client Development Director	Fitch
Anthony Ritch	Vice President	Westfield
David Roth	CEO	The Store WPP
Herb Sorensen	Scientific Advisor	TNS Global
James Sorensen	Senior Vice President	TNS Global
Jon Stine	Global Director, Retail Sales	Intel
John Warn	Regional General Manager	Westfield, Scentre Group
Adrian Whelan	Business Development	Intel
Anne Zybowski	Vice President	Kantar Retail

Without the passion, vast experience, deep knowledge, and enthusiastic participation of every person that collaborated in the futurecasting session, this report would not have been possible. Thank you all.

Another big thank you to the experts that set the scene for the futurecasting session, grounding the attendees in the latest trends in technology, economics, retail, IT, demographics, and shopper behavior.

The expert speakers for the futurecasting session:

- **Paul Thomas** Intel Chief Economist
- **Dick Cantwell** VP of Cisco Consulting
- **David Roth** CEO of The Store WPP
- **Herb Sorensen** Scientific Advisor to TNS Global and creator of www.shopperscientist.com
- **Anne Zybowski** VP of Kantar Retail
- **Jamie Gutfreund** CMO at Noise.
- **Steve Brown** Futurist, Intel

SYNTHESIS OF KEY TRENDS

The futurecasting participants first listened to a day of informed opinion and insight from a variety of domain experts spanning the retail industry and beyond. Within small teams, participants then synthesized and distilled all that they had heard, highlighting key insights and determining the factors most likely to shape the future of retail. They then considered the implications of trends to the world of retail, both positive and negative, and determined how the retail sector should respond as a result.

Here are some examples of the key trends and retail imperatives that emerged from teams during the synthesis process:

Trend	Retail imperative
Compute will enable us to add intelligence into anything and everything	Need to ensure control still remains in the hands of the shopper and that we are solving a customer need/pain point and not just using technology for technology's sake
Trust is becoming digitized and value is being created by refining data into wisdom	Retailers must build and protect trust with shoppers
Shoppers, particularly Millennials, want more customized products	Retailers will need to offer customized or customizable solutions, accessed via easy interfaces, and can use them to upsell customers
Some shoppers prefer access to things rather than to purchase them	Retailers can lease as well as sell things, they could act as a reputation management system for resold goods, and could provide an indemnification service as a value add
Millennials have a strong desire for efficiency	Retails should build stores with no checkouts, or totally automated stores using RFID or vision data to manage inventory and perform automatic checkout
Shift from supplier control to customer focus	Retailers must put the customer at the center and obsess over what's right for customers, not what serves suppliers best
Technology can make a bricks & mortar store more efficient	Innovate internally and outsource for speed
Routine shopping is primarily done on autopilot; shoppers don't want to be bothered while shopping	Better understand value proposition and needs across categories; enhance the shopping experience for more engaging categories and automate the "commodity" categories
Product proliferation in bricks & mortar has made making choices very difficult	Pursue a long-term strategy to "get off the drug" and have greater focus on the shopper
Stores are polarizing their business models: efficient on one end, experiential on the other	Understand the customer using data, build responsive stores, invest in frictionless experiences, and invest in quality of staff

You will see these trends, and others like them from the futurecasting process, show up throughout the body of this futurecasting report.

FUTURECASTING – MODELING THE FUTURE AROUND PEOPLE

As a vehicle to building out models of the future, teams then created imagined personas of people living in the year 2024. These people spanned a range of ages, socio-economic backgrounds, outlooks, lifestyles and geographic locations. Each team then brainstormed a set of new shopping experiences that might be of interest to their imagined person, using the trend synthesis as a basis for exploration.

A sample scenario is listed below as an example of a set of experiences being imagined by one of the futurecasting teams:

In a dense urban environment of the future, circa 2025, Alexandria and her husband live in a newly-constructed smart apartment building in Mexico City.

Intelligent shelves are deployed in their home pantry that use a combination of RFID and visual recognition technology to identify items. The shelf can measure and securely report inventory of products stored in each home. An intelligent fridge is fitted with similar capabilities.

Alexandria's personal home inventory feeds into a recipe recommendation system. It offers meal choices and also suggests shopping lists.

Real-time inventory rolls up to provide an overall picture of neighborhood inventory levels. A "Friendly neighbor" service helps Alexandria get the ingredients need for her next meal. It alerts her to inventory she don't have but that a neighbor does have and hasn't used, and facilitates the request to move an item from their home to hers (and handles appropriate billing).

Intelligent shelves in Alexandria's local store (which is conveniently built into the base of her tower block) are able to determine when a product is removed, and who removed it (and then bill appropriately) providing a frictionless way for Alexandria and her husband to purchase items they need.

A membership program for the local store securely stores people's consumption information and uses analytics to predict future consumption of members based on real-time usage (gathered from the store, the pantry, and the fridge) and ensures desired items, even if they are what would formerly have been considered unusual purchases, are in stock as often as possible. Alexandria is delighted as this means her local store nearly always has the particular brand of cured meat her Colombian husband likes so much.

Secure links into Alexandria and her husbands' calendars improve the accuracy of the neighborhood consumption prediction analytics by knowing when they are away.

Alongside physical products, the local store includes attractive and interactive virtual spaces that enable Alexandria to browse online services and products she can order easily for delivery. The online shopping experience is seamlessly integrated alongside the physical product displays to create a fluid shopping experience where the physical and virtual blur.

The local store acts as an aggregation hub for packages Alexandria has ordered and that are delivered next day or sometimes next hour by online vendors. Her neighbor has invested in a butler's hatch for their apartment and has the store deliver packages and goods directly into her home but Alexandria hasn't got around to that yet.

The store has embraced the sharing economy and manages a set of shared community items including a carpet cleaner, toolbox, and a couple of cars. It has both an online and in-store dashboard showing availability of these shared items and enabling shoppers to make reservations

In addition to renting "do it yourself" community items, Alexandria's local store has a portal that enables her to schedule a range of household services such as cleaning, repairs, and babysitting. As a member of her local store club she has access to a broad ecosystem of local service providers who give her preferred rates and service levels negotiated through group bargaining.

BACKCASTING

The backcasting process is a way to figure out the interim steps that are needed in order for an imagined future to become true. The result is a set of concrete actions that need to be taken at various times between now and the time in which the futurecasting scenario is to be realized. The process also extracts a set of capabilities that will need to be developed.

The teams did this for both the 2017 and 2020 timeframes. This provided a set of nearer term steps they could take towards realizing their visions for 2024.

A set of sample actions and capabilities extracted by the teams are listed below by way of example:

By the year 2017

- Need data integrity on stock availability across the purchase chain
- Need a social media platform to allow visibility of buyer to friends' likes/interest in products
- A consumer platform that is extensible to all screens
- Hire data scientist to conduct behavioral analysis and modeling on needs and purchase habits

By the year 2020

- Same day and next day shipping for goods
- 3D printers to create products, cotton fabrics and designs that are designed by friends or (other) participants in the market – or markets in other parts of the world

SCIENCE FICTION PROTOTYPING

Once backcasting had been used to start to extract concrete actions and capabilities that would be needed for each scenario, science fiction prototyping was employed to stress test that scenario and look for issues and nuances they might have overlooked while in the experience creation phase.

These prototypes took the form of stories from the future, usually set in a time placed several decades beyond the futurecasting time horizon. The goal of science fiction prototyping is to use the added freedom afforded by the extended timescale to take the imagined scenarios to the extreme. Teams were encouraged to imagine something going terribly wrong and then being remediated or fixed. This approach reveals insights and important design considerations that would be applicable to the shorter-term experiences being imagined.

By way of illustration, a sample science fiction prototype is included opposite to demonstrate the process. The team had a bit of fun with the story, but it highlights some serious potential security issues with their experience scenario that have applicability back to the 2017 and 2020 time frames:

The year is 2055. Alexandria is now 73 years old. She recently experienced a stroke, has partial paralysis and has great trouble speaking. Her husband was somewhat older than her and died back in 2050. Her four children are all grown and have moved to other cities in Mexico, and across Latin America.

Alexandria takes a pill twice a day to manage her various ailments, which include high blood pressure, obesity, migraines, COPD and chocolate addiction. It has been specially designed for her by her health provider based on her genetic code.

She still lives in the same building, albeit in a much more spacious condo, and now relies heavily on the "Convenierge" service to assist her with many of her daily living tasks. It understands and anticipates all her needs and service robots deliver all her goods, her food, and her medication to her home.

Recently, Alexandria has noticed that her life feels different. Her medication looks the same, but doesn't seem to have the same beneficial effect on her that it once did. Perhaps she's imagining it? But her blood pressure certainly does seem to be on the rise. And lately, the range of food her robot is loading into her fridge and pantry doesn't seem quite right. Products she's never used before are showing up. And many of the staples she uses for her favorite recipes are missing.

Alexandria suspects something is up. She hasn't had to check her billing statement in years. She's just learned to trust Convenierge to take care of everything for her. She waves her hand to bring up a visual display of her spending on the wall and is shocked by what she sees.

From being quite financially comfortable, she now sees that she only has three months of living expenses left in her account. Somebody has been ordering vast amounts of goods and services, and billing them to her. Somebody has hacked her "Auto birthday present" service and been sending themselves high value items – a 4D camera, a 70-year special anniversary edition Back to the future hoverboard, and even a new eKidney to her niece. Only of course it was never delivered to her niece, Naomi, but went to some address in Beijing. Alexandria also sees that many of the healthy, high-quality products she has enjoyed over the years have been substituted with poor alternatives. Some of them are known to include ingredients that were banned in the '30s for their serious health issues. Even worse, as she investigates further, she finds that her custom pill is actually a slow acting poison. The criminals clearly intend to knock her off before her money runs out, and take over her apartment.

Alexandria's life is turned upside-down, and she realizes somebody is out to kill her and take everything she owns and has worked so hard to build. She now has nothing to leave to her kids as inheritance, and doesn't know what to do.

She summons her automated lawyer and criminal investigation service, LawAI by thinking about a shirtless Tom Selleck as Magnum PI, her pre-agreed brainwave icon for the service. Her BMI (brain-machine interface) hat has been a godsend since her stroke. LawAI's holographic representative appears in her lounge and listens to her problem. The representative is not a real person, but certainly looks like one. It is powered by powerful algorithms and represented as a 3D avatar carefully selected to look as friendly and calming to Alexandria as possible, based on her data profile. The algorithms of the law service immediately begin to run diagnostics on the system and search for compromises. They quickly pinpoint a weakness in Alexandria's security features that she has inadvertently failed to keep up to date. The thieves have covered their tracks, but the algorithm traces the criminals to a location in Ghana. The law algorithm coordinates with local Ghana law enforcement algorithms and passes them all relevant data enabling a crime bust.

The law service checks the details of Alexandria's SLA and finds that she signed up for an indemnity contract back in 2035 that is still in force. This covers her for losses incurred as a result of any data breach that results from using their service. The law service instantly negotiates a settlement with Convenierge and her account is restored within 4 seconds.

As part of the settlement Convenierge sends a luxury self-driving pod to take her to the nearest doctor for immediate assessment. The doctor and her AI algorithm examine Alexandria. They scan her body, and quickly resequence her genome. The algorithm identifies the poison in her system and formulates a potent combo of chemical, biological, and nanobot treatments to cleanse her bloodstream and major organs. This single pill is 3D-printed in the office, and administered with a nice cool glass of water and a shot of whisky (now understood to have incredible medicinal properties). She waits for just 15 minutes for the treatment to act and is rescanned. Once given the all clear, the LimoPod™ whisks her back to her apartment where her family, alerted by the Law Service to her recent brush with death and destitution, have flown to celebrate the fact that she's ok. There is cake, and of course lots of healthy Irish whisky to wash it down.

The particular insights that the team drew from this science fiction prototype that they then went back and applied to their 2024 experience were:

- **Security is key**
- **Indemnification and remediation plans are key to building consumer trust**
- **Need regular security audits that catch issues early on**
- **Add self-driving delivery vehicles to 2024 experience**

4

LOOKING BACK BEFORE WE LOOK FORWARD

RETAIL CAN LEARN FROM THE MEDIA INDUSTRY

Over the last thirty years, digitization has utterly transformed and remade the media and publishing sector. A lengthy upheaval was triggered by sustained technological change. The changes wrought on the industry ushered in new business models, obsoleted prior expertise, changed customer expectations, and remade the entire business landscape.

Both winners and losers emerged. Companies that embraced the digital revolution prospered and powerful new companies like Netflix*, Spotify*, and Google* rose to prominence. And companies that either denied the trend, or actively fought it, have since been consigned to history. We all fondly remember Kodak*, Xerox*, and Blockbuster video*.

MOORE'S LAW

To understand what happened you need to understand a little about the implications of Moore's Law.

Moore's Law states that you can squeeze roughly double the number of transistors onto a piece of silicon every 18-24 months. The more transistors that can be squeezed onto a tiny sliver of silicon, the more capability computers get. Each generation, smaller transistors deliver higher performance, lower cost, a smaller footprint, and they consume less power. This is what allows computers with capabilities that were unimaginable even for a giant room-filling computer thirty years ago to slip easily into our pockets and purses today.

When combined with associated advances in communications, storage and other technology Moore's Law disrupts business models, businesses, and entire industries. In the media and publishing industry, the computing performance delivered by Moore's Law was enough to trigger a series of powerful breakthroughs that remade the entire industry, from production to distribution to consumption.

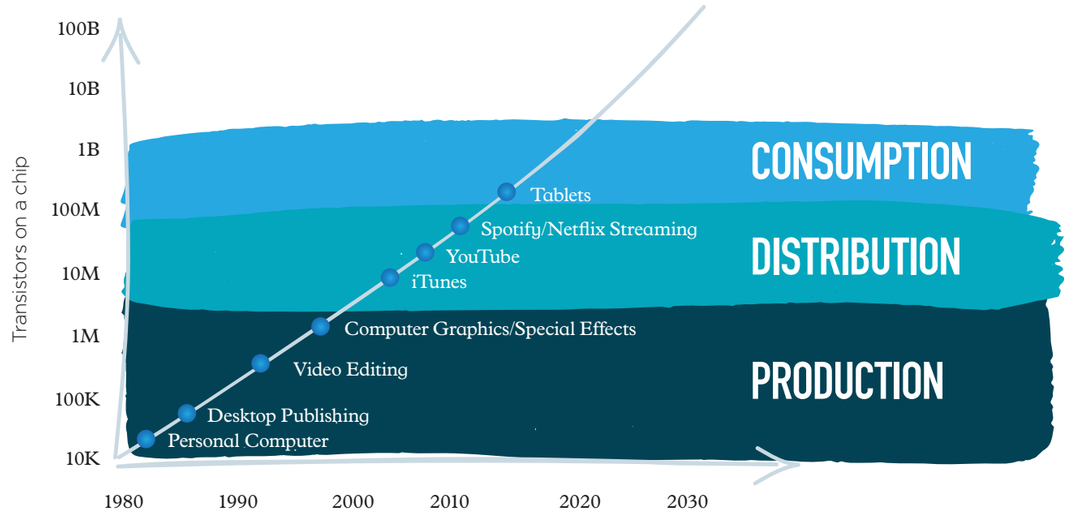
It started with media production. Steady advances in computing capability first displaced typesetters in the 1980's with desktop publishing but then quickly spread to video editing, special effects and computer animation (known as CGI) in the 1990's. Increasing bandwidth and an exponentially growing Internet remade media distribution. And now nearly all media production, distribution and consumption is transacted digitally.

Today, a five year old kid with a smartphone has the kind of production and distribution capabilities at their disposal that a 1980's media mogul would have envied. Moore's Law has delivered an entire TV production and broadcast facility in your pocket. Anyone with a digital device can shoot, edit, and distribute high definition video content to every corner of the planet. In moments.

Not only has this empowered everyone with new, exciting ways to communicate their ideas and their passions, but it has also challenged existing forces in a giant industry sector. It has changed consumer habits and expectations. It has removed middle men. It has obsoleted talents. It's created new young media stars that are able to make a small fortune creating content from their bedrooms. And it's made other people and companies irrelevant.

Disruption is not fun when you're being disrupted.

End-to-end disruption of media and publishing industry mapped against Moore's Law



There are interesting parallels between the media and retail sectors. Both involve production, distribution, and consumption. So what can we learn from the impact of Moore's Law in media?

MOORE'S LAW AND THE 2ND ERA OF DIGITAL RETAIL

Retail has already been touched by the digital revolution. Digitization has already given us inventory systems and supply chain management tools that optimized the relationship between manufacturers and retailers. Digital point of sale terminals now speed financial transactions. And every retailer has at least some online or e-commerce presence.

RETAIL IS NEXT

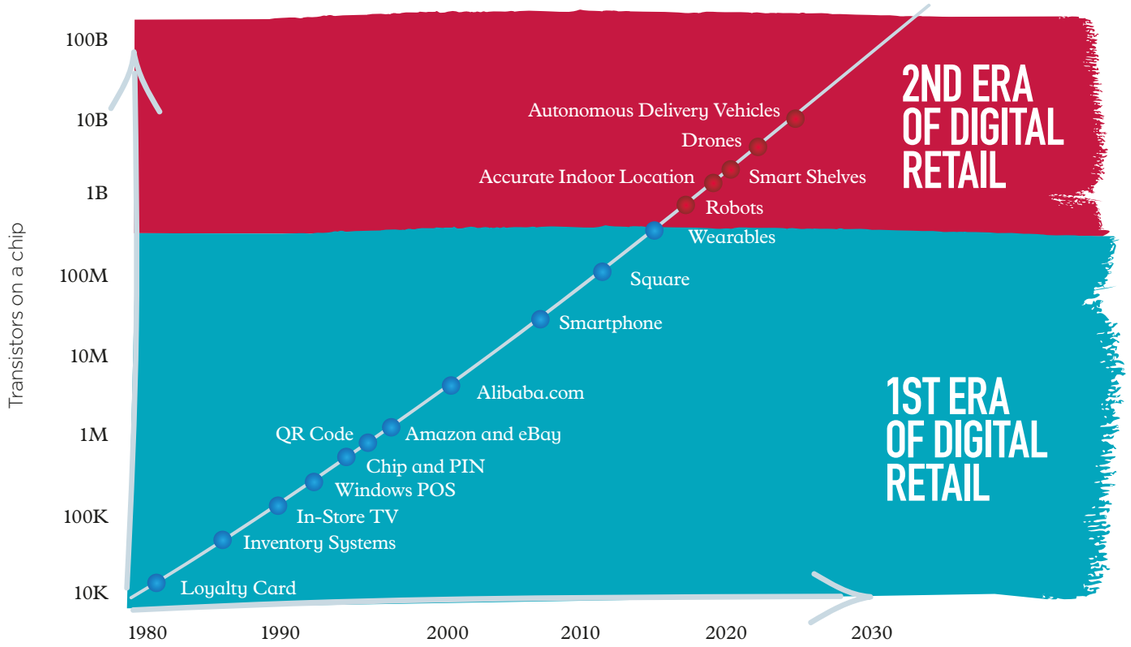
Retail is now facing a second wave of digitization. And that second wave has already begun. This wave will see a full-scale digitization of the face, bones, and brains of retail.

If the first era of digitization of retail was characterized by supply chain management, inventory, and payment systems, the second era of digital retail will be shaped by sensors, data analytics, robotics, natural interfaces, and computing ubiquity. These will be used to improve the shopping experience by making it more personal, more efficient, and more fun for consumers. This same technology will be used to continually improve the operational efficiency of retail, to enable new business models, to maximize revenue, and to speed fulfillment and delivery.

The exponential computing capabilities being brought by Moore's Law in the coming decade will enable a total remake of the face of retail—the front of house experience that shoppers see and feel. Digital technology will also change the bones behind that new face—including technology to deliver mass customization, and to deliver products to shoppers in mere minutes.

In the coming decade, computing power will be available at price points that will enable the total transformation of every element of retail. This is because Moore's Law doesn't just give you double the computing capability every few years. It can also be used to deliver the same computing capability at half the price, and half the power consumption. And that computing capability can be packaged inside smaller and smaller spaces and places. It is this parallel ability of Moore's Law to simultaneously make computing intelligence more powerful, more affordable, and more compact that will disrupt retail in the next decade.

Retail breakthroughs mapped against Moore's Law



MOORE'S LAW MAKES RETAIL SMART

Smart products will be sold in smart stores bristling with smart infrastructure. A plethora of sensors will gather data on shoppers. This will enable retailers and manufacturers to delight shoppers with fully customized shopping experiences.

Natural computing, powered by computers that can see, hear and understand the world around them, will enable brands and retailers to hold new types of interactions with shoppers, and tell stories in new ways. Wearable computing will help shop assistants to deliver much better customer service.

Drones and automated vehicles will speed delivery and boost convenience for impulse shopping. In-store automation will free up labor to be more customer-facing and improve customer service; labor that can enable human touch connections in bricks and mortar stores in a way that cannot be replicated online.

Finally, huge computers will process vast amounts of data to generate both operational insight and also detailed insights into individual shopper behavior. From this retailers and manufacturers will be able to drive operational excellence, deliver increasingly improved service, and provide new personalized experiences to shoppers.

The second era of digital retail is already in well underway. According to IDC, fully 10% of all IOT (Internet of things) investment in 2013 was made in retail. And by 2017 they estimate that annual IOT investment by retailers will exceed $466 million.

Current consumer desires in retail are way ahead of what retailers can deliver. But Moore's Law is coming to the rescue to help retailers close the gap.

Retailers should prepare themselves for as much innovation and disruption in their sector within the next decade as media and publishing endured in the last three.

Such is the power of exponential change.

SO BRACE YOURSELVES. THE SECOND WAVE OF DIGITAL RETAIL IS ALREADY UPON US.

5

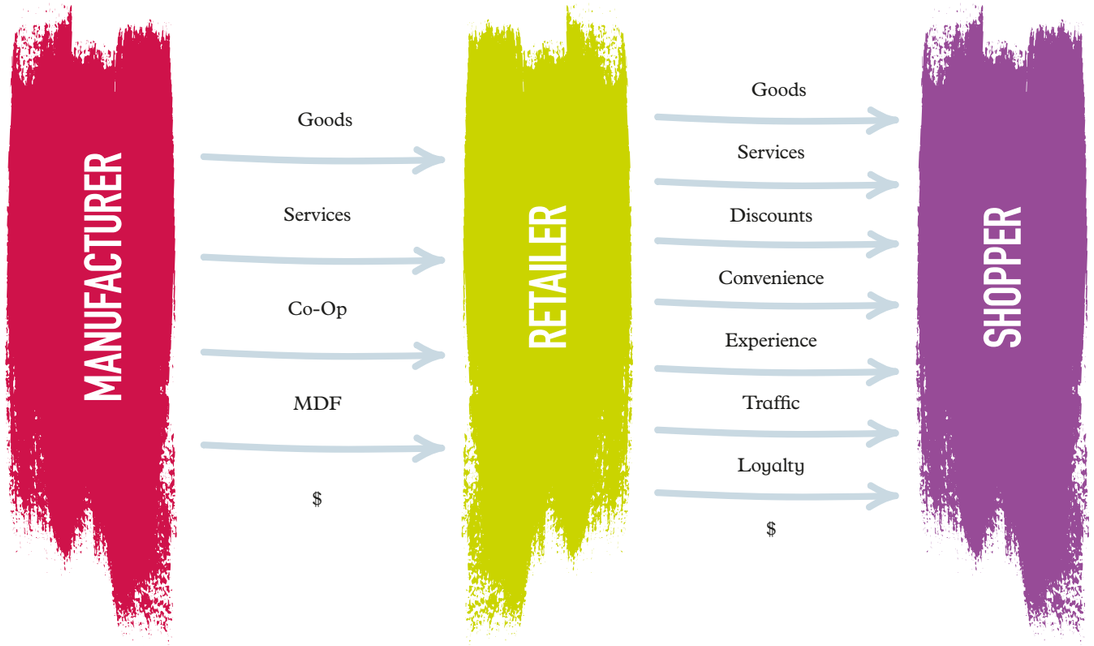
RETAIL TRENDS AND CHALLENGES

MANUFACTURERS, RETAILERS AND SHOPPERS

Retail sales represent about 18% of the US GDP, equivalent to $3 trillion in 2013, and rising to $4.1 trillion by 2020. At the same time, consumer spending patterns are shifting and their dollars are now being attracted to other sectors—to healthcare, to services, and to other non-retail household spending.

Globally, UNI estimates the retail sector employs around 142 million people across the 82 countries for which they have data. The top 250 retailers account for roughly 40% of global retail sales, but operate on low margins. Again according to UNI, the composite margin earned by those top 250 retailers in 2011 was just 3.8%.

In this section we will review the trends affecting each of the main constituents involved in retail—manufacturers, retailers, and shoppers—and also the challenges that these trends present to future retail growth.



MANUFACTURERS/BRANDS – TRENDS AND CHALLENGES

Manufacturers and brands are facing a range of ongoing challenges.

- Manufacturers currently have very limited (or no) visibility of their products once they hit the loading docks of retailers. They are demanding much more insight into what's happening inside the retail store. They want to get closer to the customer, and have new ways to interact with that customer in retail.
- Major consumer goods manufacturers are moving to simplify their brand portfolio, having either acquired or created too many brands over time. They are battling customer confusion caused by "choice overload". Proctor & Gamble recently announced it is selling off or ending the life of up to 100 of its brands. It will focus its attention on the 70-80 brands that they see making them the most money in the coming decades.
- Manufacturers see continued downward price pressure due to increasingly commoditized, undifferentiated products.
- Manufacturers face increasing competition from retailer own brands.

RETAILERS – TRENDS AND CHALLENGES

As they look to the future, retailers are facing an unprecedented number of major challenges. These challenges are:

- **The shift to online** – Traditional retailers have to navigate an omni-channel world and compete head on with pure play online retailers.
- **Footprint** – Retailers are finding they need smaller retail spaces in different locations as urbanization hikes rents and shoppers demand more local shopping.
- **Polarization** – As retailers specialize and focus to meet customer expectations they are polarizing along four important vectors.
- **Security and trust** – As retailers gather and store more and more personal data on their customers they will need to guard security and honor privacy if they want to avoid breaching trust with shoppers.
- **Oversupply** – Too many retailers with too many brands are leading to a highly competitive high street.
- **Inefficiency** – In a highly competitive environment, retailer efficiency becomes more important than ever. The shopping experience can feel very inefficient, and many stores host highly unproductive space showcasing rarely purchased items.

Each of these six challenges is explored in the following sections.

THE SHIFT TO ONLINE

Ninety percent of retail sales today are still conducted inside the store. But the balance between online and in-store sales is shifting, and online browsing now has an enormous influence on the pre-purchase phase. In a US study, Accenture found that 88% of respondents researched products online before buying in the store, a phenomenon commonly known as "web-rooming". This compares to just 73% of consumers who claim to practice "show-rooming", the practice of browsing in-store before buying online.

The shift towards online fulfillment will likely continue as routine purchases of commodity goods and consumables becomes automated and delivered to the home. In the US, brick and mortar retail sales are predicted to rise just 3.5% in 2H'14, whereas online sales are expected to jump 14% in the same timeframe. Deloitte states that just over 5% of total retail sales are now done via mobile devices, but they expect this to reach 17-21% by 2016.

The exposure of traditional retail to cannibalization by online sales varies greatly by sector. For example, high-value, small, and light goods such as electronics will be affected in a different way than lower value, heavier items such as home improvement materials.

Shopping models are emerging that span the online and physical realms. "Click and collect" is becoming popular in some geographies around the world such as Europe and Australia. This allows the shopper to order online, and then pick up their goods at a nearby location.

According to WPP's annual study of the top 100 most valuable brands, the most valuable retail brand in 2014 is not any of the brick and mortar retails, but online retailer, Amazon. Amazon has embraced digital technology to deliver efficient operations and provide shoppers with unparalleled choice. They are now imagining and developing a delivery network for the future that is designed to deliver goods in hours or perhaps even minutes.

The main challenge for traditional retailers is how to get the advantages of online (breadth of offerings, high availability, reviews, product details etc.) into their physical stores and at the same time get the best of physical into their online offering (immediacy, size & fit confidence, touch & feel etc.)

Retailers face a significant challenge as they try to unify their in-store and online shopping experiences. Shoppers see no distinction between the two worlds and expect to be able to interact with retailers and brands across mobile, web, and physical channels as they meander through the shopper journey. Retailer online stores typically grew up separately from the core physical store business and sometimes offer a different range of products, different pricing, and don't share inventory. This has led to shopper confusion and frustration. Retailers will need to unify all their systems so that customers feel just one seamless experience that traverses multiple channels.

Retailers are finding they have a huge "data gap" for their brick and mortar customers. They are able to gather streams of data on shopper behavior for their online customers: purchase history, browsing history, wish lists and more. Yet in the store, there are rarely any such data-gathering mechanisms. Today, when a retailer's biggest online customer walks into one of their stores, the store staff have no idea, and so no way to react appropriately.

And retailers have no way to build a unified picture of a shopper's profile that spans both virtual and physical space. Retailers will need to deploy IT solutions that offer a single view of the shopper across the enterprise.

Traditionally, retailers have spent a lot of time looking at the back-end of their business, deploying IT in the "bones" of retail to help streamline their supply chain, manage inventory, and reduce costs. This will continue, and technology still has an ongoing role here. But in addition, retailers now need to look at IT in a new way and consider how to use it to improve the "face" of retail. They will need to use IT in the front-end of their stores, improving their in-store experience, and using it to ignite sales with shoppers.

FOOTPRINT

Trillions of dollars of retailer's capital is tied up in physical presence and real-estate. Increasingly retailers are finding that the spaces they occupy are too big, and in the wrong location.

Scale once offered competitive advantage. But retailers are finding that is no longer the case. Startup retailers can take advantage of the cloud to source, market and deliver their products efficiently and easily without the need for scale. And pop-up stores are taking quick advantage of short-term footprint opportunities.

Unused space has become a burden, and long-term leases have shifted from being strategic plays to now being chains around retailers' necks. Traditional retailers with large swathes of unproductive space will find themselves less able to invest in the customer experience or to lower prices, making them more vulnerable to newer retailers who lack this real-estate baggage.

Urbanization continues apace; by the year 2050 around 2½ billion more people will be living in cities than today. As populations concentrate in mega-cities and mega-corridors, real-estate is getting more expensive and stores are getting smaller.

In the grocery category, these small, local stores are becoming the "communal pantry", holding inventories of food staples for people to grab when they need it. Section 7.6 outlines a technology proposal for a networked system of smart shelves, some in the home and some in the store, that embraces and builds on the idea of the communal pantry.

Shoppers want more in-town shopping, and more local shopping, implying smaller stores. But they are still seeking choice, value, and a great shopping experience. Technology that creates virtual spaces (such as the giant touch displays of virtual shelves used by Adidas in some of their flagship stores) or that makes more efficient use of space (such as the Hointer store model) will enable more products to be displayed in these increasingly smaller spaces.

Smaller stores inevitably lead to the simple question of what products retailers choose NOT stock. Just in time inventory will become critical. Smart retailers will use analytics to match their inventory to customer demand, a demand that shifts both seasonally and in real-time. In a world where not having something in stock means the loss of a sale to a competitor, algorithms will increase the chances that a retailer has exactly what the increasingly time-pressed shopper is looking for.

POLARIZATION

Retail stores are beginning to polarize in four interesting ways, and they are starting to polarize towards the extremes with little or no space for a position in the middle:

- **Physical size** - Big vs small
- **Product type** - Emotional vs commodity
- **Shopping model** – Shopper experience-focused vs shopper efficiency-focused
- **Price** – Price vs value

While many stores will get smaller, and move to be nearer to the consumer, some stores will still be very big, taking advantage of scale to create a variety of in-store experiences and abundant choice.

As well as polarization between the small and the large stores, expect a polarization of products. Brick and mortar retail will focus more on highly emotional products where the buying process is highly experiential while smart homes will auto-order consumables that are then delivered.

And stores will either optimize to delight shoppers with a high-touch, high-tech, fun experience built around the buying process, or delight shoppers with stores built for shopper efficiency, reduced friction and for getting the customer in and out as quickly as possible for their more routine purchases. It is worth noting that companies like Hointer* have ably demonstrated that shopper efficiency models should not be reserved for non-emotional product categories but can also play a role in meeting shopper needs in emotional product categories like apparel.

Retailers will need to fit in with the new rituals and routines of the changing customer and to understand the difference between ‘fast’ and ‘slow’ shopping missions. They will need to figure out how to best meet customers’ expectations for each of these missions, and then what products, services, formats and channels they need to meet the relevant shopping missions in their sector.

Based on their strategic focus and product category, retailers will need to appropriately rebalance their store and channel portfolio over time. With long leases, this will be a slow process. And retailers will need to find ways to reallocate space to boost the experience for shoppers. One big UK grocer has already stated they will no longer be building any new large stores, and will in future exclusively invest in smaller, in-city stores and their online retail and delivery capability. They are also using space in their bigger stores for restaurants and coffee shops to create more of a destination experience.

SECURITY AND TRUST

Fundamentally, shopping is about trust: Trust that value-exchanges will be fair, that transactions are secure, that products will be of high quality, that the shopping environment is safe, and that all normal social contracts will be respected. A brand stands for all of these things, and when any of these are violated, they hurt brand value. That can translate into massive destruction of value.

Retail brands remain at high risk. You need only look at what befell Target* to understand the impact a security breach can have on customer confidence and trust. Target has paid a heavy price. Their data breach in December 2013 wiped roughly $5 billion off their market cap and plunged earnings 46% the next quarter.

Shoppers are demanding the level of personalization that only the collection and analysis of personal data will deliver. Retailers have little choice but to embrace it. As retailers deploy technology to gather more and more data on shoppers, they will need to ensure they apply appropriate focus and resources to guard shopper’s privacy and secure their personal data. In a landscape of heavy competition, a security breach that leads to a puncturing of customer loyalty could be fatal.

Retailers will need to embrace robust end-to-end security for all their data, including data related to financial transactions, loyalty program systems, and personal data gathered on consumers. Tokenized security systems with high encryption and hardware-based security will significantly outperform software-only security solutions. Retailers will need to consider a regimen of regular internal security audits to catch issues early on and assure data integrity.

Recommendation

Retailers may also consider adding identity theft indemnification to their offering as a way to boost and sustain trust with shoppers. Target had to do this after the fact to try and mitigate their security breach of 2013, offering shoppers a free year of identity protection services as a way to woo back shoppers. As personal data gathering becomes more commonplace, brands that stand behind an indemnification and remediation guarantee will probably benefit from increased customer loyalty and trust.

OVERSUPPLY

Retailers are not just facing a scenario where they have stores that are too big, and not in the right places. In most mature markets shoppers are oversupplied by the number of retailers they have to choose from. Shops are abundant. Brands are abundant and even confusingly abundant. The retail sector is saturated and the goal for retailers has now become to steal market segment share away from competitors rather than to drive overall growth for the retail sector.

Differentiation in this era becomes critical, and those that embrace the second era of digital retail will find many potential avenues for differentiation.

INEFFICIENCY

The retail model today is innately inefficient. A vast amount of space is devoted to "dark" retail, hosting rarely purchased products that enjoy very little traffic. For shoppers, the purchase experience can feel inefficient and even painful.

Many large stores, for example grocery stores, host a 'very long, low tail' of items that represent only a very small fraction of store sales. In a grocery store, the top 500 items (out of 35-40,000 line items in the average store) represent one third of all sales. The top 1000 is 42% of sales. The others are there to give the shopper a feeling of choice and abundance and to attract them to the store. These are the items that might perhaps better be served via the online channel once delivery is able to meet consumers need for immediacy (see section 5.7).

There is good news about the shift towards smaller, local stores. Using technology to deliver new formats and virtual spaces (as in the Hointer* and Adidas* examples above) could lead to a potential reduction in real-estate rental costs and improved productivity. In smaller stores, shoppers visit a higher percentage of the displays and shelves in the store, making that space potentially more efficient for the retailer. According to WPP, the average number of displays visited in small supermarkets is 33% versus close to 10% in a larger super center like a CostCo* or a Walmart*.

Technology will also boost brick and mortar retail efficiency. Many low value-added manual processes will become automated by leveraging mobile, IOT, robotic, and other technologies. This will free labor to be more customer-facing, further improving the customer experience and differentiating retailers versus their competition. This implies that retailers will need to invest in the quality of their staff as retail labor is more focused towards delivering highly-differentiated customer service.

For example, Chili's* restaurant chain has deployed the Ziosk* table-side menu and ordering system in many of its restaurants. This system automates the process of getting the customer's order to the kitchens—a process formerly conducted using paper, pen, and paying a person to walk that piece of paper physically from A to B. Chili's made the very clear business decision not to use the Ziosk deployment as a way to save costs and reduce staff headcount. Instead, they focused their wait staff on building better human connections with customers. The Ziosk system acts as a point of sale terminal, taking all the friction out of bill payment. Time waiting for the bill is the number one customer complaint in hospitality. As a result of the Ziosk deployment, customer satisfaction went up, tips increased, Chili's staff satisfaction increased, and everyone was happy.

Smart retailers will need to examine existing processes and determine where humans add true value, and where automation can remove manual, low value, or tedious activities, freeing in-store labor to do what they do best... boost the customer experience.

RETAILERS THAT AUTOMATE FIRST WILL BUILD DIFFERENTIATION AND WIELD A CLEAR ADVANTAGE.

Retailers will need to understand the right mix of human and digital investment needed at each customer touch point to ensure they meet customer expectations. Sometimes money saved through automation may be best invested back into lower prices or better returns. Sometimes it will be best to invest back into a better experience. The answer will depend on customer expectations, and those will vary by sector, and by brand. Retailers will need to invest in the quality of their staff as retail labor becomes more focused on delivering highly differentiated customer service.

SHOPPER TRENDS

Shoppers have a new and maturing set of expectations of retail. Above all shoppers expect to be put at the very centre of the shopping experience, and to be fully in control throughout.

Shoppers see one shopping experience, spread across multiple channels. And they want those channels to be as integrated and seamless as possible—one experience that matches across all channels. They want to order products online, and return them to physical stores. They expect stores to have the same online and physical inventory. And the same prices, regardless of channel.

Retailers that obsess over what's right for the customer, rather than what best serves them or their suppliers, will succeed in the long term. Back in 1997, Amazon CEO, Jeff Bezos, was quoted as saying, "From the beginning, our focus has been on offering customers compelling value."

Putting customers at the center means retailers will need to tailor solutions by channel, by shopper mode, and even by geography: in Asia they will need to embrace a model that is more focused on mobile, consumer to consumer, and ownership. In the US they will need to embrace the shift towards access over ownership, and in Europe they will need to put added emphasis on home delivery.

Many of the shifting attitudes of shoppers are being led by the Millennial generation. There are two billion Millennials (people currently between the age of 18 and 34) and according to The Cassandra Report they will represent $2.5 trillion in spending by the year 2020. Millennials expect to have a much more active relationship with brands and retailers than previous generations—more of a two-way conversation. They have a low tolerance for inefficiency and are looking to more sustainable modes of consumption. You will see Millennials reflected broadly in the shopper trends below.

The main changes in shopper expectations are summarized on the following pages:

CONVENIENCE, EFFICIENCY AND SPEED

EXPERIENCE

CHOICE AND CONTROL

TRANSPARENCY

BRAND INTERACTION

PERSONALIZED/CUSTOMIZED

OWNERSHIP TO ACCESS AND ASSOCIATION

OMNI-CHANNEL

CONVENIENCE, EFFICIENCY AND SPEED

Convenience is king. Shoppers want what they want, when they want it, how they want it. And they want to get it as quickly and as easily as possible.

Amongst some baby boomers, a stress-free shopping experience can be the number one priority they have when deciding where to shop. But for most shoppers, the number one need is speed. These shoppers buy things because they want them right now. They are driven by immediacy. Retailers that can deliver products and services same day, same hour, or instantaneously will be the ones that win.

Customers are looking for fluid, seamless, frictionless shopping experiences. The last thing a consumer wants is that their shopping journey is interrupted, whether that be by a glitchy website, an inattentive sales assistant, or poorly designed in-store technology.

People want to get in and out of stores more quickly. There is an opportunity to reduce friction at point of sale, and also to deploy technology that helps people quickly find and select the products they need. Shoppers enjoy choice, though not so much choice that selection becomes confusing. Shoppers favor retailers that help them understand their options and that simplify the choosing process.

Shoppers are also looking to reduce the overall number of stores that they have to visit in order to fulfil their needs.

For example, when it comes to grocery and other regular needs, shoppers value the ability to do all their shopping in one place if they can get it. The average number of stores shoppers visit is dropping. In the US, according to Kantar Retail, the average number of stores people visited in 2007 was 12.4. That's dropped to around 9 stores in 2014. And most people have a core portfolio of just 4-5 stores that they go to most often.

In the US, people are making 2.3 trips/week to the grocery store. Many convenience purchases are for commodity consumables which could potentially be shifted to an automatic fulfillment and delivery model.

Despite retail shifting to a 24/7 model in some categories and locations, impulse purchasing is declining, in part due to the fact that people now know they can buy at any time and thus don't need to hold inventories at home.

Shopper efficiency has traditionally not been a focus for retailers because nobody is paying for the customer's time. Yet some stores encourage purchases at 5X the rate of others. There may be an opportunity for some retailers to differentiate themselves based on shopper efficiency (as Costco has done).

Traditional retailers should prepare now for the day when their immediacy advantage is removed. If the only advantage in buying from your store versus online is immediate gratification, your value proposition is under direct attack from looming "next hour" delivery services. These retailers will either need to invest in other differentiators to boost their brand proposition, or ensure they have similar delivery speeds available to customers.

Retailers will need to seriously consider embracing auto-replenishment services. If they don't, they run the risk of Amazon doing it for them.

Retailers should invest in technology that reduces friction in the product selection and purchase process. Ideally this friction should be reduced down to zero. If your customers still have to wait for anything, then you're not done innovating yet. Retailers should consider developing RFID and/or visual recognition technology to reduce checkout friction to zero, while minimizing theft. The ideal efficient shopping experience is embodied by the concept of a local store as a "community pantry" that enables people to walk in, grab what they need, walk out, and be billed automatically. This applies to mission shopping and perhaps some types of experience shopping. Experience shoppers may still prefer an interaction with a human sales assistant at checkout as part of their broader shopping experience.

EXPERIENCE

Shoppers want certain types of shopping to be an experience, and not just be a speedy acquisition. Many shoppers seek the pure joy of shopping as an activity unto itself, regardless of their need to buy. They see shopping as a day out, an escape, or an adventure. The thrill of the chase. A time to be social and present in the physical world.

Experience shopping is enjoyable, often has a strong social context, and is sometimes built around an occasion that has important social or personal meaning. For example, a couple might visit a number of stores to look for ideas and inspiration on a new kitchen they want to build in their home; a kitchen they imagine filled with future children. Or a woman might be on the hunt for a dress for a special occasion.

In experience shopping, touching, feeling, or trying out a product is often essential. Shoppers are drawn to retailers that wrap experiential elements around shopping that amplify the sense of occasion, enable the shoppers to make memories, or that enhance the social aspect of shopping. These all contribute to the increased sense of meaning people can then attribute to the shopping experience itself, and by extension to the retailer's brand.

Retailers selling emotional products should explore, develop, and deploy technology that makes shopping more social, helps shoppers choose, helps them make memories, and that deepens emotional relationships with shoppers by increasing brand and product interaction. Interactive technologies that embrace natural interfaces and that span multiple senses of the shopper can create memorable experiences for shoppers that create deeper relationships with brands. For example, McCormick Spices created an interactive Guess That Spice machine. The system dispenses a variety of spice scents and shoppers attempt to select the correct spice from a list on a large touch screen in order to earn discount coupons.

CHOICE AND CONTROL

Shoppers now expect abundance. They seek retailers that can offer an abundance of products that are always available and in stock. Shoppers favor retailers that allow them to shop whenever they want to shop (which is anytime).

As store footprints diminish (section 5.2.2), retailers will need to find ways to offer maximum product choice within the small physical spaces they have available. They will need to display and merchandize products as efficiently as possible. Technology that creates virtual spaces, combined with systems that increase store automation could offer a helpful solution. See section 7.3.3 for more detail.

TRANSPARENCY

Shoppers are demanding increased transparency into pricing, retail operations, and the products they buy.

This is particularly true for Millennials who now see a purchase as a 'vote' for a brand. In their minds, they are what they buy. They want to know ahead of time that buying a product or brand will reflect well on them, and their own personal brand, 'Brand Me'. Consumers want to understand your company, your manufacturing policies, how your products are made, and how seriously you take corporate social responsibility before they reach for their wallet. Mobile apps like Buycott*, and BuyPartisan* make it easy for shoppers to quickly research a product or brand as an aid to their purchase decision.

Transparency also extends to a customer expectation of connectivity in the store: after all, if you're resisting their efforts to use their devices to check the competitiveness of your prices, reviews on your products, or information on your operations, then they will conclude that perhaps you have something to hide.

Retailers will need to consider proactively increasing the transparency of their operations. This might include being able to provide shoppers (or more accurately prospective shoppers) details on the origin of their products, labor practices, and even political donations. For some retailers this will imply cleaning up some of their operational policies and practices and placing more emphasis on supply chain ethics and supplier management. In an era of savvy shoppers that are empowered with information that is available at the speed of the Internet, transparency cannot be faked. The "green-washing" phenomenon of the last decade quickly revealed some organizations as less sincere than others as they responded to consumer demand to operate more sustainably. Companies like apparel retailer Everlane* are already staking out leadership positions in this space.

Retailers that don't already provide in-store connectivity as a service to shoppers will need to continually reevaluate their decision.

Opportunity

As the provenance of products becomes more important to consumers, manufacturers and retailers may be able to differentiate by wrapping origin stories around their products.

BRAND INTERACTION

Millennial shoppers now have the mindset that they are voting for or investing in a brand when they make a purchase. These shoppers are demanding an increased say in how a product is developed and sold.

Shoppers expect to be both creators and consumers, and favor brands that make them feel included in the product development, merchandizing and sales process.

Retailers will need to explore ways to involve their customers in two-way conversations about the future of their business, the suppliers they use, the development of their products, and the way that they operate. Social networking and other platforms can be used to engage shoppers in this dialog and do so in a way that strengthens the relationship and the emotional connection between consumers and brands. These conversations need to be authentic and transparent to be successful. These efforts should reward retailers with increased customer loyalty and keep them relevant in a fast-moving marketplace.

PERSONALIZED/CUSTOMIZED

Retailers will need to examine their businesses and look for areas where it is appropriate to offer customization as an option. They will need to push suppliers to deliver products with customization options and look for ways to sell-up to a customized option in the store

In order to customize experiences for their customers, retailers will need to understand each shopper as best they can and have the intelligence & analytics capabilities in place to enable them to make every experience in the store both personal and relevant.

Shoppers are increasingly looking for products and experiences that have been customized to meet their individual needs. This is particularly true of Millennials. In a survey by The Cassandra Report, 80% of US Millennials said they would prefer to have a customized product.

The continued rise of 3D printing and other local, just-in-time manufacturing technologies will likely accelerate this trend and make mass customization a reality. See section 6.2 for more information.

Shoppers are also interested in products that they can take home and customize. Manufacturers would be well served to create products that can easily be personalized by the consumer, either at time of purchase, or after purchase. All people have a fundamental need for creative expression and to express individuality, whether it be in the clothing choices they make, the case that covers their phone, or the color of their car.

Beyond customized products and services, shoppers are seeking personalized shopping experiences.

OWNERSHIP TO ACCESS AND ASSOCIATION

Led by Millennials, shoppers in mature markets are becoming less interested in owning things.

Aspirations towards ownership were a way to demonstrate success, but these are now giving way to more efficient models of consumption. Rather than seeking to own, many consumers now prefer simply having *access* to products and services when they need them. "Next hour" delivery speeds only make this shift more attractive. Why own an infrequently used item like a hammer when you can have one delivered to you in minutes by drone anytime you need to hang a picture? See section 5.5 on the sharing economy for more details.

In an associated trend, some Millennials now feel a reduced need to own or even access a product in order for it to reflect positively on their personal brand. Rather than buy a Louis Vuiton* purse, or a shiny new Vespa* moped, some Millennials report instead being equally satisfied merely "pinning" these products and brands on their Pinterest* page. That association alone is enough, and purchase is no longer necessary or even desirable in some cases. According to The Cassandra Report, half of Millennials visit the shops and browse for things they don't want, need, or intend to buy. They browse for fun and without any consumption goal in mind.

Retailers will need to fully understand the sharing economy, its implications, and its likely evolution. They will need to build out a considered strategy in response that fully addresses what could be a major threat to their existing business models. This response might include aspects that embrace the trend, and others that seek to retard it and that remake the case for ownership. See section 5.5 for more details.

OMNI-CHANNEL

The path to purchase has become way more complex. The shopper journey—spanning awareness, familiarity, consideration, conversion, purchase, and loyalty—is anything but linear. Shoppers don't see a difference between online and in-store shopping. It's all just shopping to them. And with a shopper population that is now connected 24/7, every moment is a potential shopping moment.

Shoppers are engaging with brands and products using a range of devices that varies depending on time of day: desktop, smartphone, tablet and laptop.

Ordering and fulfillment are becoming separated. Shoppers can build a shopping basket online over a period of days and then have their orders fulfilled when they go to the store. Retailers should imagine a range of shopping experiences in the future that span gracefully across multiple channels in this way.

Retailers need to be able to hold and maintain a conversation with shoppers that spans across all these devices and also across the physical retail space. They need to do so seamlessly and without creating any friction for shoppers.

Retailers must have a consistent message across the shopper journey between the physical and digital worlds, and there must be no distinction between physical and virtual inventory.

6

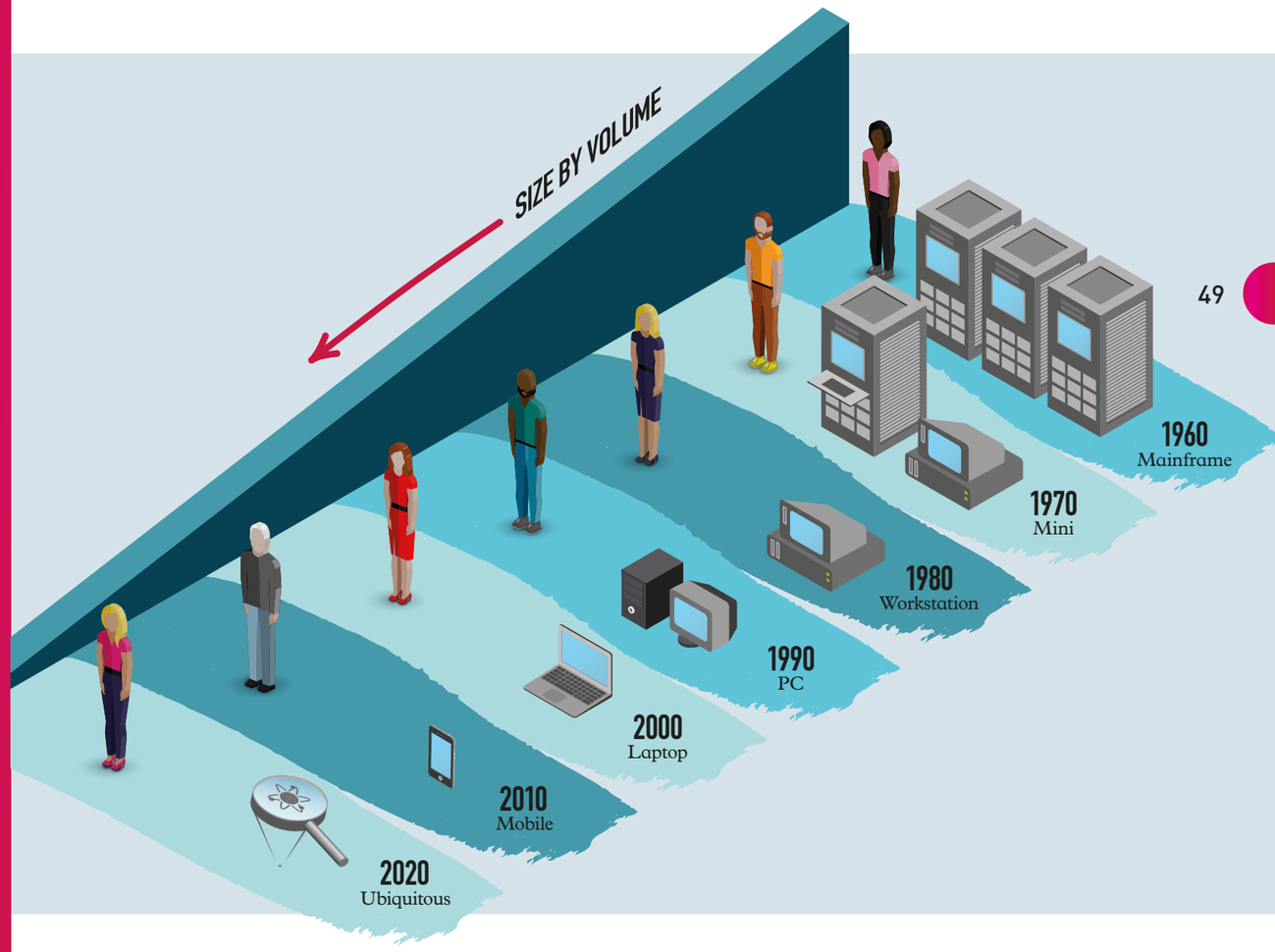
DISRUPTIVE FORCES ON THE HORIZON

DIGITAL EVERYTHING

Moore's Law reduces the size and cost of computing year on year, while simultaneously increasing the capability of that same computing. Over the last fifty years we have seen computers shrink from being multi-ton machines that filled an entire room, to bulky devices that sat on or under our desks, to today's mobile devices that fit in our pockets and purses.

Today's leading edge chips are manufactured from many millions, sometimes billions of transistors, each transistor just 22 nanometers across. These transistors are so small that 4000 of them would fit across the width of a single human hair. This has enabled us to carry small handheld computers around with us (better known as smartphones) that are more powerful than all the computing available on earth in the early 1980s. Moore's Law will continue to deliver cheaper, smaller, more powerful computers for the foreseeable future, leading to the era of ubiquitous computing.

In the era of ubiquitous computing (which you may also hear referred to as the Internet of things, the Internet of Everything, or other similar terms) meaningful amounts of computing—computing that's powerful enough to do something fairly useful—will become so small, so low cost, and consume so little energy that we can consider turning anything into a computer.



SMART EVERYTHING

This implies that within roughly a decade, **any object can be made smart**. Anything in our world can become a computer. As well as being smart, that object can become connected to the Internet, and also sense the world around it. This is a profound change for humanity. Not only will objects become smart, but so will our environment and infrastructure.

Smart cars will navigate down smart streets in smart cities. Smart toys, boxed inside smart packaging, will be delivered by smart trucks to smart stores. And throughout, the smart things will be sensing and generating data that is uploaded via the Internet to giant computers that monitor and process that data to optimize efficiency and deliver valuable insights to retailers and manufacturers. Often these insights will be used to create new value, and to deliver new, personalized services that generate incremental revenue.

When you receive an expensive bottle of wine, it should ship in smart packaging that tells you if it has been properly handled on its way to you. Was it shipped in a container at the correct temperature and humidity? Was it dropped? If so, who dropped it and how hard did it hit the ground? Did the packaging properly protect the bottle, and how could it be better-designed in the future?

Making an object smart changes its utility and potentially creates incremental value. A teddy bear that can read a book to a child is clearly worth more to some people than a dumb teddy bear that does not. And an expensive purse that can report its location when stolen might be an attractive proposition that shoppers are willing to pay more for.

Challenges

Retailers will need to embrace creative thinking and risk-taking to brainstorm bold new ways to create services around the smart objects they will soon be selling. They should partner with manufacturers now to start imagining and demanding these smart products of the future, and the services that will revolve around them.

SMART OBJECTS ENABLE NEW BUSINESS MODELS

But making a product smart doesn't just potentially make it more valuable and increase its utility. It also enables you to monetize products in new ways, and can essentially turn a product into a service.

Consider the smart teddy bear. A toy manufacturer that develops and sells such a product a few years from now will have multiple ways to monetize the value they have created. They could sell the bear for a one time price of $149.99. Or they could sell the bear for $34.99, and then sell people the book-reading service for $8/month.

In emerging markets where incomes are low and high initial prices are a barrier to purchase, manufacturers could use this same approach to activate products for a monthly fee rather than charging an upfront price, reducing the barriers to ownership. In Africa, India, Southeast Asia and parts of Latin America, pay-as-you-go services are largely the norm and consumer expectations would be highly consistent with this *product as a service* approach.

Challenges

Retailers and manufacturers should consider new ways to monetize the smart products they will be selling in the future. New business models will allow them to target new customers in new ways. By enabling the creation of annuities they may also generate ongoing revenue streams that increase profitability and boost income for manufacturers and retailers alike.

WEARABLES WILL TRANSFORM CUSTOMER SERVICE

Tiny computers will also usher in the era of wearable computing. These hands-free, click-free computers, whether in the form of smart glasses, in-ear computers, or other form factors, could help sales assistants through the sales process and enable them to deliver improved customer service. Such sales support systems are attractive in an era of fast-changing product portfolios and high staff turnover. Hay Group reports that median retail staff turnover for part-time labor is 67%, though it varies dramatically by retailer.

Wearables could use a combination of visual recognition, speech recognition, and other sensors to help assistants efficiently assist shoppers. For example, when a shopper asks, "Which of these wireless printers can also scan at 600dpi?" the sales assistant could near instantly be presented with a list and guide the shopper to the appropriate products. Or "Is this dress available in a size 8?" could trigger a stock check enabling the assistant to respond that he has some in another store and offer to have it waiting for her to try on when she gets home.

Computing technology worn by shoppers is also an opportunity to transform the customer experience. While 80% of US consumers currently have privacy concerns over wearable technology, half of those same consumers would be willing to share personal data collected from their wearable devices with retailers if they are given some kind of compensation such as a coupon or discount (Source: Accenture's Acquity Group, 2014).

Some retailers are already experimenting with replacing loyalty cards with wearables for their customers. These wearable devices can be used to monitor shopper behavior, trigger personalized offers, and deliver rewards to shoppers for certain behaviors (perhaps for visiting the store a certain number of times in a month or in a year). Shoppers will need to perceive that they enjoy a fair exchange of value for agreeing to wear technology supplied by a retailer. It will need to offer them benefits they value and come with adequate assurances regarding privacy and security. These benefits may or may not be related to the shopping experience itself.

Challenges

Retailers should begin experimentation with wearable technology and devise strategies to complement the capabilities of their existing human sales teams with real-time, data-driven insights that help them deliver better customer service.

Retailers might want to explore the benefits of giving wearables to their regular shoppers and what value exchange will be required to incent shoppers to keep these wearable items on their bodies.

3D PRINTING COULD TURN RETAILERS INTO MANUFACTURERS

3D printing technology will continue to improve over the next decade and will potentially reframe the economics, supply chain and customization capabilities of retail.

Retailers may also become manufacturers, able to make or finish customized goods on demand. In an urbanized world of small retail spaces, 3D printing promises to be able to offer shoppers maximum choice and immediacy, all supplied from a footprint that uses the minimum amount of space.

The trend towards the use of 3D printers may also be fuelled in the US and Canada by the on-shoring of manufacturing due to cheaper energy and steadily rising labor costs overseas.

NEW MATERIALS AND NEW APPROACHES TO JUST-IN-TIME

Printers will be able to handle more types of materials, will be able to create products based on mixed material types, will improve output quality, reduce in cost, and improve their production speed.

Beyond 3D printers, expect to see a broader new category emerge, that of local, just-in-time manufacturing. For example, DARPA is currently investing in research to build robots that are able to assemble an entire garment without any human interaction.

Expect to see printers and other automated manufacturing technology that can print or make almost anything, including makeup, electronics, food, clothing, and even houses.

MILLENNIALS LEADING THE DESIRE FOR CUSTOMIZED PRODUCTS

As described in section 5.3.6, shoppers continue to desire personalized or customized products and they will soon **expect** at least some level of customization to be offered for most categories of product in the future. This trend is especially strong amongst, but not exclusive to, the Millennial generation.

Just-in-time manufacturing technologies, including 3D printers, may offer retailers solutions that enable them to meet the demand for personalized or customized products.

Challenges

Retailers will need to be prepared to deliver an increased level of customization across most categories of product. Retailers and manufacturers will need to collaborate to understand the ways that shoppers will want to customize products and then design a supply chain able to meet those desires. A decade from now a customer may expect to walk into a clothing store and say, "I want this shirt, but in that color, in my size, and I'll pick it up in 10 minutes please

CUSTOMIZED PRODUCTS REQUIRE NEW DESIGN THINKING

Customized products may also take on a social element with shoppers able to buy products in retail that were created or modified by friends or other "citizen designers" located all over the world. A shopper in Tokyo might buy a teapot, based on an original Spanish design, but that was modified by an up-and-coming student designer in London and printed at their local store in Ginza.

This concept inevitable calls into question the notion of design copyright and may be very uncomfortable for designers that are used to exerting absolute control over the look and feel of an end product. Strong consumer demand for customized products could lead to a significant shift in design thinking. Designers and manufacturers might choose to make their products more appealing to customizers by leaving certain design elements open and flexible.

Challenges

Manufacturers will need to design for customization. They will need to make products that can be turned into finished goods close to point of sale, based on the particular desires of the shopper. Designing for customization might include thinking about modularity, leaving design windows for customization, and collaborating with retailers to wrap compelling shopping experiences around the customization process itself. For example, a company making eyeglasses may deliver their retailers a set of easily assembled frame fronts, hinges, bridges, and temples. The shopper might enjoy an interactive, gesture or touch controlled augmented reality experience to build and virtually try a set of customized glasses that the retailer then puts together on the spot.

LOCATION

Location-based services have been a transformative boon to the modern smartphone-owner. But location tracking has largely remained an outdoor activity. That is changing. The race is on to use indoor location tracking to improve the customer experience and gain better insight into shopper behavior.

WHY INDOOR LOCATION?

Indoor location will enable a number of new opportunities for retailers:

Shopper insights

Retailers will be able to gain increased insight into shopper behavior and improve their store layout and shopping experience accordingly. In-store location data can be analyzed to understand the "footstream" of shoppers, much like insight can be divined by analyzing the "clickstream" of online shoppers.

Location-based offers

Retailers and manufacturers will be able to push location-based offers.

Dynamic pricing

Retailers will be able to optimize revenue through the use of dynamic pricing that varies by shopper, by time, and by location.

Shopper guidance

Retailers will be able deliver customer-valued, location-based experiences in the store, including shopping guidance, route planning (based on a personal shopping list) to pick the optimal route through the store, virtual sales assistants, and more.

INDOOR LOCATION TECHNIQUES

A wide range of techniques are being developed to determine indoor location, each with varying pros and cons. The easiest methods to deploy have low accuracy. The more accurate technologies still require further development or refinement but will become viable within the next several years.

Location tracking comes in two main flavors:

Passive Tracking

In the passive mode, the location of a shopper's device is tracked while it is in their pocket or purse. The customer is not interacting with their device and so this mode of tracking is considered to be valuable only for retailers and manufacturers.

Active Tracking

In an active mode, the customer is interacting with their device and seeking some sort of information, service or experience based on their location.

Different location techniques are more or less appropriate for each of these two modes. Multiple techniques are emerging to deliver indoor location. These include:

Wi-Fi triangulation

This technique is in deployment today and uses well-established technology. It suffers from low accuracy – around 30m. And it doesn't work in big box stores that have not invested in a customer-facing Wi-Fi infrastructure.

Wi-Fi fingerprint

This is a more sophisticated version of Wi-Fi triangulation tracking that uses learning algorithms to map a store's Wi-Fi profile. In early trials, this has yielded much better precision, achieving 2-5m location accuracy.

Bluetooth LE-based beacons

Beacons such as Apple's iBeacon* technology can trigger offers to a shopper's device when they are within range of an iBeacon transmitter. The range of the transmitter can be adjusted to cover a small area (5m radius) or the entire store.

Accelerometer and inertia

Using a known starting location outside the mall (sourced via GPS) the accelerometer in a phone can be used to track motion once the GPS signal is lost. If the shopper holds the phone so that it is fairly stable, this approach works quite well in the short term. However is not yet accurate enough during normal use (phone jogging around in the shopper's pocket) and over longer distances where measurement errors add up over time. The accuracy of the MEMS devices inside phones will need to improve several orders of magnitude before this will be a reliable approach on its own, however it can be used to augment other location techniques.

Semantic location

This approach uses additional signal processing on Wi-Fi signals over time to help refine location when it is unclear which side of a wall the shopper is standing by looking for the telltale signal attenuation created by walls.

Ambient audio

Different stores sound different. Using a device's microphone to sample the ambient audio is not enough to determine absolute location but this technique can help when used in addition to existing, inconclusive location information. For example, when near to a store's wall in a mall, with 5m accuracy, the algorithm may not be sure if the shopper is one side of the wall in Starbucks*, or the other side of the wall in Bath & Body Works*. The sound signature of the store could be used to make that final determination by the location software algorithms on a device.

Active audio

Some stores are experimenting with adding audio signatures to their in-store piped music to help devices understand where they are.

Visual triangulation

When devices are in active tracking mode, visual techniques can be used to determine location by figuring out the geometry of the room they are in. Google's Project Tango is doing some work in this area.

Visual fingerprint

Similar to the Wi-Fi fingerprint approach, a database of visual fingerprints could be generated to help devices quickly assess their location in a store based on what they can see.

Magnetic field

In a technique similar to Wi-Fi fingerprinting, the digital compass in smartphones can be used to assess location based on magnetic fields present inside the store.

The best accuracy will be achieved by combining several of these approaches together. Expect these techniques to evolve over time.

HOW ACCURATE IS ACCURATE ENOUGH?

The desired accuracy for indoor location depends on the use case desired.

A mall guide would be fine with perhaps 5-7m accuracy. Traffic flow analysis needs roughly 2m accuracy, enough to assess which aisle a shopper is standing in. And a customer-facing store guide may require 1m accuracy to be truly valuable to the shopper and guide them right to the product they are looking for.

Highly accurate indoor location information can be used to connect the digital and physical shopping experiences and delivering location-based interactions to shoppers.

LOCATION AND SECURITY

Location is also interesting as an additional security measure. For card-present transactions, smartphone location can be used as an additional verification mechanism that adds another layer of security to protect shoppers at point of sale.

Retailers should work with IT partners to begin exploring and investing in active and passive location tracking as a key component of their strategy for improving the shopper experience, and to provide shopper analytics services to manufacturers.

CONSUMER DESIRE FOR PERSONALIZATION AND CUSTOMIZATION

Shoppers would like to be treated as a customer of one, with their retail experience tailored to their exact individual tastes and desires.

Shoppers are interested in products, services and experiences that have either been customized, personalized, or perhaps both. The difference in these two notions is largely about who controls the individualization choices.

A ***customized product or experience*** is one that has been designed, modified or somehow finished to conform to the specific choices, or specifications of the shopper. The parameters of the finished product have been explicitly shaped by the shopper through some sort of interaction where they are in control. They select from a set of parameters that are offered to them or can choose to include some level of personal element as part of the customization process, for example a personal image. Customization may make a product, service, or experience feel more personal, but that does not make it personalized per se. Examples of customized products include: NikeID* customized shoes, Red Envelope customized gifts, and the cars offered from most automobile manufacturers that allow you to select engine size, colors, and other options.

A ***personalized product or experience*** is one that has been built based on the observed behaviors or preferences of a shopper. Personalization requires a retailer or manufacturer to get to "know" their customers in a very intimate way if they are to deliver personalized products or shopping experiences that delight. Decisions about the way a product is personalized are made by the retailer and manufacturer, perhaps in partnership with the shopper, but not under shopper control. Amazon*'s "Recommendations for you" are personalized based on observed behavior on their site. Netflix* includes "Suggestions for you" based on watching behavior. And the clothes shipped by Nordstrom's Trunk Club* are chosen by a human that gets to know your personal style and makes personalized selections based on what they think you will like.

While the distinction between customized and personalized is not a simple one for many people to grasp it is an important one to understand. A digital sign that displays images based on the apparent age and gender of a shopper is supplying personalized content while an interactive sign that shows a shopper the location of a store on a map based on some kind of input from the shopper would be customization.

According to The Cassandra Report, 80% of Millennials would prefer to have a customized product.

As local just-in-time manufacturing technology (including 3D printing, see section 6.2) evolves and enables the speedy production of customized goods at point of sale, shoppers will grow more accustomed to buying customized products, potentially fuelling increased desire for further customization. This positive feedback loop may lead to customization swiftly moving from a differentiator, and more of a novelty, to becoming a standard expectation for shoppers. "I'm not buying from <Brand X> any more. They won't let me customize a single thing!"

At the service level, the more valued type of customization might be as simple as being able to specify exactly when your products will be delivered (so you can be home to receive them).

Customization and personalization will affect different sectors in different ways, to different extents, and on different timescales. But one thing is for sure: Shoppers are going to desire more and more product customization and expect personalized experiences.

Challenges

Retailers will need to think carefully about the right places to apply customization and personalization capabilities to the products they sell and the associated shopping experiences they wrap around the shopper journey.

Retailers will need to begin experimenting with customization as soon as possible, and figure out how they can upsell shoppers to customized solutions.

Brands should be prepared to have a two-way conversation with customers to understand what they want, and then deliver it to them. These conversations will need to be facilitated via easy-to-use interfaces designed to make customization a delight. Colorful touch displays can guide shoppers thought the customization process and design products from modular components. Technologies including gesture control, augmented reality, and virtual reality may be used to enhance the customization experience.

Retailers will need to find the right balance between meeting a shopper's desire for customization and overwhelming them with "choice anxiety". Smart retailers will hide many customization options behind a set of simpler choices that mask the truly overwhelming number of choices or permutations available. For example, Starbucks* doesn't assault customers with a huge customization menu yet manages to deliver tens of thousands of options in the way they prepare their drinks.

6:5

THE RISE OF THE SHARING ECONOMY

Prefaced by massive advances in efficiency in both production and distribution we are now seeing technology and associated business practice changes being applied to consumption. The result is that consumption is becoming more efficient. This has potentially profound implications for retailers and manufacturers.

The sharing economy is creating extraordinary new value at lightning speed, and disrupting whole industries segments in the process. Consider Uber*, Lyft*, Sidecar* and RelayRides* versus the traditional taxi, town car, and limousine industry as a primary example.

6:5:1

MASSIVE EFFICIENCY ALREADY APPLIED TO PRODUCTION AND DISTRIBUTION

Starting in the 18th century, the industrial revolution brought incredible efficiencies to production. Major technological breakthroughs included mechanization, steam engines, automation, electricity, hydraulics, and ultimately robotics. These made manufacturing vastly more efficient, boosted productivity, and massively reduced the cost of goods. Parallel business process innovations like mass production techniques, outsourcing, and specialization boosted production efficiency even further.

The late 19th century saw the beginning of a major revolution in retail as innovation in both technology and business processes brought huge efficiency to product distribution. The emergence of branding and packaged goods shifted stores from being a full service to mostly a self-service experience. Logistics networks sped goods between manufacturers and retailers, and ultimately also delivered to consumers. And more recently the Internet, mobile technology, and e-commerce have provided very efficient tools to connect manufacturers with consumers. Supply chains and inventory have been streamlined using successive waves of automation and information technology.

With serious efficiencies brought to production and distribution, we are now starting to see technology and business innovation applied to improving the efficiency of consumption itself. Hey presto, the sharing economy, where high-value or rarely used items are used in much more efficient and sustainable ways, and products are being turned into services.

The sharing economy would not be possible without an underlying root of trust. Underpinning all of this innovation is the fundamental need for strangers to come together as buyers and sellers, or renters and loaners, and to conduct transactions safely and securely.

6:5:2

DIGITAL REPUTATION AND TRUST

By digitizing trust, computing technology is acting as the vital lubricant needed to enable the sharing economy where people share, barter, rent, or loan products in a peer-to-peer manner, bypassing traditional retail and distribution networks. This has already brought huge efficiencies to consumption.

The sharing economy is particularly attractive to Millennials not just because it gives them a potentially better deal on a product, but because they feel it make more efficient use of expensive resources—this could be financial expense, environmental expense, or both.

For example, most cars spend 22 hours out of every day doing nothing. So why own a car when you can just rent one whenever you need one? And do so by the hour (Zipcar*), or even by the minute (Mercedes* Car2Go*). Or if you do own a car, you might choose to rent it to others when you leave it at the airport for a trip (FlightCar*).

According to The Cassandra Report, 37% of US Millennials say that they want to rent expensive items rather than buy them. The big open question: is this an economic reality of Millennials' current economic status and buying power, or a more savvy consumption ethos that will translate to long term changes in shopper behavior?

FROM OWNERSHIP TO ACCESS

Some shoppers are now more interested to merely have access to a product rather than ever own it.

Consider the tectonic shift underway in music consumption from ownership (CDs and iTunes*) to access (streaming music services like Spotify*, Rdio*, and iTunes Radio*). In a survey by The Cassandra Report, over a third of US Millennials reported that they would prefer to pay full price to access a product, rather than own it. For older readers of this report, this finding may be jarring or perhaps even sound unbelievable. But it illustrates a fundamental difference in attitudes around ownership between Millennials, Generation X, and Baby Boomers. The status once inferred by ownership, and the ambition to acquire goods as a sign of personal success, have been replaced by a desire for simplicity, efficiency, and a model of living that is more sustainable. For many older Americans and Europeans, a car has become a sign of freedom. For younger people car ownership can feel like the exact opposite of freedom—it needs to be insured, parked, and maintained.

In a world where ownership is now considered gauche by some consumers, retailers will need to challenge long-held assumptions about the shopper's desire to own.

This trend towards access vs ownership is led by Millennials, but is becoming embraced by other generations, including Generation X and Baby Boomers. For example, according to The Cassandra Report, the biggest users of the AirBNB* room-sharing service are Generation X. And 91% of consumers that have used sharing services of some kind would recommend that service they used.

This trend towards sharing services could limit future consumption as people favor access over ownership, and the sharing economy brings the kind of efficiencies to consumption that the industrial revolution and retail evolutions each respectively brought to production and distribution. Savvy shoppers have already figured this out. Around 45% of Millennial consumers say they consider resale value before making a purchase, implying that they are at least considering the option to loan, rent, or resell their purchases in the future.

Retailers will need to decide how best to operate in a landscape where resale value is an important component of the purchase decision. Some may find an opportunity to differentiate themselves by including information on resale value, or the current going rates for rental, for certain products.

UNCERTAINTY AHEAD FOR RETAILERS

The shift to a sharing economy begs many important questions. The answers to these questions could have serious consequences for the future of the retail sector.

Will the sharing economy continue to grow, or is it just a fad? Is Millennials desire to have access rather than own a direct result of limited spending power that will shift as they are able to afford to own more goods? Or will this new habit of sharing and access prevail in the long term as Millennials see it as a more efficient way to use their hard-earned money? How far will the sharing trend spread beyond Millennials? Will "New only" retailers that cling to only selling brand new merchandise (and that totally ignore the opportunities presented by the sharing economy) become a thing of the past?

Current evidence would suggest that the sharing economy is here to stay. This is looking like it will be a huge, long-term disruptive force in consumption, and will spread to every sector of retail and be embraced by every age group. People report not only embracing the sharing economy for economic reasons, but also more complex social reasons tied up in identity and a sense of community. This shift in identity would imply that increased sharing is a permanent behavioral change. For example, an individual might self-identify as being "the type of person that stays in an AirBnB* home" rather than being a "hotel person". People with these shared identities are now becoming part of broader communities of people who share similar attitudes and outlooks. These are a set of community expectations and practices that come with being "an AirBnB person". How long these identities last, and how tight-knit the communities surrounding these exchanges become, will be a key part of determining the longevity, breadth, and impact of the sharing economy.

It is estimated that over a million cars have not been sold as a result of the car sharing schemes. Could the $15 trillion retail sector see a broad-based reduction in sales as a result of more efficient consumption?

More disturbing data for retailers comes from Kantar retail. In a recent survey of US consumers, roughly 30% of consumers said they plan to spend less in the coming year, and about 10% say they plan to spend more. The remainder plan to spend about the same. When asked why they planned to spend less, 40% of Americans with household incomes over $60,000 said it is because they are simplifying their lives by buying fewer things. We could see reduced consumption in mature markets not just in the name of efficiency, but also as part of a broader movement to simplify, reduce, and refocus spending in other ways, for example on services and experiences. As people embrace more efficient consumption it frees up money to spend on services and experiences. It is estimated that by 2020, every American household will spend $3 on services for every $1 they spend on goods.

Manufacturers and retailers will need to think carefully about all the implications of the sharing economy and formulate their response. Those that choose to fight or slow the trend (which may be akin to King Canute commanding the sea to turn back) will need to remake the case for ownership and build strategies to drive shopper desire to own rather than to just be satisfied with "mere" access.

Retailers that decide to partially or fully embrace the sharing economy will need to have a brave rethink of their current business models and look for ways to create new and compelling propositions for their customers, and new ways of defining and thinking about their own value (see section 6.5.5 for some ideas).

"SERVICIFICATION" OF THE WORLD

As shoppers shift their spending towards services and away from buying goods, manufacturers and retailers will need to find ways to wrap services around products to grow future revenues.

These services not only create opportunities for increased revenue and value creation, but also can create customer stickiness and increase loyalty. Section 6.1.2 offers a simple example of services made possible as products becoming smart, connected and sensing courtesy of the computing capabilities coming in the next decade from Moore's Law.

Challenges

Manufacturers and retailers, many of whom have expertise in product development but do not have a core competency in services, should start exploring service opportunities now and either hire or buy appropriate expertise that will enable them to build out adjacent service offerings in the future.

CONCLUSIONS ON THE SHARING ECONOMY

The sharing economy does present a number of opportunities to retailers that choose to embrace it:

- Retailers could experiment with leasing and rental services for a range of product categories (for example Best Buy is shifting from selling consumer electronics to leasing home theaters as a service)
- Retailers could devote a portion of their footprint to selling used products alongside new
- Retailers could serve as an indemnification service to guarantee used products they are reselling, thereby justifying higher margins by assuming some of the risk for purchasers
- Retailers could facilitate loaning, bartering and renting services and serve as a reputation management system between customers

THE SOCIAL ECONOMY

Increasingly, consumers are more likely to trust reviews and product insights from friends on social networks than from 'official' reviews and tests. The use of social networks is bringing greater efficiency to shoppers as they pulse their networks for advice on purchases, or for reassurance on an impulse buy.

Challenges

Retailers will need to figure out how to integrate social networking throughout the entire length of the shopper journey: from initial discovery, to the decision process, through purchase and beyond to building after sales loyalty.

CLUBS AND MEMBERSHIPS

Membership shopping clubs have proven popular with shoppers. For retailers they create customer lock-in and change shopper's behavior to give them "first option" advantage.

From Costco* to Amazon Prime*, memberships can offer great value to consumers. Kantar retail estimates that club memberships will rise 5.6% CAGR from 2014-2019. Amazon Prime is now used by almost 1 in 5 US households and boasts over 20 million members. It is particularly popular with Millennials. Costco membership fees make up a large part of their profits.

CLUBS CHANGE SHOPPER BEHAVIOR

The most important things to note about memberships is that they **change people's behavior**.

Amazon Prime members shop at Amazon at twice the rate of non-members. People often join for the free 2-day shipping that Amazon Prime offers, but stay for the additional benefits afforded by being a part of the Amazon ecosystem: free instant streaming video, the Kindle lending library etc. Members exhibit an "Amazon first" mentality whereby 49% of them report that when looking for a product they will go to Amazon first before going anywhere else. Amazon's sales can in part be attributed to their high success turning these inquiries into sales.

As a result of this "Amazon first" behavior, 1 in 5 Amazon Prime customers say they have reduced their shopping at other retailers.

Memberships and clubs could be critical to locking in customers and increasing revenue in the future.

Retailers will need to make large investments to build out trusted platforms and programs that deliver increasing added value to shoppers if they want to compete with Amazon Prime and other emerging membership-based ecosystems. They will need to build ecosystems of value that attract members and keep them signing up year after year. Those that do will benefit from increased ability to deliver personalized value, more cross and up-selling, and enjoying much deeper insights into their customers.

See section 5.2.4 for discussion on the security and privacy implications for handling all the personal data that such membership schemes would generate.

6:7

DELIVERY NETWORK DISRUPTION WILL FURTHER STRENGTHEN ONLINE

High-speed delivery could totally tip the balance in the battle between traditional and online retail. Online retailers are keen to remove one of the final major barriers to buying from them—lack of immediacy.

Traditional retailers still have "immediacy" as a major advantage when it comes to convenience purchases and impulse buys. They are also still the obvious suppliers for goods with a short shelf life such as fresh food and flowers.

But delivery networks are about to undergo both technology and business innovation. "Next hour" delivery services are already emerging and may eventually become widespread. Traditional retailers should watch closely for changes to delivery networks that could strip away one of their key advantages.

Challenges

Retailers should partner as needed with existing and emerging delivery providers to assure they have a clear line of sight to high-speed delivery services as they become available.

A number of disruptive business and technology forces are at play:

- **Algorithms fed by sensors will improve delivery efficiency** - Fleet management, route management, and truck packing algorithms will continue to improve. These will boost the productivity, efficiency, and speed of existing delivery networks. They may also help improve the accuracy of delivery windows encouraging more shoppers to seek home delivery.
- **New peer-to-peer delivery networks will emerge and compete with the existing giants** - Companies like Uber* won't just be satisfied disrupting the taxi business. Uber is already experimenting with delivery services, including UberFRESH* for lunch delivery, and Uber Corner Store* for on-demand delivery of convenience store staples.
- **Public infrastructure** – Municipalities wrestling with how to supply the megacities of the future are already conducting delivery experiments using public infrastructure. Dedicated trains in Japanese subways deliver goods as a way to remove delivery trucks from surface routes in major cities. Subway trains removing waste will surely follow.
- **Autonomous delivery vehicles and robots will emerge slowly** – beyond autonomous cars lie autonomous delivery vehicles, and beyond that robots or drones that can deliver packages the final 10 meters from the curb. The speed of this transition from human labor to autonomous machinery will more likely be set by social desires and labor policy (and union power) than technological readiness.
- **Delivery drones may speed last mile or last 10 meter delivery** – once they have been adequately tested and airspace has been cleared for their use, drones could deliver many of the smaller, lighter weight items we need. This said, many regulatory and social hurdles still remain before this becomes a reality. Several companies already have development programs in this area, including Amazon*, UPS*, and Google*'s Project Wing. Drones could cut deliver times from days to minutes, moving many impulse purchases from physical to online. Such a shift would need to be considered against a broader sustainability, energy efficiency, public safety, and environmental set of contexts.
- **Click and collect** – Self-delivery is on the increase, mostly in Europe. Carrefour in France has big drive-through collection centers next to their hypermarket stores.
- **Mobile stores** – Auchan, another major French retailer has created 3000 mobile stores that go to the places where they know their time-strapped customers will be: the parking lots of big businesses, schools, churches etc.

To amortize the huge investment they are making in delivery infrastructure, will we see Amazon eventually horizontalize their delivery offering and compete with existing delivery players like FedEx and UPS? This is consistent with the way they have monetized their other major infrastructure investments, including offering compute, storage, merchandising, warehousing, and distribution as a service.

Home delivery is clearly a growing trend. However, it is worth noting that home delivery is not a panacea desired by everyone. For some it offers great convenience, but for others it can be the exact opposite, mostly driven by inconvenient and unpredictable delivery windows.

Challenges

Retailers will need to ensure that they still have a strong brand proposition once immediacy is stripped away as a differentiator versus online suppliers.

7

THE FUTURE OF THE SHELF

THE FUTURE OF THE SHELF

The shelf has been with us for at least a couple of thousand years, and probably longer.

And it's perhaps time for it to get a make-over. It's time for the shelf to go digital. It's time for the smart shelf.

DEFINING THE "SHELF": SHELVES, RACKS, END CAPS AND MORE

When we talk about a shelf, what are we talking about exactly? As the primary user interface of retail for at least a couple of millennia, we have seen the shelf show up in a variety of forms: the shelf, the rail, the end cap, virtual shelves on a digital sign, and one could even think of an Amazon product page as a shelf of sorts.

In this report, we will use the term "shelf" to encompass all these various forms. Shelves display wares to shoppers and try to entice them to buy. Shelves also help facilitate the conversation between the manufacturer and the consumer. They help the shopper to discover and experience the product, and often to see that product within the broader context of other products and offers. And they help the manufacturer to move the customer towards a purchase.

REDEFINING THE ROLE OF THE SHELF

As discussed in section 6.1, within the next decade anything in our world can become smart, connected, and sensing. In this timeframe, computing will become so low cost, consume so little energy, and be so physically small that we can think of "smart" as an ingredient for anything. Even the shelf.

The opportunity for the smart shelf is to change the shelf's role within the selling process. Today the shelf is plays a passive role in this process. But a smart shelf can fulfill a much more active role where it understands shopper needs, understands the product or products it is showcasing, and uses enhanced capabilities to participate more fully in the selling process. And it can do this in a way that is highly personalized, including the use of personalized pricing and promotions.

Fundamentally, the shelf can improve the shopper experience in two fundamental ways: making the shopping trip easier, and making the shopping trip more exciting. And for manufacturers, a smart shelf can create data-led sales and marketing opportunities and help them better understand who is buying their products, and who is not buying their products. It can also maximize profit for the retailer by optimizing pricing dynamically, and enable manufacturers and retailers to reward shopper loyalty, all at the shelf edge.

EXPECT A BROAD, DIVERSE FAMILY OF SMART SHELVES

There will not be a "one shelf fits all" solution. Smart shelves will come in all shapes and sizes, and all levels of sophistication.

Shelf capabilities will vary widely, and will improve over time as computing capabilities increase and costs reduce. The diversity of smart shelves will match the multiplicity of different tasks they will be asked to perform.

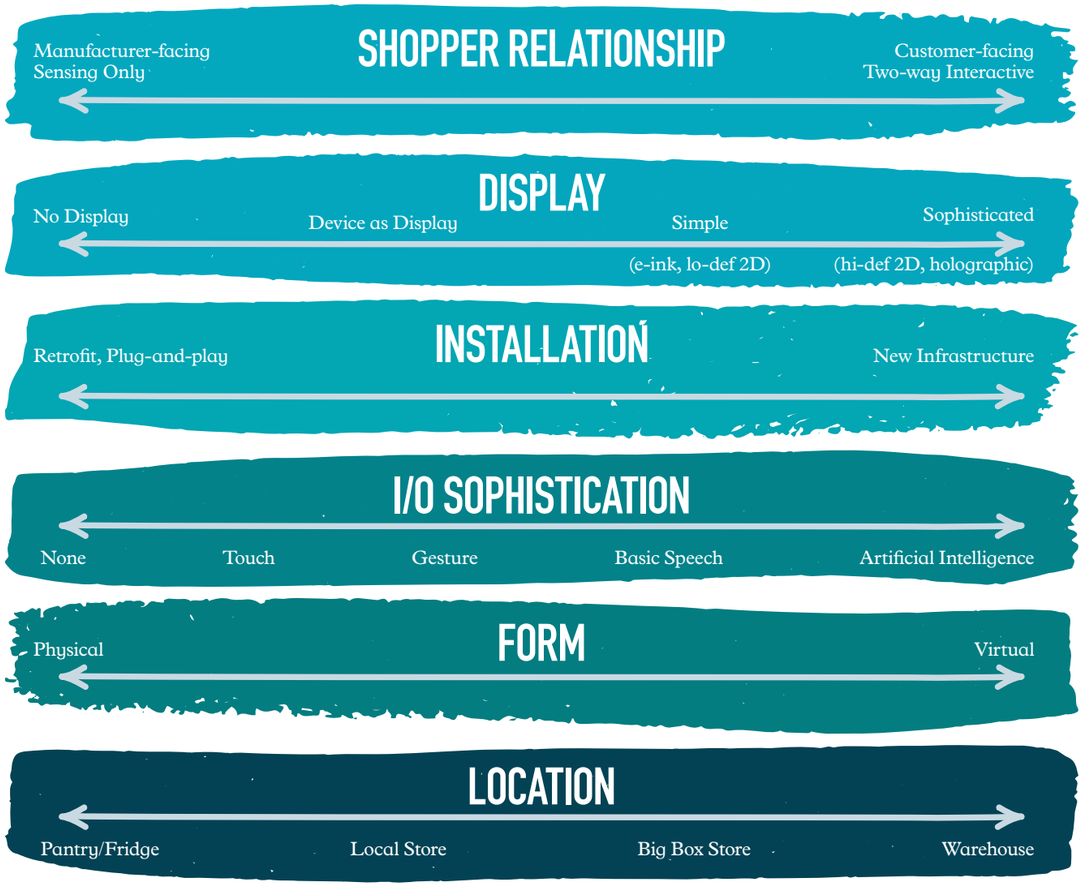
"Good" shelves will have basic sensing capabilities, very limited display and no natural communication capabilities.

"Better" shelves will be characterized by having more sophisticated sensors, more local intelligence, and better cloud connectivity and services. Simple shelves may have only proximity sensors, while premium smart shelves might include the ability to see, smell, feel, understand, and intuit the world around them. These shelves will not only know what products they have loaded on them (whether that be by using cameras, RFID readers, weight sensors, or other technology), but also understand and interact intelligently with the shopper stood in front of them. This will require a combination of sensors (3D cameras, microphones, proximity, touch) and computing capability needed to interact with the shopper in a way that is natural, comfortable, and that is fully respectful of privacy. For example, the shelf should process all shopper image data locally at the shelf and not transmit any images to the cloud for privacy reasons.

The "best" shelves will be able to leverage all these capabilities, and also tap into cloud-based data sources to deliver bespoke wisdom and guidance to the shopper.

Some of these capabilities may, at least initially, be leveraged from the shopper's device. For example, the display, touch capabilities, and even the microphone of a smartphone might be used by the shelf for shopper interaction. As cooperative, heterogeneous compute architectures evolve, the shelf may even use some of the local computing capability of devices to perform its function.

The bottom line is that smart shelves will come in a wide range of different types and capabilities. The main dimensions of this diversity are shown in the diagram below:



SMART SHELVES – MANUFACTURER-FACING VS CUSTOMER-FACING

Different retailers will make different business decisions on whether the smart shelves they deploy are focused toward the provision of manufacturer-facing services, customer-facing services, or both.

Manufacturer-facing functions are typically a one-way sensing relationship with the shopper. These include gathering insight on traffic, linger times, customer demographics, and success of offers and advertising. A more sophisticated manufacturer-facing function that would require a two-way relationship would include the delivery of dynamic or personalized pricing, and promotions.

Customer-facing functions are more likely to facilitate a two-way interactive conversation with the shopper. These include providing product information, social media reviews, discounts, and personalized shopping guidance. For example, the shelf might display or say, "Alice, this product contains gluten", or "Alejandro, this product is on your daughter's birthday wish list".

Challenges

Retailers will need to decide how to focus their smart shelf deployments. Some will focus them on offering a differentiated shopper experience, some will be more focused on data gathering as a service for their manufacturers. Many will deploy shelving infrastructure that does both.

SHELVES WILL SPORT A RANGE OF DIFFERENT DISPLAYS, OR NO DISPLAY AT ALL

Shelves will vary in their display capabilities. Many will have no display. Some will have glorious high-end, highly engaging displays used to merchandise products. Other models will use the shopper's device as the display.

Since most retailers won't want to turn their store environments into a visual assault resembling a miniaturized Las Vegas strip, most shelves will likely have no display, or employ the display on a shopper's device. However as display technology continues to develop, capabilities increase, and costs fall, some categories of product will benefit from a rich display capability. This might include the use of high quality video, and ultimately "holographic" displays.

Challenges

Retailers will need to consider shelf displays as part of their broader look and feel. With proper attention paid to on-screen design, and the use of more muted display technology (brightness will need to be set optimally for the lighting levels in the store) even an OLED or LED display can be made to look good in a store environment. Control and constraint on the design will be important to avoid the shelf looking like a coupon catalogue on steroids. Retailers that figure out this recipe early on by engaging thoughtful designers and user experience expertise will be at an advantage.

UPGRADES AND NEW DEPLOYMENTS

Initial implementations will need to plug and play with existing shelving infrastructure. Longer term, more sophisticated smart shelving will replace existing infrastructure. This will be justified once new deployments are able to deliver appropriate value to manufacturers, retailers and shoppers.

VIRTUAL SHELVES

Some shelving will be physical while other shelves will be virtual, designed to enable the shopper to view a wider variety of products than is available in the increasingly limited physical space of the store. Adidas* has already done some successful experimentation in this area with virtual space technology. Using a set of large touch screens they created a movable carousel of virtual shelves displaying footwear alongside physical racks of shoes to create the illusion of a virtual space. This allowed more product to be showcased in their flagship stores where space is at a premium. Their implementation also enabled shoppers to interact with the digital shoes, to learn more about their construction, and to see the materials used to make them.

DIFFERENT SHELVES IN DIFFERENT LOCATIONS

Shelves will also vary depending on their location: A smart shelf in a small local grocery store will be different to a shelf in a big box electronics store and they will both be different than a smart shelf in someone's pantry or fridge. Shelves in a pantry or fridge only need to sense and gather home produce inventory levels. Shelves in a local store will likely combine inventory and some basic sales capabilities, whereas shelving in experiential retail might make use of sophisticated sales capabilities to help shoppers discover products and move them towards a purchase decision.

GOOD, BETTER, BEST, AND AMAZING

So we should expect a broad spectrum of smart shelving.

These will range from simple plug-and-play add-ons to existing shelves (basic sensors, no display, assessing shopper traffic and linger times) up to super high-tech installations with either 2D or even 3D/holographic displays that are able to communicate with the shopper using touch, gesture, and voice and that can see and understand the world around them. These shelves might be capable of natural language interaction with shoppers, able to make personalized offers, optimize retailer revenue by offering intelligent dynamic pricing, act as in-store billboards so retailers can sell advertising services to manufacturers, and more.

As technology continues to mature, and price points fall, more and more capabilities will become possible over time. Whatever the capability, a smart shelf must deliver value to either the shopper or the manufacturer. Ideally both. After all, history shows over and over again that technology for technology's sake is an utter waste of everybody's time.

Given the rapid speed of innovation coming to the shelf courtesy of Moore's Law, infrastructure manufacturers may choose to design highly modular smart shelf systems. These will allow easy extensibility and rapid experimentation with new technology as it becomes available. A platform approach such as this will help to boost competitiveness and at the same time control costs. It may also enable the capture of increased value by attracting the activity of software and services developers.

Retailers will need to figure out how to capitalize on the opportunity to generate returns from manufacturers by creating data-led sales and marketing leads at the shelf.

Retailers will need to think about the smart shelf as a platform for creating and delivering new services to manufacturers, including at-shelf advertising, dynamic pricing, virtual sales assistance and more.

THE TIP OF A MUCH LARGER ICEBERG

Deploying smart infrastructure based on Internet of things (IOT) technology is relatively useless unless it's connected to a back-end infrastructure that can gather, analyze, and act upon all the data gathered by the sophisticated set of sensors in the shelf.

Section 8 discusses data in more detail, but deploying IOT solutions like the smart shelf is not for the faint of heart. To unlock maximum value, and deliver truly personalized service to customers, smart shelves will need to be supported by a sophisticated back-end server infrastructure able to gather and store data, run the latest data analytics, and deliver support services to the shelves as needed. These support services could include access to databases that store real-time inventory data, customer profile data, and product information. The back-end server infrastructure may also provide video streaming services, natural computing services and more.

Systems architects will need to make careful architectural decisions on where best to host the intelligence needed to deliver experiences at the shelf. In some cases it will make sense to build capability into the shelf itself, but in other circumstances a cloud-based approach may be the more cost-effective approach and enable faster deployment of new services and capabilities.

7:5

ENHANCING CONVERSATIONS BETWEEN MANUFACTURERS AND SHOPPERS

A smart shelf, bristling with sensors, should be able to understand not only what product is displayed upon it, but also something about the shopper stood in front of it. Like any good sales person, the ideal smart shelf will need to have a personality that combines knowledge and insight on the shopper with great selling skills. The shelf should also make choosing easier for the shopper. Again, this is just like any good sales person.

The shelf will be able to host a conversation between manufacturers/brands and consumers. Today that conversation is hosted by way of simple signage on the shelf, and also by packaging or labelling on the product itself. But what if that conversation could be customized based on the individual shopper, and the shelf could make enticing, customized offers to the shopper on behalf of the manufacturer?

Let's consider the types of conversations that manufacturers and brands need and want to have with prospective buyers:

Value and differentiation – They want to explain why their product justifies the price tag, offers value for money, and how it is different and offers better value than the competition.

Positioning and help choosing – Is the product good, better, or best? How does it compare against other products in a range? The shelf should simplify the purchase decision and make it much easier for the shopper.

Suitability – How well does this product meet the customers' needs? Not any customer. This particular customer.

Offers and special pricing – They want to convey any special offers and promotions, including personalized offers that the manufacturer wants to make to the shopper to entice them to make a purchase. They might also want to set pricing dynamically based on the individual shopper, either to reward loyalty, or to optimize revenue by using algorithms to try and set the price at the highest level that will still encourage the shopper to buy.

Queries – They want to answer shoppers' questions on the product and remove them as a barrier to purchase.

Social context – They want to share any salient online reviews that might help the shopper choose. These could include reviews from sites that this particular shopper respects and trusts, and also reviews from their friends. They may possibly also want to highlight similar purchases made by friends and shared via social media. "Carrie has this in black, and loves it"

Availability – They want to show in-store, local and online availability. And if the product is out of stock, provide other options for the shopper to source the desired item, or a similar item.

The ideal shelf will be able to handle all of these conversations with shoppers and help to move the shopper towards making a purchase.

Challenges

When designing smart shelves, retailers will need to focus on trust. The shelf will need to build trust with the shopper in just the same way a human shopping assistant would. It will need to be able to demonstrate:

- Strong knowledge on products and the market
- Empathy for the shopper and understanding of their needs
- Honesty, transparency, and trustworthiness
- That it has the shopper's best interests at heart

Shoppers will quickly figure it out if retailers block poor online product reviews or deploy shelves that don't appear to have the shopper's interest at the center of their programming. Shoppers will flee a self-interested shelf just as fast as they will run away from a shop assistant on commission that clearly as an agenda.

Retailers will need to find ways for the shelf to help the shopper through the product discovery process and move them towards purchase. What if the shelf could become a trusted advisor to the shopper?

Retailers will need to find ways for the shelf to help brands establish and then strengthen relationships with shoppers.

7:6

SMART SHELVES SHOULD DEVELOP AN EQ

A smart shelf might also assess the emotional state and context of the shopper in much the same way a human shopping assistant will attempt to rapidly assess their best approach to interacting with a customer.

Using indoor location, cameras, eye-tracking, and other sensors, the shelf could assess whether the customer is:

- Stressed, or relaxed
- In a hurry, or open to a more lengthy shopping engagement
- Confused and lost, or moving with purpose
- Looking at multiple products (and thus in discovery mode), or focused on just one or two products (and thus perhaps in decision mode and about the move to purchase)

By better understanding the emotional state of the shopper, the shelf will be able to make an intelligent decision on how best to offer assistance. For example, a shopper that looks stressed and in a hurry probably doesn't have time or the patience for a helpful suggestion on a delicious sauce that would go perfectly with the broccoli they just put in their cart.

Challenges

Retailers should start thinking about what they will do differently once they are able to deploy infrastructure that can assess and understand the current emotional state of a shopper.

7:7

CONVERSATIONS WILL BECOME NATURAL

Computers will soon be able to communicate with people in a way that is natural to us, rather than in a way that is suitable for computers.

Computers will be able to see and understand the world. They will understand objects and people and the relationships between them. They will be able to hear and understand natural human language, sense emotional states, and understand and appreciate context. And since shelves will soon become computers, shelves will be capable of all these things too.

Imagine a future interaction with a shopper, talking to a "natural" smart shelf:

Jack: *"Shelf, where can I find basmati rice?"*

Shelf: *"Hi Jack, it's on aisle 3, highlighted in yellow. You'll also find Tikka Masala sauce on the shelf above, 20% off today."*

Jack then walks to aisle 3 and sees the shelf area with basmati rice lit up in yellow. The shelf took a leap, based on Jack's previous purchase history, and offered a personalized suggestion for a sell-up item.

For the merchandising of some product categories, perhaps high-value or newly-launched products, retailers may choose to use a natural shelf with speech or display capabilities that could provide on-demand information on the products being displayed.

A natural shelf could respond to queries like: "Show me how easy this is to install", or "What does this look like in orange?" These types of conversations could help move shoppers a step closer towards purchase.

Natural shelves might also give the shopper an option to connect with a human who is able to answer queries on the product and aid the sale. This connection could use audio, video, or even use avatars. This latter technology might be of particular interest to retailers selling products for children, allowing the child to interact with their favorite cartoon character as they learn about a new book.

Challenges

Retailers will need to understand the range of questions and concerns that typically stand between a shopper and purchase, and ensure these are fully comprehended in the shelf's software algorithms.

7:8

GOING BEYOND CONVERSATION

As well as facilitating the conversation between manufacturers and shoppers, some smart shelves will also be able to perform a range of other functions including:

- **Loss prevention** – Cameras and other sensors in the shelf could offer closer monitoring of larcenous shoppers.
- **Sample management** – Smart shelves could include mechanisms to offer and dispense samples to targeted shoppers.
- **Asset management and Inventory management** – Sensors in the shelf could constantly report inventory levels for products they are showcasing, and also potentially for products across the aisle using machine vision technology.

Once the base platform of the intelligent shelf has been established, and a set of standards emerge, developers will continue to dream up a set of exciting new capabilities for retailers that will help improve the shopper experience, create new value for manufacturers, enable the provision of new revenue-generating services, and that improve the competitiveness and profitability of the store.

Challenges

Retailers should find ways to engage third party developer communities and invite them to imagine and build new applications for their smart shelving platforms.

A TIERED HIERARCHY OF SHELVES

Perhaps one of the most promising use cases for deploying smart shelves is one that connects together many shelves in a tiered network.

A shelf network would include shelves:

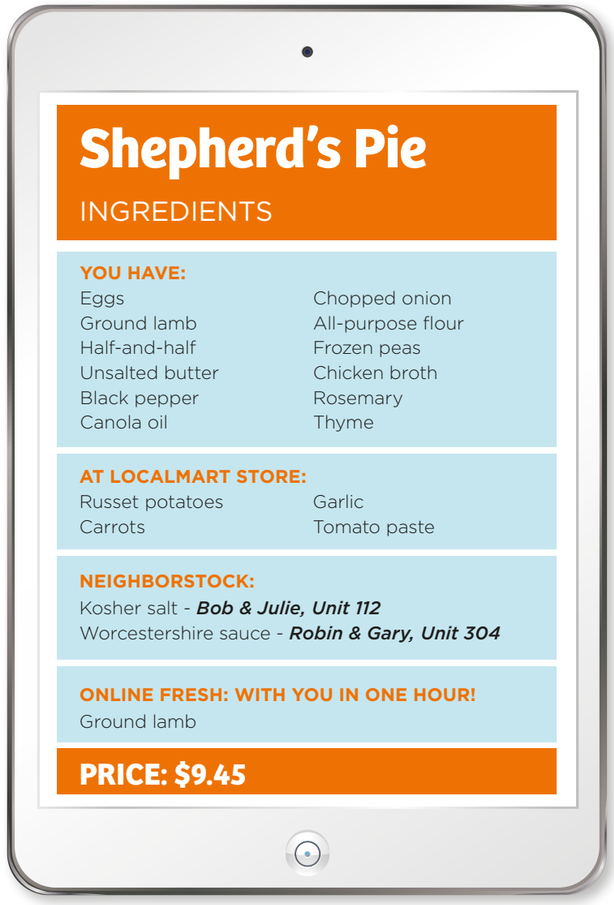
- In the home, both in the fridge and in the pantry
- In the local neighborhood convenience store
- In big box stores
- In distribution centers and warehouses (these could be distribution centers that feed physical stores, or pure play online stores)

By fully instrumenting shelves, right down into the home, a new generation of algorithms could be created that would anticipate demand and optimize the position of products within the supply chain, increasing availability and reducing spoilage and inventory mark downs.

It would then be possible to anticipate local community demand not just by looking to historical consumption patterns but also by understanding the real time in-home consumption of local residents. Further, if residents opted in to a secure, perhaps anonymized service to share their calendars, this aggregated demand forecast could also take into account the travel schedules of shoppers. High security and the guarding of privacy would be essential in this scenario.

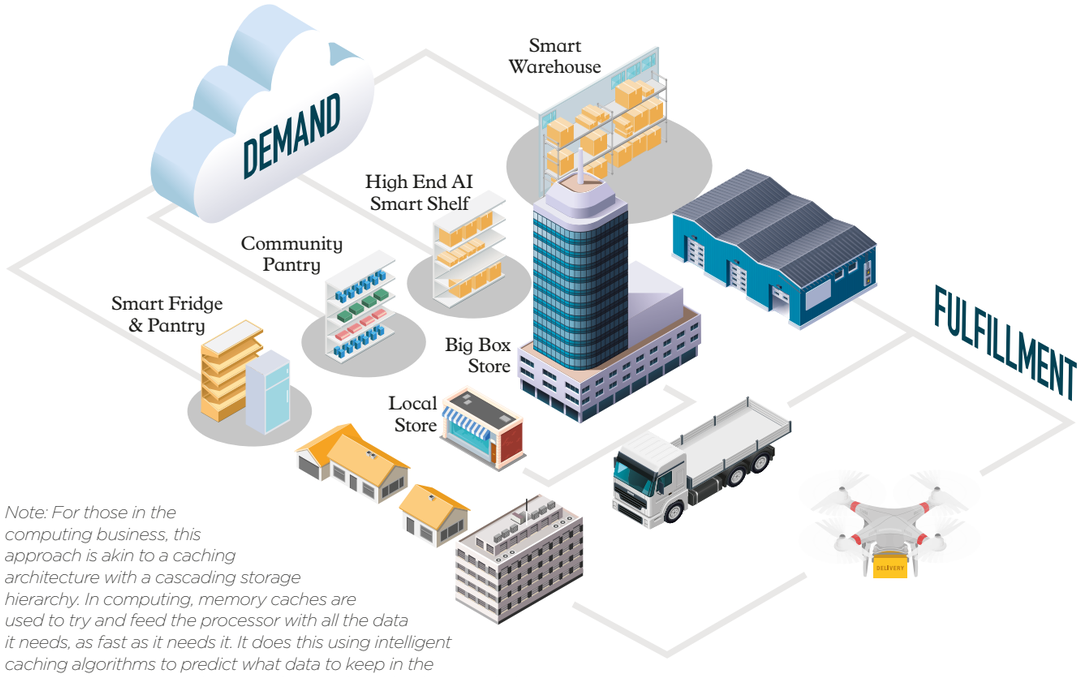
A set of networked, instrumented shelves might also enable a new set of neighborhood focused sharing services, embracing the sharing economy at the local community level. The old, "I need to borrow a cup of sugar" model of old could be facilitated as an opt-in neighborhood service for community-oriented neighbors that chose to participate. Need an onion? The system could let you know that neighbor Alice has seven and probably won't eat them all, facilitate a request, and even handle cross-billing so that Alice got paid for her onion.

A smart, connected recipe system connected into this tiered shelving system could suggest menus optimized around the ingredients available in the home, but also point out the availability of needed ingredients in other locations, including neighbor's homes. For example, a smart, connected recipe might look something like this:



The initial idea for this tiered model was generated out of the futurecasting session where it was explored via a futurecasting scenario and a science fiction prototype. These were covered in section 3.3 and section 3.5 of this report, respectively. This futurecasting scenario combines shelf intelligence in the home, an intelligent local store, and online capability to deliver an experience that puts the shopper at the center.

A model like this is perhaps the ultimate integration level for the smart shelf where a network of intelligent infrastructure—spanning home, store and online—can optimize for efficiency at the system level, and also create exciting new value by delivering a set of new shopper-centric services.



Note: For those in the computing business, this approach is akin to a caching architecture with a cascading storage hierarchy. In computing, memory caches are used to try and feed the processor with all the data it needs, as fast as it needs it. It does this using intelligent caching algorithms to predict what data to keep in the closest, fastest memory. If we consider retail distribution as a similar network with a storage hierarchy, we can imagine the need for predictive algorithms to analyze usage and optimize the chances of customers finding the items they need in stock, whether that be in their pantry (L1 cache) their local store (L2 cache), or at the hypermarket (L3 cache).

A solution such as this might be of particular interest to a retirement community living in an urban environment where mobility is more limited and convenience is even more prized.

Major retailers should start thinking more broadly about infrastructure deployments and partner with others to deliver much greater value to shoppers and to society at large. Rather than limit the scope of their thinking to the infrastructure in their own stores they might consider engaging in partnerships with others to imagine and deploy system-level networks of smart infrastructure that improve efficiency and deliver new experiences for people. Partners could include suppliers, architects, builders, city planners, and logistics companies.

7:10

SMART SHELF BUSINESS MODELS

A wide variety of different business models could be built around the intelligent shelf.

A few sample business models that come to mind:

An integrator builds a smart shelving solution (including all the back-end data analytics capabilities) and sells it to a retailer. The retailer configures the system and deploys it in a way that delivers a highly differentiated shopper experience, boosting their revenue and margins.

The retailer leases a smart shelving solution from an integrator, who becomes their business partner. The retailer generates revenue streams by selling a range of services to manufacturers. These might include shopper analytics services (foot traffic, demographics), provisioning customized offers to shoppers, on-shelf advertising, dynamic pricing, and other services. The integrator and the retailer share revenue from these services as part of their business relationship.

Manufacturers fund, develop, and deploy smart shelving in their retailers' stores. Retailers gain insight into a subset of the data gathered by the shelves to help them optimize their operations. Shopper-facing capabilities boost sales increasing revenue and margins for both retailers and manufacturers.

Any number of business models could be used to bring smart shelves into retail. The key business questions are around who pays for deployment, how they pay, and why they will pay. So long as the deployment creates adequate value for those involved, business models will emerge that will fuel these installations.

Designers developing smart shelves will need to consider the best way to monetize the value that they are creating for retailers, manufacturers, and shoppers.

8

IT'S ALL ABOUT THE DATA

IT'S ALL ABOUT THE DATA

As the front-end face and back-end infrastructure bones of retail become instrumented, a myriad of sensors will generate vast amounts of data. This data will be collected everywhere from the warehouse loading dock, though the store shelf, to point of sale and beyond.

This data will fundamentally serve two main purposes:

1. Enable operational efficiency improvements based on data analytics and operational insight
2. Enable personalized experiences to be created and delivered to customers that save customers time, generate delight, and increase brand loyalty

While dealing with all this new complexity, retail enterprise structures will also need to keep a close eye on security. Retailers continue to be large targets for cybercrime, and security will be an ongoing (and never-ending) war against ever-more sophisticated hackers and criminals. (See section 5.2.4).

Retailers and manufacturers are going to be faced with managing a huge explosion in the amount of data they need to collect, store, manage, protect, and analyze. They will need to do this cost effectively, and in a way that extracts maximum value from the data; Value for them, for manufacturers, and for shoppers.

Retailers will need to introduce data-driven analysis into their traditional "gut-driven" decision-making process. This combination of art and science melds creativity and a deep understanding of the shopper psyche to enable them to build new and innovative retail propositions that delight customers.

Retailers will need to understand how to use the insights they derive from data to create increased loyalty, brand connections, greater efficiency, and ultimately translate that into greater profit. To do this, they are likely to need help.

PARTNER WITH OR ACQUIRE DATA TALENT

Moving data around costs money, and as smart infrastructure—including smart shelves, smart warehouses, and smart delivery networks—spews out vast amounts of data, decisions will need to be made on where and how that data is processed.

Some data will be processed in the cloud, but much will be processed at the edge using intelligent gateways that mitigate or reduce the need to send bits all the way to the cloud. Optimizing data and associated computing and network architectures will be critical to minimizing OpEx costs. Architecture will also be dictated by privacy needs and regulations that will vary from country to country.

Winners will also be the fastest to innovate and deploy new technology in ways that improve experience for shoppers.

Whether through building partnerships and outsourcing data services, or through hiring and acquisition, retailers will need to invest in building a scalable data capability. This will enable retailers to differentiate by proving a better customer experience both online and offline.

In some cases, retailers will need to boost their own data acumen and may need to acquire data engineering and data analytics talent. In a game where the retailer that best understands and best serves their customers wins, it may be that the retailers with the best team of mathematicians and thus the best analysis wins.

Retailers will need to think carefully about the right balance of insourcing and outsourcing to optimize speed, differentiation and thus competitive advantage.

Retailers will need to build strategic partnerships with experts in data management, network and data architecture, security and encryption, privacy, analytics, data hosting, cloud, and storage.

UNIFYING ONLINE AND OFFLINE DATA

Understanding a shopper as a "customer of one" means building a picture of them that spans right across the omni-channel customer journey.

Today online retailers gather data on customers in the form of clicks and hovers, through the purchases they make, and through the wish lists they compile. Once sensors are deployed in physical stores that can gather the equivalent data set for shoppers as wander through the store, retailers will end up with two, discrete data sets. One for online customers, and one for in-store customers.

The challenge is to harmonize these two data sets and meld them into one detailed picture of a shopper's interests, habits, needs, preferences, and likely intentions. This is easy to say, but very difficult to do.

A full picture of a shopper's in-store activity can't begin and end with their purchase history as it does today. Loyalty cards linked to online accounts help retailers add in-store purchases to a shopper's online shopping history, creating a piece of the unified history. But retailers would love to know more. They would love to know when shoppers come through their store and buy nothing. They would love to know what shoppers look at, but don't place into their basket. And they would love to see how they moved around the store and what caught their attention.

The identity of a shopper might not be known, or might only become known when they swipe a card at the checkout. Systems could be imagined that monitor and track shopper behavior in-store and label them simply as "Shopper A", "Shopper B", and "Shopper C". A combination of location tracking and smart shelf sensing could build a profile of a shopper without them being identified and link together multiple interactions at the shelf into one single profile for their visit. This would allow retailers to build a more holistic view of a shopper's journey in the store combining their route with details of the individual interactions they had with smart elements of the store.

And if "Shopper B" then identifies themselves at the checkout by using a loyalty card or recognized payment system, their in-store behavior could then be added to their profile and used to improve the personalization of the experience the next time they enter the store, or go online. All this will need to be managed within the constraints of respecting the privacy of shoppers, allowing them to remain anonymous if desired, and with the philosophy that any data that is gathered on a shopper is done so on an "opt in" basis, with explicit permission from the shopper.

Retailers will need to be able to clearly articulate value to the shopper in tracking their behavior and deliver real value that encourages shoppers to opt in. Tracking that only serves the needs of manufacturers or retailers will be seen for what it is, and will probably be seen as a break of trust and the social contract.

Retailers will build the most accurate understanding of their customers if they are able to unify their customer data from both online and offline sources.

Retailers will need to build their systems in a way that respect shopper desire for privacy and that allow them to remain anonymous if they so desire.

COLLABORATION VERSUS COMPETITION

In this new world of big data, retailers have a couple of ways they can regard their new data assets.

Firstly, retailers could jealously guard their data and leverage the insights they gain from it as a competitive advantage. This might be a great strategy for retailers that have loyal customers that they see on a weekly or even more regular basis, such as grocery stores.

Alternatively, retailers could make deals to share their insights with other retailers. This might be a great strategy for retailers with low frequency interactions with shoppers, or who only have a small number of outlets. Such retailers might find other retailers willing to share customer data on a quid pro quo basis, enabling them to gain better customer insights and deliver more personalized experiences. This may be welcomed by shoppers who value personalized services. For example, a woman's favorite store might recommend a top that goes well with the skirt she just bought in another store.

Third party data brokering services may emerge that link together retailers in "data cooperatives". And retailers might perhaps collaborate in much the same way airlines club together in alliances to offer their customers convenient services that span across airlines. A connecting flight becomes a connecting shopping experience that spans retailers. Such alliances may make more sense if they were to span different sectors, or were between retailers that don't directly compete.

And of course the moment data starts to be shared between entities data security becomes paramount.

Retailers will need to determine their strategy for sharing data with others. If they decide to share they will need to gain the consent of shoppers, build strategic partnerships with other retailers or data brokers, and determine appropriate, secure mechanisms needed to share data in a way that fully guards privacy.

8:4

WHO PAYS: CAPEX VERSUS OPEX

One major open question for the retail sector is who will retain ownership of all this data?

This question can actually be simplified and reduced to: who will pay to collect all this data? Will retailers and manufacturers make the CapEx investments needed to gather and analyze their own data, or will they give it away to third parties that offer "free" or subsidized infrastructure in return for retaining ownership of the data?

Different retailers will have different approaches. The answer for each retailer will be partly a philosophical and partly a business decision.

Whoever collects and owns all this data will be able to refine it to create value. It boils down to an issue of control, and a discussion of whether manufacturers and retailers want to pay for this type of capability out of their CapEx or OpEx budgets. Retailers face two main options here:

Option one: Big CapEx up front, and ownership of the data.

Option two: Give the opportunity to a third party that collects and analyzes the data, and then pay for analytics services on a monthly basis.

Retailers will need to determine their data ownership strategy.

Either way, manufacturers and retails will pay somehow. And they will gladly pay because this refined data will offer great value, both to them and to their customers.

8:5

RETAIL INVESTMENT HORIZONS MUST LENGTHEN

Other than having to deal with long-term real estate lease agreements, retailers have historically enjoyed very short-term planning horizons when compared to many other sectors such as construction, healthcare, or transportation.

Investment timeframes measurable in years are hard to comprehend when stores are focused on takings for the week, designers are scrambling to decide what the new line will be three months from now, and cutthroat competition keeps retailers focused on competitors on a daily or hourly basis.

To maintain their competitiveness in the second era of digital retail, retailers will need to lengthen their investment horizons and take a much longer term view of their future. The retail evolution that's coming will take multiple years to build out. Success will require strategic investments to be planned, executed, and managed over multi-year timeframes. Retailers will need to think of their return on investment over much longer periods, perhaps five or ten years, or even longer for major investments. Those retailers that have a strong vision for their brand and their brand proposition, that are brave enough to set their course, and that invest for the long haul to build out the customer experience will prevail. And the sooner they start, the better.

8:6

STANDARDS FOR DATA, ANALYTICS, AND SMART INFRASTRUCTURE MUST EMERGE

Proprietary, vertical solutions will eventually yield to lower-cost solutions based on open standards and horizontal building blocks.

The industry will need to define standard interfaces and a set of open APIs that enable developers to collaborate with each other across standardized platforms. Most every aspect of the smart shelf will benefit from standardization at some level. For example, content delivery will benefit from standard screen sizes, formats and resolutions for on-shelf advertising.

This will enable developers to bring waves of rapid innovation to the retail sector. Retailers should look for open source analytics engines, standards-based networking, storage and computing, and an open set of APIs in any deployment they embark upon.

Retailers will need to take risks and begin to deploy new technology in stores before industry standards have fully emerged. Waiting is not an option. Those retailers that invest early and forge the path using more vertical and perhaps even semi-proprietary approaches will gain early-mover advantage. They will learn what works and what doesn't, and be on their second and third generation deployments before slower competitors have even begun. Smart retailers will invest early, learn quickly, and be willing to modify or switch deployment strategies on a dime. Once standards emerge they will move to open platforms that give them access to an ecosystem of developers and service providers. This will enable them to add exciting new functionality over time, and do so in a modular way that keeps costs under control.

9

SUMMARY AND NEXT STEPS

THE SECOND ERA OF DIGITAL RETAIL IS HERE.

Retailers that embrace the possibilities presented by digital retail technologies will be able to ride a sustained wave of innovation that will carry them through the coming decades. They will gain significant competitive advantage by vastly improving the customer experience, and delivering better quality insights and more targeted selling to their suppliers.

As the physical and digital worlds collide in retail, the smart shelf will likely be at the forefront of the value proposition of computing within the shopping experience. The shelf will need a variety of different features and capabilities so it can handle all the different tasks and usages we throw its way.

A decade from now, the winners in retail will be those that invest in building personalized shopping experiences based on a deep understanding of each shopper as an individual. This will require the gathering, secure storage, and analysis of vast troves of personal data. And will also see a shift in the balance of IT spend from a deployment largely focused on the back-end bones of retail, towards a more balanced approach that spans both back-end operations, and also using technology to create a range of exciting, personalized in-store experiences for shoppers at the face of retail.

Welcome to the **Second Era of Digital Retail** where shoppers will feel the power of digital technology as a key ingredient in every form of the shopping that they enjoy, whether it be online or offline, pick-up or delivery, mission or experience shopping.

NEXT STEPS FOR SAVVY RETAILERS

So where do retailers go from here? The possibilities afforded by the **Second Era of Digital Retail** can be overwhelming.

Traditional retailers will need to bring the advantages of online into their physical stores, including breadth of offering, high availability, high efficiency, and low friction. Additionally, omni-channel retailers will need to bring the best of traditional shopping to their online offering, including immediacy, size & fit confidence, and touch & feel.

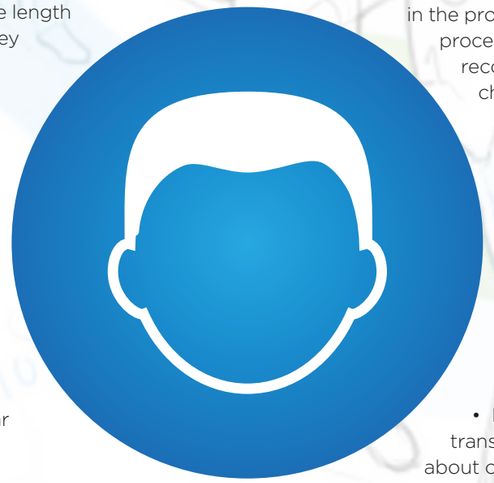
Here are is a summary of steps that retailers should consider taking to get started in this exciting new landscape:

GENERAL

- Consider the face, the bones, and the brains of retail, and build a vision for the store ten years from now. Use science fiction prototyping if you would like. But have a clear vision for what you want to build, and what you don't want to build. Strategy is as much about what you are not going to do as what you are going to do. Focus. And aim high.
- Partner with both your IT suppliers and your experience designers to brainstorm potential opportunities afforded by the smart shelf, smart infrastructure, data analytics, indoor location, and natural computing. Select one or two projects you want to focus on and create a viable plan to build a proof of concept that you can test.
- Review hiring, staff retention, and training policies and procedures in anticipation of needing to attract and retain higher quality talent able to deliver different types of value to customers. Value that transcends that which will eventually be delivered by technology.
- Invest in the quality of your staff so your labor force can become more focused on delivering highly differentiated customer service.
- Understand the right mix of human and digital investment needed at each customer touch point to ensure you are able to meet or exceed customer expectations. Examine existing processes and determine where humans add true value and where automation can remove manual, tedious, or low value activities, freeing in-store labor to do what they do best.
- Start the tough conversations with investors on the need to extend investment horizons, and explain the long-term return they can expect as a result. Retailers themselves will need to lengthen investment horizons and take a 5-10 year view of the future.
- Optimize your speed, differentiation and competitive advantage by carefully balancing your insourcing and outsourcing strategy for innovation.
- Take risks and begin to deploy new technology in stores before industry standards have fully solidified in order to gain first-mover advantage.

SHOPPER EXPERIENCE

- Consider how to use technology to improve the "face" of retail, boosting their in-store experience to ignite sales with shoppers.
- Fit in with the new rituals and routines of the changing customer and understand the difference between 'fast' and 'slow' shopping missions. Retailers will need to figure out how to best meet customers' expectations for each of these missions. They should optimize operations to delight experience shoppers with a high-touch, high-tech, fun experiences built around the buying process, or delight mission shoppers with stores built for shopper efficiency, zero friction, and to get them in and out of the store as quickly as possible.
- Integrate social networking throughout the entire length of the shopper journey from initial discovery to purchase and beyond.
- Consider building a membership ecosystem around your traditional sales model that delivers added value to shoppers (beyond simple discounts) and that retains members year after year.



- Begin experimentation with wearable technology and devise strategies to complement the capabilities of their existing human sales teams with real-time, data-driven insights that help them deliver better customer service. Explore the benefits of giving wearables to regular shoppers and understand what value exchange would be required to encourage them to wear these items while shopping.
- Invest in technology that reduces friction in the product selection and purchase process. Deploy RFID or visual recognition technology to reduce checkout friction to zero, while minimizing theft.
- Explore, develop, and deploy technology that makes shopping more social, helps shoppers choose, helps them make memories, and that deepens emotional relationships with shoppers by increasing brand and product interaction.
- Involve customers in authentic, transparent, two-way conversations about operations, suppliers, the future direction of the business, and the development of products to boost emotional connections between brands and shoppers.
- Differentiate by wrapping origin stories around products and brands that tap into shopper's desire to understand the provenance of products.
- Provide in-store connectivity to shoppers.

CUSTOMIZATION AND PERSONALIZATION

- Tailor solutions by channel, by shopper, and by geography. In Asia, retailers will need to embrace a model more focused on mobile, consumer-to-consumer and ownership. In the US they must embrace the sharing economy, and in Europe they will need to put added emphasis on home delivery.
- Deliver every experience in the store in a way that is both personal and relevant by deploying the intelligence and analytics capabilities required to understand each shopper intimately.
- Begin experimenting with customization as soon as possible to understand how shoppers can be sold up to customized solutions and to determine the right places to apply customization and personalization capabilities to products and the associated shopping experience wrapped around the shopper journey.
- Find the right balance between meeting a shopper's desire for customization and overwhelming them with "choice anxiety".
- Collaborate with manufacturers to understand what level of customization shoppers want and build an appropriate supply chain that can take modular products and turn them into finished goods close to point of sale based on the desires of the shopper.
- Deploy easy-to-use, fun interfaces (perhaps including touch, gesture, augmented or virtual reality) that are designed to make customization a delight for shoppers and engage them in two-way conversations on their needs and wants.
- Work with IT partners to begin exploring and investing in active and passive location tracking as a key component of their strategy for improving the shopper experience, and to provide shopper analytics services to manufacturers.

SMART SHELF

- Develop clear strategies for smart shelf deployments. Think about the smart shelf as a platform for delivering new services to manufacturers and exciting, valuable, personalized experiences to shoppers.
- Understand how to capitalize on the opportunity to generate returns from manufacturers by creating data-led sales and marketing leads at the shelf.
- Use analytics to match inventory exactly with real-time customer demand. Algorithms will increase the chances that a retailer has exactly what the increasingly time-pressed shopper is looking for.
- Engage thoughtful designers and user experience expertise to optimize the fit and function of smart shelves within the store environment.

SMART PRODUCTS AND NEW SERVICES

- Partner with manufacturers to start imagining (and demanding) smart products, and brainstorm bold new ways to create services that will revolve around them. Start exploring these service opportunities and either hire or buy appropriate expertise that will enable you to build out adjacent service offerings in the future.
- Consider new ways to monetize smart products and boost overall revenue including creating annuities that generate ongoing revenue streams, and new business models that allow new customers to be targeted in new ways.

REAL ESTATE AND SPACE EFFICIENCY

- Rebalance the store and channel portfolio over time to shrink footprints, increase local presence, and reallocate space towards increasing the shopper experience.
- Make more efficient use of physical space, reduce real-estate costs, improve productivity, deliver new formats, and offer maximum choice in the minimal footprint by using technology to create automated infrastructure and virtual spaces.

DELIVERY

- Partner with existing and emerging delivery providers to assure a clear line of sight to high-speed ("next hour") delivery services as they become available.
- If appropriate, consider embracing auto-replenishment services for consumables.
- Traditional retailers should prepare now for the day their immediacy advantage is removed by high-speed delivery and invest in other differentiators to boost their brand proposition.
- Consider proactively increasing the transparency of operations to build trusted relationships with shoppers.

SHARING ECONOMY

- Understand the sharing economy, its implications, and its likely evolution, and build out a considered strategy in response. Retailers will need to challenge long-held assumptions about the shopper's desire to own. Retailers that decide to partially or fully embrace the sharing economy will need to have a brave rethink of their current business models and look for ways to create new and compelling propositions for their customers, and new ways of defining and thinking about their own value.
- Understand how to operate in a landscape where resale value is an important component of the purchase decision.
- Experiment with leasing, loaning, bartering and rental services and shifting a portion of their footprint to selling used products alongside new.

DATA AND ANALYTICS

- Boost your organization's data acumen and acquire data engineering and data analytics talent.
- Understand how to use the insights derived from data to increase loyalty, build brand connections, improve efficiency, and increase profits.
- Build strategic partnerships with experts in data management, network and data architecture, security and encryption, privacy, analytics, data hosting, cloud, and storage.
- Embrace robust end-to-end security for all data, including data related to financial transactions, loyalty program systems, and personal data gathered on consumers. Tokenized security systems with high encryption and hardware-based security will significantly outperform software-only security solutions. Retailers will need to consider a regimen of regular internal security audits to catch issues early on and assure data integrity.
- Build systems that fully respect and guard shopper privacy, that give them opt-in control over how their data is used, and that allow them to remain anonymous if they so desire.
- Clearly articulate value to the shopper in tracking their behavior and deliver real value that encourages shoppers to opt in.
- Consider adding identity theft indemnification to the offering as a way to boost and sustain trust with shoppers. As personal data gathering becomes more commonplace, brands that stand behind an indemnification and remediation guarantee will probably benefit from increased customer loyalty and trust.
- Determine a data sharing strategy, build strategic partnerships with other retailers or data brokers, and determine appropriate, secure mechanisms needed to seek shopper consent and share data in a way that fully guards privacy.
- Determine a strategy for data ownership – philosophically and practically, should you own it, or should some other provider gather and own your data?

SHOPPER OF ONE

- Unify in-store and online shopping experiences and align all systems so that customers feel one seamless experience that traverses multiple channels, including a single unified inventory.
- Deploy IT solutions that offer a single view of the shopper across the enterprise.
- Build an accurate understanding of shoppers and unify customer data from both online and offline sources.
- Deliver consistent messages and maintain two-way conversations with shoppers that seamlessly span the shopper journey: physical store and all digital device types (PC, tablet, phone, wearables) without creating any friction for shoppers.

A VISION FOR THE FUTURE OF SHOPPING

The ideas explored in the retail futurecasting session illuminated an exciting array of possibilities for the future of retail. In isolation, each idea is compelling. But put them together and the opportunities to create incredible new value, amazing new experiences for shoppers, and to totally remake the face of retail are truly compelling.

Imagine the world in 2030. Many people are living in busy, vibrant, crowded cities. Many are still living in rural areas but they are increasingly connected to the wider world through technology. To bring this world to life, we end this report with a short story that explores how it might feel to experience shopping fifteen or so years in the future.

Thank you for taking the time to read the report. We hope it inspired you and offered food for thought as you plot your own personal journey in the future of retail.

Welcome to the Second Digital Era of Retail.

Science fiction prototype: The shopping experiences of 2030

by Steve Brown

Thrilled by the prospect of an upcoming trip to Barcelona, Susie couldn't wait to start packing her bags even though her journey wasn't for several more weeks. It would be a warm spring in Spain, but here in Minnesota the snow still clung to the trees and a chilling wind still whistled through the buildings. The thought of wandering the ancient streets of the old city and sampling the local Catalan cuisine already had her excited. But if she was honest, it was the inevitable shopping trips she'd need by way of preparation that were most exciting of all. Susie loved to shop. Especially these days.

Susie arranged to meet up with some friends and they headed to her local shopping mall. They were going to make a day of it. Massages, shopping, lunch, pedicures and all!

Susie was a member of a BuySmart, a shopping club that helped her find clothes and accessories that matched her style, her budget, and her existing wardrobe. She paid $10 a month for the BuySmart service, shared details on all her purchases, and had also shared information on all the important pieces in her wardrobe that she already owned, as well as many of the valuable items that littered her apartment. In return, the service provided her with a 24/7 virtual fashion and buying consultant, guided her to items she might love, rewarded her loyalty with deep discounts that she really valued, and even hooked her up with a discount on contents insurance to cover her household items. She was insanely in love with BuySmart.

Susie has already shared details on the duration, destination and purpose of her trip with BuySmart and it had sent her a personalized shopping list suggesting all the items she might need to take with her. BuySmart had taken into account the Barcelona climate, the types of activities Susie was likely to want to enjoy (shopping, eating, drinking, and walking!), the dress code and local culture. It would have recommended more conservative clothing if Susie were visiting Malaysia. She'd need some new pants, a couple of new blouses, a shawl for the cool evenings, and a new suitcase as BuySmart calculated that the current one she owned was over five years old, Susie traveled a lot, and it was likely time for a refresh.

Before they went anywhere else, Susie and her friends made a bee line for Blűmstrom's, their favorite store. They knew that Blűmstrom's offered fair prices, incredible customer service, and would be the place most likely to have exactly what they wanted. But above all, it was just a fun place to go and hang out with the girls, and as Blűmstrom members they had access to VIP fitting rooms, enjoyed extended warranties on used clothing, and a number of other benefits including free next hour shipping.

The BuySmart app on Susie's device had already contacted Blűmstrom's and picked a selection of new and lightly used clothing to meet Susie's needs. Blumstrom's knew Susie as a regular customer and based on their data they predicted that she was in the mood to spend today. They added in some additional items of their own for her to try and provided some treats and beverages for Susie and her friends to enjoy. The BuySmart app guided Susie and her friends to the VIP fitting room where they found that everything was all laid out and ready to go. The party began! Susie changed into a range of outfits using the privacy zone and the ensuing fashion show was a lot of fun. She showed off potential outfits to her friends, got important feedback, and discarded unwanted items down a chute in her changing room.

One outfit really looked great on her, but was a little too expensive for her budget this month. Being unsure on whether or not to get it, she decided to ask her husband what he thought. He was visiting an old friend in Chicago but she really valued his opinion.

"Video me", she said to the changing room. A recording light came on to indicate that the cameras around the mirror were now recording her as she spun around to show off the dress and shoes that she loved so much, but that would put a bigger dent in her bank account than she would like.

"What do you think, honey? I love it, but I'm not sure it's worth it". She then held up her arm to halt the recording and said, "Send to Eric".

Eric received the video and message from Blumstrom's on his device. He was able to see Susie's video alongside details of each of the clothing items she was wearing. He replied that she looked great, but that given the expense it might be better to wait until the outfit was on sale. Susie was disappointed but agreed and went with a couple of other less expensive items instead.

Knowing that Susie's birthday was coming up next month, Eric decided to surprise her. He ordered the outfit, had it gift-wrapped and scheduled for delivery all with one simple voice command on his device, "Buy it and ship it for Susie's birthday".

His device understood what he wanted, who Susie was, when Susie's birthday was, what items he was referring to, and placed the order. Blumstrom's handled the billing, wrapped the gift in paper that Susie would love (based on the color and taste profile they had compiled on her), and shipped it by drone two weeks later. It arrived on Susie's birthday at a time it knew she'd be home. All ready for their trip to Barcelona!

Susie eventually settled on the items she liked and paid for them with her FacePrint and a simple voice command "Buy. Confirm."

Now she needed a suitcase. She and her friends made their way to the travel department and enjoyed a fun fifteen minutes designing Susie's new luggage. Using a gorgeous 3D display, touch, gesture and voice, Susie built her suitcase and personalized it to her specifications. A virtual shopping assistant guided her through the process and the suitcase took shape in 3D before them as she shaped it to her specifications. She selected a sturdy fabric-covered plastic construction, chose the size, selected a 4-wheel design, and added an extra interior pocket to hold another pair of shoes. She and her friends had fun choosing the exterior colors, and Susie even added a personal photo covering the lid of the case. It was one that Eric had taken in Italy last year and she loved it. There was no way she would grab the wrong suitcase on the carousel any more!

When she was happy with her design, Susie paid with FacePrint and gave authorization for Blűmstrom's to have temporary access to the trunk of her car.

While Susie and her friends enjoyed a glass of wine together in the Blűmstrom's Bistro & Café, her luggage was made to her specifications using a combination of 3D printing, robot construction, and human labor. The finished product was inspected for quality, packaged, and then loaded into the trunk of Susie's car. Simply following directions in the display of his glasses, a Blűmstrom's employee was guided to Susie's car in the parking lot. As he approached, the one-time security access code she had granted to Blűmstrom's opened the trunk (but not the doors to the car cabin) and he was able to securely place the new suitcase inside.

Susie waved goodbye to her friends and hopped into her car. She still had one more shopping mission to complete before she could go home.

"Take me to Electronics Warehouse", she said.

As her car safely transported her to the nearest EW in the direction of her home, Susie thought about her grandmother. Grandma Kaye lived alone in a small, fishing village in Southern Ireland and Susie knew that she loved to be in the garden, though some of the heavier garden tasks were a bit much for her these days. A GardenBot would be a wonderful help and she'd been meaning to get one for her for some time.

The screen in Susie's car suddenly lit up. An incoming call. "Hello?" she answered. A friend was in town and had some time to spare due to a delayed flight. "Can I come by for a visit later?" Susie agreed to meet her friend and closed the video call. Yikes, she didn't have any food in!

Susie spoke to her device, "BuySmart, I need some cheese and crackers for two people".

"Certainly, Susie. What about some wine to go with it?"

"Sure, what Pinot's do you have?"

"I can get you a Domaine Serene Evenstad Reserve for $15 discount."

"OK, let's do it. Deliver in one hour. End."

The BuySmart service selected a nice slice of brie and a chunk of gouda, cheeses Susie bought regularly, and included a new blue cheese from Oregon that it calculated she also might like. It also selected crackers that would match with the cheese made by a brand Susie trusted. As a loyal customer, it also threw in some Quince paste as a nice surprise. It would help that Oregon blue go down nicely. The items were picked and packed and delivered to Susie's home by drone in chilled, secure hutch that was left at her door.

A well-dressed man greeted Susie by name as she walked through the door of Electronics Warehouse. Susie loved stores that still had people in them. The man could see from Susie's profile displayed in his glasses that she had not selected the "no greeting" option that some customers preferred.

"Can I help you find something?" he beamed.

"I'm looking for a GardenBot for my grandmother."

"Robots are all in the back right corner, next to the other appliances. Follow the yellow path."

The intelligent store, which had been following their conversation, used projected lighting and also commandeered signage on varies shelves and fixtures in the store to guide Susie to the robotic department with a soft, pulsing yellow hue. "Follow the yellow brick road" she mused to herself.

On her way to the rear of the store, she noted a display that grabbed her attention. A bright red blender sat on a shelf displaying a personalized notification for Susie—"This is on Netty's bridal registry." Susie still had to get her niece a wedding gift so she decided to make the purchase. This was one of those older shelves that couldn't speak so Susie took out her device and easily completed the purchase with a single touch.

Susie then perused the store's selection of GardenBots but honestly they all looked pretty much the same to her. Signage on the shelf recognized Susie by her device and displayed product reviews from a number of sources that it knew Susie trusted. It was even able to pull a couple of reviews written by people in Susie's social network. But it seemed that every one of the bots was actually fairly well-reviewed and so she still wasn't sure which to choose.

Emotion sensors in the smart shelf understood her facial expression and determined that she might need assistance.

"May I help you find something?" said the shelf.

"That would be great. I need a bot that can dig holes, rake, and mow the lawn. But I can't spend more than $40 or so."

The shelf analyzed the request and reviewed the specifications of the products it had on display as well as the specs of additional products it had at the warehouse. It determined suitability and reviewed Susie's profile to understand how price sensitive she was, which brands she favored, and what her sustainability and corporate responsibility requirements were. As a result it rejected a couple of options that were made by a company with a poor environmental record.

"The GardenHelper 2000 you see highlighted here in green digs holes, rakes, and carries a 100lb load, but it doesn't mow lawn. It's $34.99 today. I don't have it in stock, but the GardenHelper 2500 looks similar, has similar specifications to the 2000, but also mows lawns. It's $44 but as a special offer I could do the first six months for only $35 per month."

The shelf projected a holographic display of the GardenHelper 2500 and it did indeed look splendid. Susie was able to see it helping an older person plant tomato plants and she could imagine it helping out Grandma Kaye with her roses.

Susie was a sucker for a special offer (and Electronics Warehouse knew it) so she decided to buy the $44/month GardenHelper 2500 service. After all, she justified to herself, Grandma was worth it.

Susie arranged for a GardenHelper 2500 bot to show up at Grandma Kaye's house the following day and recorded a personal video message that the robot would play when it arrived. "I hope you enjoy this bot! It'll help you in the garden and I've paid for three years of service so he'll be your friend for a while. By the way, I named him George! Love you!"

Susie remembered her impromptu guest and raced back to her car.

She wanted her place to look and smell nice for her friend's visit so she had the car pull over at the convenience store near her home. As Susie ran into the store it sensed that she was in a hurry and made no attempt to engage her in conversation. Susie had an account with the store and so grabbed a bouquet she liked and let the automated store and her device handle the rest between them. Cameras recognized the type of flowers Susie had selected and securely billed Susie's account.

Remembering her friend liked ice cream, she whizzed over to the frozen food section and spoke to the fridge, "What's Meg Mauer's favorite flavor?" The fridge consulted Susie's social network and tried to ascertain her friend's preferences. Meg had not chosen to opt in to any shopping assistance service and so the fridge simply replied, "Unavailable".

"Oh well, who doesn't like chocolate", she thought, grabbing the Deluxe Double Chocolate Brownie gelato. Susie dashed to her car and headed home to meet her friend. She grabbed the cheese and wine from the cool box outside her door and touched the CollectMe button. As Susie's door opened to let her inside, a drone that had just dropped off a package to a neighbor, swooped down from the sky and picked up the empty cooler box and returned with it to the delivery depot.

A few weeks later, Susie and Eric were getting ready to leave on their trip to Barcelona. Their house knew they were leaving as they securely shared their calendars and other personal data with it. Over the last week the meal plans the house had suggested were designed to use up any food in the fridge that would have spoiled while they were away.

Eric loaded Susie's new luggage into the trunk and was pleased to see the photo he'd taken adorning one side. As they began their journey, Eric and Susie were able to focus on their excitement for their trip to Barcelona and didn't have to even think about all the standing orders they had for food and other deliveries.

As they sped to the airport, the house quietly cancelled all their deliveries of milk, eggs, juice and other regular items Eric and Susie consumed, put itself into sleep mode, and patiently awaiting their return.

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As a futurist, Steve synthesizes technological, demographic, social, business, economic and market trends to understand how technology will shape the future of all the major industry sectors. As Intel's Senior Industry Advisor to the Retail, Hospitality, and Consumer Goods industries, he is responsible for building a compelling and achievable vision for the future of retail and hospitality. He then works with Intel business groups, industry partners and retailers to bring those visions to life.

Steve joined Intel in 1989 and has held a wide range of positions spanning strategic planning, marketing, engineering, manufacturing, management and communications. Steve remains tightly coupled with Intel's long term technology planning process and is a popular keynote speaker, writer and analyst on the topic of the future of computing.

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David Roth

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David started his career at the House of Commons working for a member of the UK Parliament. He swapped politics for the cut and thrust of advertising. Joining Bates Dorland, he became main board director for strategy and Managing Director of the consulting and digital divisions. David was the CEO of the worldwide retail and technology centre of excellence.

David joined Kingfisher's B&Q plc, one of Europe's largest retailers sitting on the main board of directors as UK and International Marketing Director.

David is now at WPP as the CEO of The Store, EMEA and Asia, the WPP Global Retail Practice. David also leads WPP BrandZ, the world's largest brand equity study.

David is a non executive director of NGO, TFT, an organisation dedicated to sustainable production and on the board of The Judge Business School, Cambridge, Centre for International Business and Management.

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