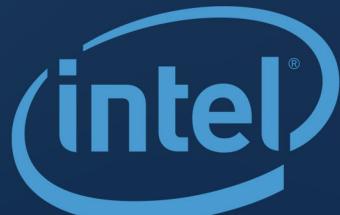


# The future of retail through the **internet of things**

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# Executive summary

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**It may be one of the worst technology buzzwords of all-time, but the Internet of Things (IoT) is on the cusp of changing all business sectors, including the retail industry.**

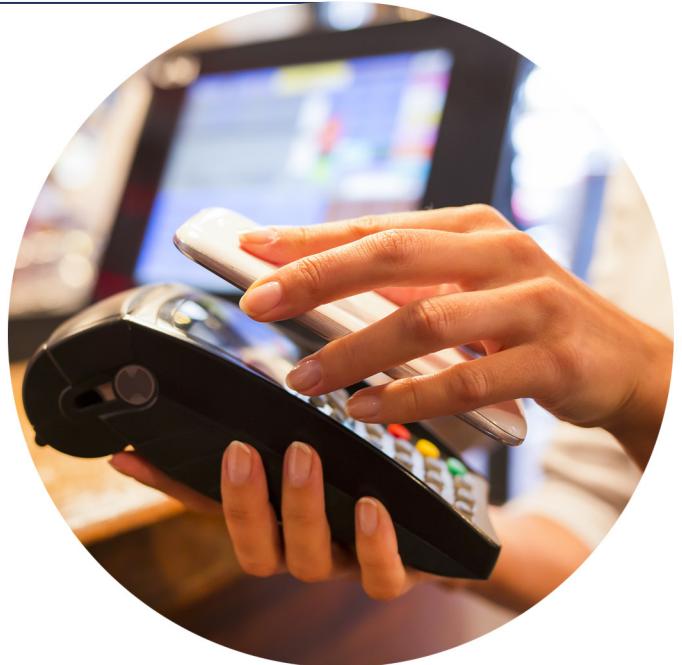
The Internet of Things is about to get serious. Forget the hype and those analyst figures, for these technologies are about to make your retail business smarter than you can possibly imagine. Let me explain why.

IoT is the catch-all term used to describe machine-to-machine (M2M) connectivity, where sensors and hardware devices communicate with each other on their condition and whereabouts. There's nothing overly smart about this of course, but there is when machine-learning and Artificial Intelligence (AI) combine to take this data and turn it into something meaningful for the user, or for the business.

The over-used example of IoT has been of your fridge reminding you when you're out of milk, and ordering on your behalf, but IoT goes so much deeper than that. It has a huge impact not only for your business, but also for your industry.

It takes us to an age of smart cities, autonomous cars and connected homes. Businesses can leverage the real-time data coming from IoT sensors to know when a product is about to go out-of-stock, or what their customers have bought that day.

In addition, they can see when staff are unwell or absent, or when office equipment needs to be repaired or replaced. Going forward, it is argued that soon we, as people, will soon simply be moving, connected "things".



## Why is the Internet of Things a big deal in retail?

Here at the [Internet of Business](#) we are already seeing companies take full advantage of this nascent trend.

We've reported on retailers rolling out smart shelves and robotic sales assistants, as well as using sensors and RFID tags to monitor goods, and see how a store is performing (there are numerous examples below, and throughout this in-depth whitepaper).

Indeed, along with manufacturers and utilities companies, retailers are arguably at the cutting-edge of this trend.

# So what about IoT and its impact on retail?

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In this whitepaper, we investigate this question with senior decision makers from leading retailers American Apparel, Asos, Benetton, Coop Italia, Dixons Carphone, Ocado, Waitrose and many others.

This whitepaper is a summary of our findings from those interviews, which were carried out in June 2016.

Our findings are that, by adopting IoT, retailers transform and become experience-based retailers. They combine the online and in-store experience for customers, and turn the store into a place of entertainment, thanks to the rise of Virtual Reality, Augmented Reality and data analytics tools.

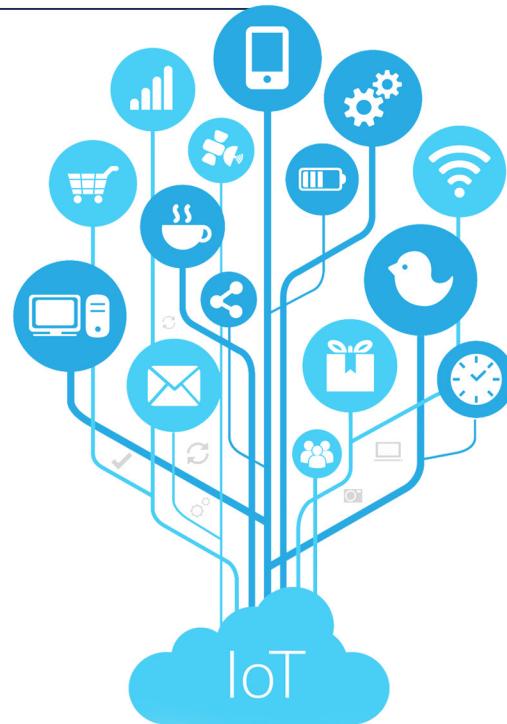
Indeed, it is clear that the Internet of Things is already having a significant impact on the retail industry, and on everything from improving the in-store shopping experience for customers to making retailers much more profitable, efficient and unique.

IoT offers retailers the ability to connect both things but people. This gives retailers far greater insight on who their customer is, how products are performing, and new ways of engaging with new or existing customers.

Alternatively, these technologies can help retailers to introduce new products or optimise store layout. And while it is early days for IoT in the retail sector, there are already some wonderful case studies, as this whitepaper explores.

We've seen American Apparel using RFID tags and data analytics tools to improve inventory management, US retailer Kroger utilising sensors in containers to monitor goods on the move, and Tesco, John Lewis and others launch smart devices so mobile payment can be taken around the store (and not necessarily at the checkout).

Walmart has rolled out robotics for greater efficiency and customer service, whilst



packaging and labelling giant [Avery Dennison](#) is using IoT sensors to track up to 10 billion items.

According to the 2015 Global Shopper Survey, 96 percent of retailers are ready to bring IoT devices into their operations in the hope that it will strengthen relationships with consumers. These same retailers also hope it will help them to track stock levels and better analyse customer data – an area where most retail firms will admit they fall down.

Some of this innovation is coming from outside the industry of course, and from technology giants in Silicon Valley. [Amazon's Dash button](#), in particular, is one of many devices looking to revolutionise how, when and where we buy products.

In this whitepaper, carried out by Beecham Research and on behalf of Intel, we look at how the Internet of Things will impact retail, the opportunities and challenges ahead, and what you need to do to get your IoT strategy in order.

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# Research methodology

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**Since 2013, Beecham Research has explored the impact of the Internet of Things (IoT) in the retail sector.**

This has been reflected through several activities, including speaking at conferences and writing thought leadership articles in industry publications. But, most importantly, industry knowledge on the topic of IoT in retail has increased dramatically in recent years.

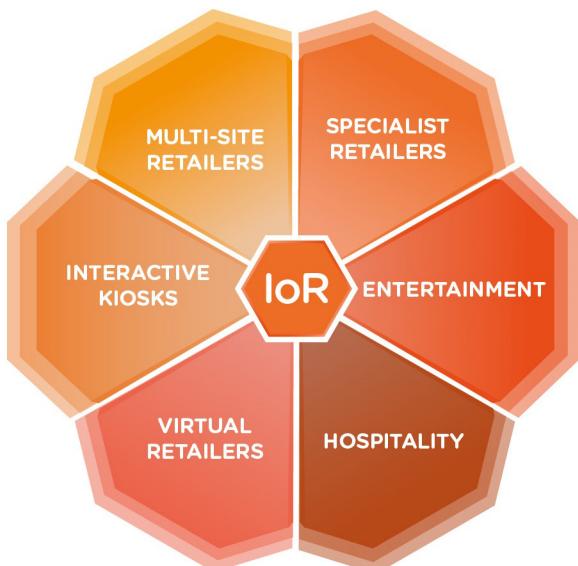
This whitepaper is built around that knowledge and enriched by a number of interviews the research team has carried out with retail experts. These interviews took place in June 2016.

The research team has focussed on retailers to understand their challenges and how the IoT can help them overcome those challenges.

The research team ran ten interviews with large retailers operating in the following fields: fashion retailing, food distribution, online shopping, and consumer electronics.

These interviews were with senior managers responsible for technology and innovation. The interviews were based on a short discussion guide. The output of this process has provided qualitative insights which are discussed in this whitepaper.

## THE INTERNET OF RETAIL



# The digital transformation of retail

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## The effects of digital technologies on consumption

The last thirty years of technological development has taken individuals and societies into the information age.

The Internet, and the subsequent adoption of mobile technologies and devices, has affected all realms of our daily lives.

The access to knowledge has multiplied through the introduction of new channels, like websites, mobile applications, and social networks. On one side, this should – in theory - help us to make better informed decisions. But, on the other, it has also created a state of entropy, with too much market choice and little to choose between the competition.

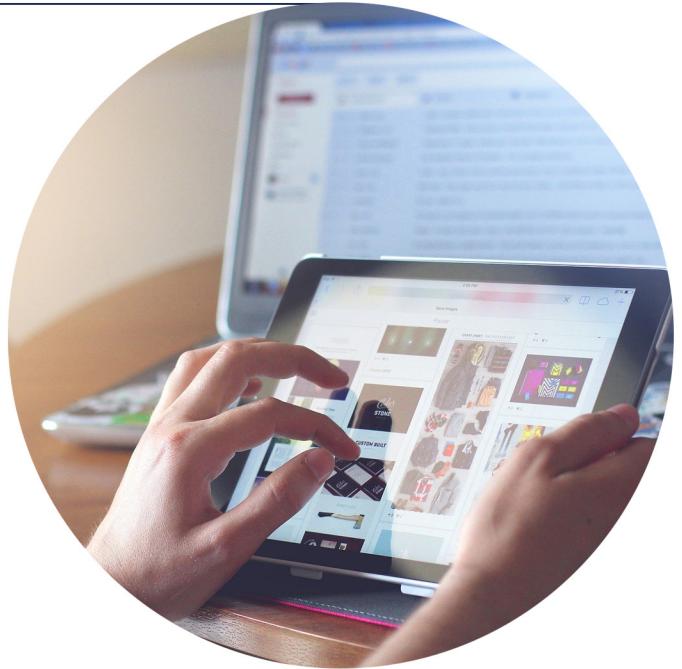
In this state of entropy, feelings, logic, and values – the human aspects – use the tremendous amount of digitally-produced knowledge in order to make choices and take actions.

However, digital technologies do not just open unlimited sources of knowledge.

They also introduce tools that help us to process and understand that knowledge (through data analytics tools), predict new thoughts or feelings based on that knowledge (predictive tools) and support our decisions. And maybe, in the coming future, these digital technologies might even take decisions on our behalf (Artificial Intelligence).

When we look at the impact digital technologies have had on our lives, and our daily decision making process, shopping is a fine example of just how things have changed in recent years.

In the pre-Internet era, the purchase of an item of clothing was experienced in very similar ways by almost all consumers.



They could browse fashion magazines, identify an item they liked, and then share their views with their family and friends. They would then go in-person to the store, where they would try a number of different items with the help of a shop assistant.

Consumers could then choose to buy the item, or leave the store to go to another.

Today however, the widespread use of the Internet and smartphones has opened up new knowledge channels for consumers.

Consumers now find themselves faced with a diverse, rich, and immediate flow of information about the item of clothing they want to buy.

This flow of information follows them wherever they go. Using their smartphone, they can see products, read reviews, share opinions, switch from one online shop to another, and purchase the product. And they can do this wherever they are, and whenever they like.

# The digital transformation of retail

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## Different attitudes towards consumption

It would be wrong, however, to believe that every individual embraces digital technologies in the same way.

The variety of new knowledge channels has the contradictory effects of richness and entropy. Human aspects, as discussed previously, remain fundamental and each individual reacts and uses digital technologies slightly differently, based on factors such as age, gender, culture, values, and feelings.

As a result, these factors create a very diverse audience with very different attitudes towards consumption.

It would not be an exaggeration to say that the concept of mass consumption – the idea where everyone tends to buy the same item in the same way – is weakened.

With digital technologies, consumers become more aware of their possibilities. Consequently, they want to personalise their shopping experience. They want to stand out from the crowd. But they also want to exploit the power and ubiquity of technology for more convenient and engaging ways of shopping.

In a nutshell, digital technologies empower consumers, without dominating them. Therefore, the consumption scenario has become very complex.

## Towards experience-based retailing

The complexity and flexibility of consumption behaviour dictates a dramatic change in retailing. That change should be consumer-centric and so new retailers should be fluid, flexible and happy to adapt.

The new retailer should become experience based and should be able to re-design that experience based on the change of the consumer's behaviour. This experience-based approach should happen through all the channels of engagement with customers.



## These channels are as follows:

**Physical stores:** The store is not necessarily the point of sale anymore. Today it takes on new roles, such as a place of entertainment. There are also new ways of being a physical store, such as a pop-up store where brands operate in specific locations for limited amounts of time.

**Online stores:** This is the e-commerce platform for buying and ordering goods, a platform that is becoming increasingly customised through the use of data analytics tools.

**Social media:** This remains a key channel for engagement between brands and customers and for building brand awareness and customer loyalty. Social media sites are also becoming online selling platforms.

**Mobile communications:** Smartphones and tablets are used for engagement with brands and as a source of information through mobile applications. These same mobile applications are also increasingly being used for consumers to buy products directly from online stores.

**Public spaces:** Brands are leveraging public spaces to engage with their customers. For example, they do this via the introduction of kiosks in shopping malls, and QR barcodes and NFC readers at bus and train stops.

# The digital transformation of retail

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## Designing an experience-based retailer is not an easy task

Transforming like this can have a dramatic impact on the operations and the management of the retailer.

To combat this, some retailers have taken to introducing a new senior role, called the 'Chief Experience Officer'.

The Chief Experience Officer is in charge to design what this experience-based retail should look like, to understand the challenges in undergoing this process, and to evaluate which set of technologies will best create the best experience for the customer.

There are various channels which can be used to create an experience-based retailer (as discussed above), and there is not one solution for all customers and for all times. The retail environment, both physical and virtual, is forever changing.

The Internet of Things vision is all about context or spaces and the situations they exist in. Our interviewees believe that the IoT vision is ideal for creating the experience-based retailer.

The following section of this whitepaper will explore in more detail the challenges raised by this emerging retailing model, as well as how IoT technologies are able to respond to that challenge. The whitepaper will also analyse some specific retailing cases such as consumer electronics, supermarket and food, and fashion.

## The challenges of the experience-based retailer

Our research reveals that, in order to create an experience-based retailer, there are common challenges among the different segments of retailing.

## There are five key concerns that are in the mind of board members:

- Moving from generalised to personalised interactions with consumers;
- Managing customer engagements and dealing with customer retention issues;
- "How they continually manage and evolve their omni-channel strategies given the number of connected devices coming into the market, such as wearables and smart home devices."
- Understanding the impact of changing customer relationships (i.e. the changing behaviour of the younger generation, increasingly smart forms of urbanisation, different levels of education, people living in different areas, new modes of living)
- Understanding and managing the new horizon of security threats, both physical and virtual (cybercrime)

## There are other challenges highlighted by some of our interviewees such as:

- Adaptation to different regulatory environments, particularly in relation to consumer data privacy legislation;
- Managing the delivery of goods to consumers is a key challenge for online retailing activities;
- Managing and controlling supply chain and stock control.

The following part of this chapter analyses those challenges in the context of specific types of retailers.

# The digital transformation of retail

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## Consumer electronics

Out of all retail segments, one of the hardest hit from the digital era has been consumer electronics.

The industry has been affected by the rising popularity of online shopping services, such as Amazon and eBay, where the same goods have often been offered at cheaper prices. At the same time, these online retailers haven't had to contend with managing bricks-and-mortar stores, or deal with the overheads that come with them. While online sales continue to grow, traditional retailers are looking for new ways to engage the customer in order to attract them back to the store.

This is a challenge for retailers because consumers have seen the benefit in online shopping; they like to compare prices, save money and view online feedback from a large number of buyers/users. That said, customers still occasionally like to speak to sales staff, because this might save them time on product research, especially if speaking to a specialist who knows the market well.

As a result, consumers increasingly use traditional stores as showrooms where they can view the goods and try them out before buying online, despite the dwindling need to see the device physically before purchasing.

In the retail price war, traditional retailers have had to price-match online prices, despite the store having higher costs. This makes it a really hard task for traditional retailers to attract consumers to the store. One way the IoT can resolve this is by using digital signage that offers connection to social networks and consumer feedback, all with the customer in store. This reduces the need for consumers to refer to mobile devices for that same information.

At the same time, these digital signage displays can also suggest related goods on offer, or point the customer in the direction of goods that would complement their purchase.



Of course, there are other ways of attracting the customer. The other important marketing tool is being able to understand consumer behaviour and to attract the consumer by putting an advertisement in their mobile phone's notification bar when they pass the store. Alternatively, retailers could also use this to offer help when the customer is inside the store. The store also offers a unique opportunity to see an item in real-life, to try it, as well as get an introduction of the best way to use the new item by the sales assistant.

If, as part of this conversation with the customer, the sales assistant is able to check the availability of the product and complete that transaction seamlessly, it would then become almost second nature to the customer. The item would be paid for during the conversation.

This is where the IoT can offer great benefits. For example, the sales assistant could check the availability of the item in-store using their smartwatch, which is connected to the database of all items that are connected to sensors. At the same time, the assistant could show the customer how the item works using a tablet. The sales assistant could then use the same tablet and an mPOS solution to complete the transaction in minutes.

# The digital transformation of retail

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Many retailers struggle with logistics. At the end of the transaction, the consumer has to have a choice of either collecting the item in-store - which should be available before the consumer leaves the shop - or by home delivery.

Home delivery services also continue to be tricky. Delivery services, in most cases, are done by third-party courier services and their reliability tends to depend on the courier services of that country or region.

In a number of countries, the deliveries are usually done within 24 hours of purchase. More and more couriers offer a time slot for delivery, responding to consumer demands as they want to get their goods as soon as they have completed a purchase.

## Supermarket and foods

Over the years, the retail industry has seen a number of changes that revolutionised the consumer experience.

The last significant change was the introduction of supermarkets initially, followed by hypermarkets, which transformed the consumer's need of going to the market or shopping at a specialist retailer. Instead, they could do all their shopping under one roof, in one store. The growth of supermarket chains also changed the production process with many of them having their own manufacturing facilities.

Despite the popularity of supermarkets, which had a significant effect of reducing a number of small local specialty stores, they did not wipe out local delicatessen shops.

In the 1990s, online shopping emerged, but when it came to groceries it had mixed fortunes. Indeed, this area has taken much longer to get it right than in other areas of retail.

Supermarket customers were divided between primarily online and offline shopping.



As with supermarkets, the main benefit of online shopping (including mobile) for consumers is to save shopping time.

Customers can order goods from the comfort of their home or - given the high uptake of smartphones and mobile Internet - from almost anywhere in the world.

Furthermore, once the customer has identified their preferred goods, all later purchases can be done so much quicker because the system pre-selects their items for them.

This appeals to certain categories of customers, and in particular those who don't have much time and consume similar items on a weekly basis.

# The digital transformation of retail

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**Food shopping** will arguably always be bought from physical locations. There will always be food lovers that want to be able to feel, smell and test products at the time of purchase and some don't feel comfortable in trusting somebody else to choose their goods for them. Some view it as a pleasurable experience and as an opportunity to try something new, often resulting in impulse buying.

While online experiences can drive some customers away from visiting traditional stores, the IoT may ease the experience for others. For example, upgrading stores and equipping them with sensors can assist customers and sales assistants to locate specific goods. In addition, digital displays that can read sensors on goods can inform consumers of food descriptions or nutritional values.

Furthermore, retailers will be able to save cost on the number of staff needed for relabelling goods. For example, the latest price could be displayed as part of the goods description on the digital display, together with suggestions on related goods or special offers.

In the groceries market, retailers also identify the importance of omni-channel, which merges the online and offline shopping experience.

As with other segments, deliveries are a huge challenge. Logistics has improved over time and now the majority of grocery retailers offer one-hour deliveries with some narrowing it down even further.



## Delivery is crucial for online services

The other main consideration that needs to be taken into account when we are talking about the groceries sector is that a large number of products have a short shelf-life, which requires additional care.

IoT can be hugely beneficial when it comes to looking after such goods. A number of technologies have already been deployed to ensure that the retailer delivers the right product to the customer, with its condition maintained from shipment to arrival. The IoT can also help to ensure that the package due dates are correct.

# The digital transformation of retail

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**This digitalisation** can improve quality control as well as providing the retailer with information of exactly what is going on with the pre-packed product, for example. In addition, this will help the retailer to better plan waste management resources while reducing wastage all together. In itself it will also assist retailers with regulatory compliance as a number of countries under health and safety regulations require food retail and catering businesses to report on their equipment.

This helps to prove that frozen goods have remained at a constant temperature to avoid freezer burn etc. Instead of recording this information manually and using staff to complete this task, an IoT-enabled device would do this automatically while recording any issues. This reduces the cost of servicing equipment as it can be controlled using the digital diagnostics, thus avoiding business interruption.

With rising energy costs around the globe, IoT products will also help businesses save money. Take a freezer for example: instead of being on constant deep freezing mode without considering outside influences, a 'smart' freezer will adjust the temperature. When a freezer has not been opened for some time, it may reduce the energy output to maintain temperature. If a door is left open, it will send an alert so that it can be closed and no energy is wasted.

Going forward, and as part of this seamless shopping experience, retailers will also need to look at how retail (and shopping) works alongside the growing trend for 'smart' homes. As the number of smart home devices will continue to grow, we expect a trend of smart devices being able to do a number of retail-related things, such as updating shopping lists.



## Fashion

There is not "one model fits all" approach for the future of fashion retail. The consumer landscape is incredibly diverse, and the Chief Experience Officer at a fashion retailer will face all the challenges that come with being an experience-based retailer.

Omni-channel initiatives offer fashion retailers the ability to cover everyone and everything, and these are to be encouraged and adopted. But, on the other hand, the community-centric strategy – an approach which is very focussed on specific consumer groups - is limited to small-size and niche fashion stylists. The objective becomes to be able to understand and manage a continuous, unstructured, and diverse interactions between brands and consumers.

Some of our interviewees are looking into a sustainable approach – sustainable in terms of costs, expectations, and success. This is based around three concepts, of profiling, flexibility and diversity.

# The digital transformation of retail

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**Profiling** is the necessary intelligence behind any fashion retailer strategy.

**Flexibility** is the ability to move along the spectrum of consumers and being able to serve part of it, renounce to another part, and identify new groups.

**Diversity** is the ability to use the appropriate channels to serve the appropriate groups of consumers.

In this approach, the future fashion retail will be structured around a limited number of stores supported by digital channels. The number, the style, the function of the stores and of the digital channels will depend on the consumer audience.

The main objective remains capturing the moment of purchasing wherever they are.



# The Internet of Things: enabling experience based retailing

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**Our interviewees agree** that the Internet of Things vision will bring about the introduction of the experience-based retailer, as well as help them face the challenges that this whitepaper has previously discussed.

And this finding is in line with an increasingly mature retail sector when we look at the understanding and deployment of the Internet of Things.

Retailers in all segments are already looking at and implementing sensors and beacons which assist in dealing with logistics, fleet management and item location. For example, some use robots that collect purchases from the warehouse where each item is ready to be boxed and shipped out.

Some, like the Italian grocery store Co-op, developed a so-called 'supermarket of the future', by bringing together an ecosystem of IoT players. Their supermarket of the future blends old-fashioned open displays and in-person interaction with large interactive display screens that offer customers information on the food they're buying, from nutrition facts and allergy warnings to carbon footprint data and even recipes and wine pairings.

The American supermarket giant Kroger, meanwhile, already uses sensors to keep frozen foods at their optimum temperature. They have equipped refrigerated containers with sensors that check temperatures every 30 minutes, with these systems then able to alert store managers and facilities engineers if and when these levels drop too low. Previously, employees would manually check the thermometers twice a day.

A typical Kroger store's temperature monitoring system has more than 220 tags connected to a network that uses the ZigBee low-bandwidth wireless network protocol. Nearly half of the chain's 2,600 stores have the technology; a complete roll-out was expected to be complete by early 2016.



Carrefour, the French multinational retailer, has launched a newly refurbished hypermarket in the French town of Lille. The system will allow the 2.5km of newly installed LED lighting to send data to smartphones by way of visible light communication (VLC) – an approach that essentially sends binary information by turning the lighting on and off faster than the human eye can detect.

[The success of Ocado](#), with its IoT warehouse solution, is already creating interest from the industry.

Ocado is set to sell its smart machine-laden automated warehouse technology to other retailers, although it is not at present. The platform was created in-house by Ocado, and it effectively automates the majority of the firm's retail operations from order to fulfilment.

When it comes to mobile payment systems, retailers are looking to deploy the most widespread options, including NFC technology, PayPal, Apple Pay and QR-codes.

These examples represent various groups of technologies that together enable the IoT vision in retail. The whitepaper will discuss those briefly.

## In-store technologies

*Defining the role of the shops within new strategies is a key challenge for fashion retailers.*

There appears to be industry consensus that stores are still extremely important in fashion retail. Their main aim is in creating a rich and human shopping experience in the store. Currently, technologies used to achieve that are: digital screens, virtual mirrors, virtual tables, virtual mannequins, Augmented Reality (AR) and mobile applications on tablets.

But shops are not solely about experience. They have to be able to capture the key decision moment of buying or not buying. Stores have to be able to transfer knowledge about items real-time through RFID tag, barcodes, and NFC readers. Stores have to allow consumers to buy on the spot through mobile commerce solutions, or through shop assistants equipped with tablet and mPOS able to perform transactions.

## Technologies for business agility

These next technologies are not directly perceived and touched by consumers, but they represent the backbone and the brain that enable retailers to develop their presence over different channels. There are two fundamental ranges of technologies within this group.

The first range relates to the technologies that enable connectivity within stores. These are indoor wireless connectivity solutions, primarily mobile networks and Wi-Fi. The second range regards technologies that enable the storage and manipulation of data. These are mainly cloud-based solutions.



## Consumer and market data analytics

Data is at the centre of all retailing activities. It is the blood of modern retailers. Consumer and market data are then essential for understanding consumer behaviour and patterns over the different channels.

Business intelligence and data analytics suites are critical to draw value from data. Retailers can profile consumers, segment and group consumers, predict behavioural purchasing, analyse channel traffic, compare channels, optimise marketing campaign and spot new opportunities.

## Online and social technologies

The fashion retail presence on the Internet through e-commerce has been the first move towards multi-channel platforms. With the advent of social networks, these e-commerce platforms are linked to the brand's presence on social networks such as Facebook and LinkedIn. There are also social e-commerce platforms such as Magento and shop-building platforms.

However, social media plays a key role in terms of engagement with customers and therefore product marketing. Facebook, LinkedIn, Google+ are key platforms. But in the fashion industry, Instagram and Pinterest are gaining strong momentum.

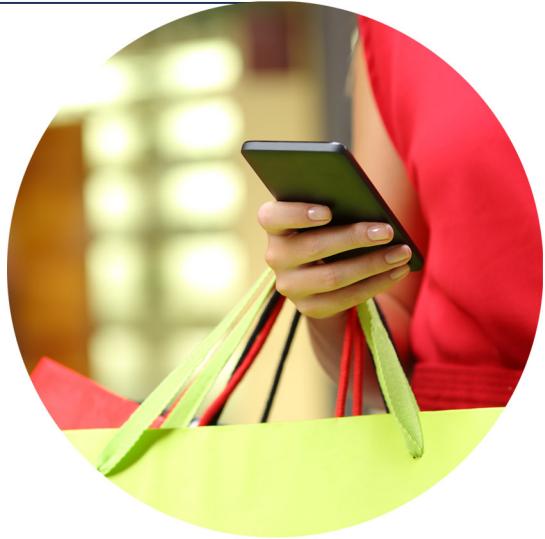
## Mobile technologies

Currently, smartphones and tablets are the key interface between online and mobile consumers and fashion brands and retailers. This interaction has to be nourished through mobile applications, and these should also become the bridge with the in-store experience. Ideally, consumers should be able to interact with in-store technologies through their mobile devices.

That exchange should help the final decision of buying or not buying. In addition, mobile payment solutions – Internet-based and NFC-enabled – are fundamental for enabling the purchasing experience from anywhere and at any time.

## Vending machines and intelligent kiosks

The world of vending machines is not new to retailers. However, the application of M2M technologies and then the rise of IoT technologies has taken vending machines to another level of sophistication. Intelligent kiosks can not only be monitored but controlled remotely and actions can be taken at different levels from predictive maintenance activities to pricing changes.



## Emerging IoT technologies

The technologies discussed so far are widely recognised in the retail community as key enablers for the experience-based approach. However, there are a plethora of technologies emerging from the IoT vision that can be of great impact for retailers.

Our interviewees believe that AR/VR and wearable technologies can be very relevant in customer engagement. They believe that data analytics tools – with their ability to collate all data from customers and the supply chain – will also be very important going forward.

Various forms of devices, like digital mirrors, intelligent shelving and so on, will increasingly impact the look and feel of stores.

Finally, new concepts arising from the IoT community are creating new channels and opportunities. Our interviewees believe smart cities, smart home, and connected cars – in other words the intelligent spaces in which we now live – are the focus for new customer engagement.

## IoT in retail – the market offerings

The number of technologies discussed previously implies a rich ecosystem of players involved in the IoT in retail market.

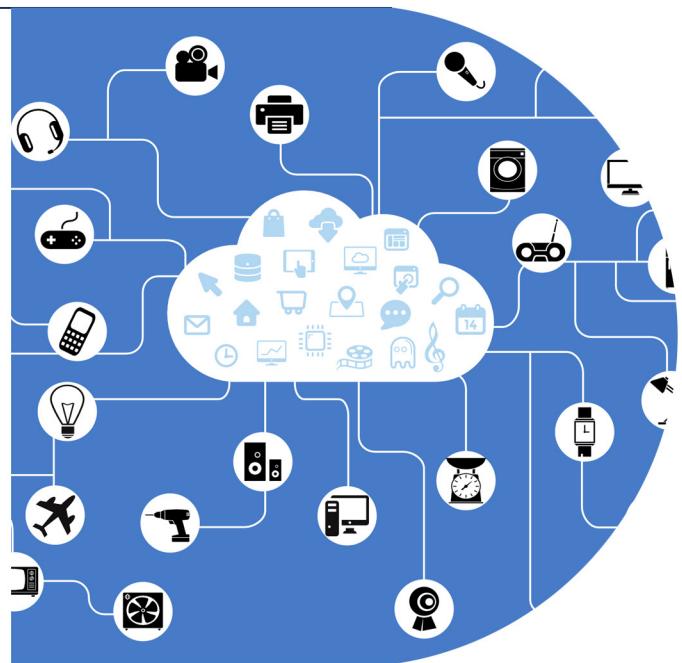
However, this ecosystem has only truly emerged in the recent years, with most industry players tending to focus on other sectors, like transport and energy.

Retail has emerged as a serious market for IoT players in the last two years but it remains an early adopter market. As of today, our interviewees believe that there are very few companies able to respond to the challenges of the experience-based retailer.

Among the interviewees, Intel was recognised as one of the leading players in offering a strategic approach to the use of the IoT in retail environments. Some of the interviewees appreciated Intel's horizontal approach, through its Retail Sensor Platform.

Some other interviewees also appreciated the firm's capacity to offer different solutions for different needs, such as vending machines and intelligent kiosks.

Our interviewees believe that the experience-based retailer faces a changeable environment. Therefore, the Chief Experience Officer must create an ecosystem of technology players which caters for all aspects of retail, from the supply chain to the customer.



In addition, this flexibility can drive new ideas in terms of using existing channels, creating new channels, and generating new revenue streams. This creative ability is essential for exploiting new scenarios and changeable consumption behaviours.

In a nutshell, the Chief Experience Officer should face a dynamic environment with a set of trusted partners.

Intel is recognised to be a necessary partner for that journey. In the next two chapters, we will show two situations in which IoT retail technology has enabled the creation of experience-based retailers.

# Intel case study: Levi Strauss

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## Background

According to McKinsey & Co, inventory distortion - in the form of overstock, stock-out and shrinkage - represents just over \$1 trillion worth of losses for retailers world-wide. Furthermore, McKinsey estimates that the potential impact of IoT on retail will range from \$410 billion to over \$1 trillion per year by 2025.

In 2015 Intel began working with the clothing manufacturer Levi's in a proof of concept to deliver near real-time inventory monitoring in the Levi San Francisco store. Intel has since marketed this system under the name of the Intel Retail Sensor Platform.

## The deployment

RFID tags are placed on all the items in the store. Data readings are forwarded to Intel gateways, and then pushed back to back office systems for cloud-based analytics.

RFID antennas are always on, gathering and disseminating the Stock Keeping Unit (SKU)-level data on a constant basis. Since the system is continuously scanning for products, it is able to locate and account for every item on the sales floor at any one time. The system provides alerts to allow stock to be replenished when running low. Intel has designed its reader to be simple to set up and calibrate. Once the plug-and-play device is connected to an Intel gateway via one wire, it begins collecting and forwarding the inventory information.

Dan Gutwein, director of Intel's Internet of Things retail solutions division, said: "Because of the way that we constructed the network, when we turn them on we have about 85 percent read rate; then after four or five days the read rate gets closer to 95-97 percent... the sensors can see movement, and as long as the store is being shopped we will get as close to 100 percent inventory accuracy very quickly".



Intel has also been developing sensor capabilities with video analytics to analyse the way customers move in the store, to help the retailer optimise the layout and placement of the merchandise.

## Product details

- The Intel Retail Sensor Platform
- An Intel-based gateway located at the back end of the store forwards the data to the cloud
- The Trusted Analytics Platform (TAP) is part of the cloud-based solution. It provides tools, algorithms and engines to work with data scientists to conduct advanced analytics
- Additional hardware, software and services are provided from third-party systems integrator partners – including SATO, RetailNext and Smartrac. External APIs enable software developers and solution providers to integrate new and adjunct applications such as inventory location tracking.

# Intel case study: Levi Strauss

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## Results and benefits

### Visibility of inventory in real-time to improve efficiency:

Levi's team now gain near 100 percent visibility into what is on the shelf or what might be running low at sub category level (size, colour etc.).

This makes the process of inventory management more effective and empowers store staff with the tools to deliver superior customer service. This means that when the customer enters the retail store looking for a specific fitted pair of jeans in a specific size and colour, it can be found rapidly on the shelf; hence staff spend less time checking the back inventory room for sizes.

### Reducing inventory costs:

Because of the system accuracy, the store no longer needs to carry extra inventory, thereby saving associated costs.

According to McKinsey, reducing stock outs and overstocking can help lower inventory carrying costs by up to 10 percent. Having an inventory tracking system in place also deters the theft of merchandise by both staff and customers.

### Improved understanding of customer behaviour:

The system records not only when the item has been sold, but also what items have been touched and tried on. In addition, as well as being fully informed about their stocks, store staff gain a better understanding of customer traffic and local demand.

The retailer is able to identify premium traffic areas, learn how customers interact with specific items, and learn which products are abandoned and which are preferred. McKinsey estimates that optimising store layouts can increase productivity by 5 percent.



### Misplaced items and poorly stocked shelves can lead to lost sales opportunities:

McKinsey estimates that offering customers the exact items they are looking for – particularly luxury items – can raise sales by up to 11 percent in some areas;

### Identifying new usage models and retail applications:

The platform enables the Levi analytics team to aggregate data from multiple edge sensors. This affords a wider insight as to how inventory moves as part of the supply chain. In addition to supporting superior insight into how stock moves, the information provided can suggest new usage models and new, innovative retail applications.

### Better customer experience:

For customers, their privacy is preserved. They can use a smart fitting room app which allows their selected garment to be viewed in a fitting room on the screen. If needed, they can request a different size from the sales person without leaving the fitting room.

# Intel case study: Costa Coffee

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## Background

*The International Vending Alliance (IVA) has some 82 members worldwide that operate 1.7 million machines in 70 countries.*

It has grown increasingly concerned about the decline of the vending industry, particularly as sales are lost to customers preferring new ways of buying, such as touchscreen kiosks.

The IVA partnered with Intel to develop a 'smart black box' solution for vending machines. This aims to accommodate the new features that consumers want, such as cashless payments, touchscreens, as well as enable vendors to respond more rapidly to consumer tastes.

Joe Jensen, worldwide VP and General Manager for retail solutions at Intel, explains: "Manufacturers have been eager to incorporate new features but have struggled with hardware based machines that are largely siloed and have varying protocols".

These factors make it hard to rework the core of the vending machine to add the desired new features.

## Product details

The 'smart black box' vending solution incorporates multiple hardware-based components onto a single software-based platform. The system offers a wide range of new features including:

### For customers:

- Cashless payment options
- Touch screen mechanisms for customers to make selections
- Interactive digital signage

### For the vendor:

- Remote management with online monitoring and diagnostics
- Reliable remote monitoring of temperatures for hot or cold beverages
- Reliable data on which to base product and campaign data analytics
- New technologies for customer loyalty, including using a smartphone app that allows machines to communicate with customers through beacon technology.

The box is based on the Intel Vending Reference Platform, a secure architecture that streamlines systems and protocols and powered by Intel vPro processors.

To comply with VAT (value-added tax) collection, the platform incorporates a cloud-based fiscal compliance feature based in Intel technology. Intel claims the Box is easy to build into new and existing vending machines.

The network connectivity part of the solution is provided by Jersey Telecom. A SIM management platform provides real-time connectivity status and control.

# Intel case study: Costa Coffee

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## The deployment

The example here is of the Costa Express CEM-200 intelligent vending solution provided by the Costa Coffee chain to its concessions.

The hardware is based on Intel's low power dual-core Intel core i7-3517UE processor, integrating graphics and supporting several display interfaces. Rather than using hard drives, the system uses the Solid State Drive 520 series. It consolidates several functions onto a single Intel processor board, thereby lowering the total cost of the system.

The coffee machines also have a range of built in capabilities including Bluetooth connectivity and social media links. Touchscreens replace buttons to allow users to navigate through product information and make selections. The machines also accept credit and debit cards.

The analytical part of the offering consists of the Intel Audience Impression Metrics suite, which gives the vendor customer metrics such as demographics and impressions.

It comprises AVA (Anonymous Viewer Analytics), AIM Counter (a viewer capable of recording and analysing a video stream of the customer), and a web-based reporting system allowing data analysis. All this comes with a cloud-based licence and sensor management system.

## Results and benefits:

**For the supplier:** The system provides real-time data on the machines, such as when to restock or when to collect cash. It also provides fault alerts.

**For the brand marketing:** The analytics tool allows the brand owner to tighten the supply chain, enabling just in-time delivery. The losses due to overstocking are significantly reduced.



The brand owners gain a more precise understanding of consumer preferences and behaviour. They can utilise campaign feedback and product performance information to gauge the success of their marketing campaigns.

The AVA feature uses an optical sensor to view the customers (anonymously) and detect purchase choices and dwell times - the brand marketers can use this information to ascertain the effectiveness of their ads.

The state of the art capabilities and quality of the coffee allows Costa to charge premium prices not normally possible with drinks vending machines.

**It is clear, as the Beecham Research study reveals, that the IoT is on the verge of fundamentally changing how retailers operate.**

Ultimately, the retailers embracing these technologies will come to know so much more about all aspects of their business, not only including their customers and products but their supply chain too.

On the flipside, the retailers that don't innovate will likely see their customer base dwindle, and customer retention fall. And in a crowded market where data-centric retailers are king, there's a chance that the laggards will disappear altogether.

One of the underlying themes of this whitepaper has been about data and how the forward-thinking retailers of tomorrow will tell customers what to buy, where the discounts are and when their favourite item is back in stock. On the back end, this same approach will result in reduced shrinkage and much tighter inventory control.

In many ways, this approach to business is nothing new – Amazon, Netflix and Facebook have been pioneers of the Big Data era for years. However, IoT for retail will arguably drive a much deeper shift in how people consume goods and how they pay for them. And in this shift, retailers start moving to becoming technology companies.

This is not to say it will be an easy path to success in the field of IoT in retail – there are cultural and technological challenges, with the latter including issues like technology integration, privacy, security and data ownership. Finding the right partners will be key.



These issues, and others, will need to be tackled in the move to becoming an experience-based retailer. Fortunately, we believe that many of these questions are being answered, with retail organisations getting smarter not only about the data, but also who they work with and how.

The Internet of Things is here and already disrupting the retail industry – are you ready for the change?

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Informing IoT and the Connected World

Intel were sponsors of our IoT in retail summit, ***The Internet of Retail***, which took place in Greater London in February 2016. For more information on next year's summit, [click here](#).

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