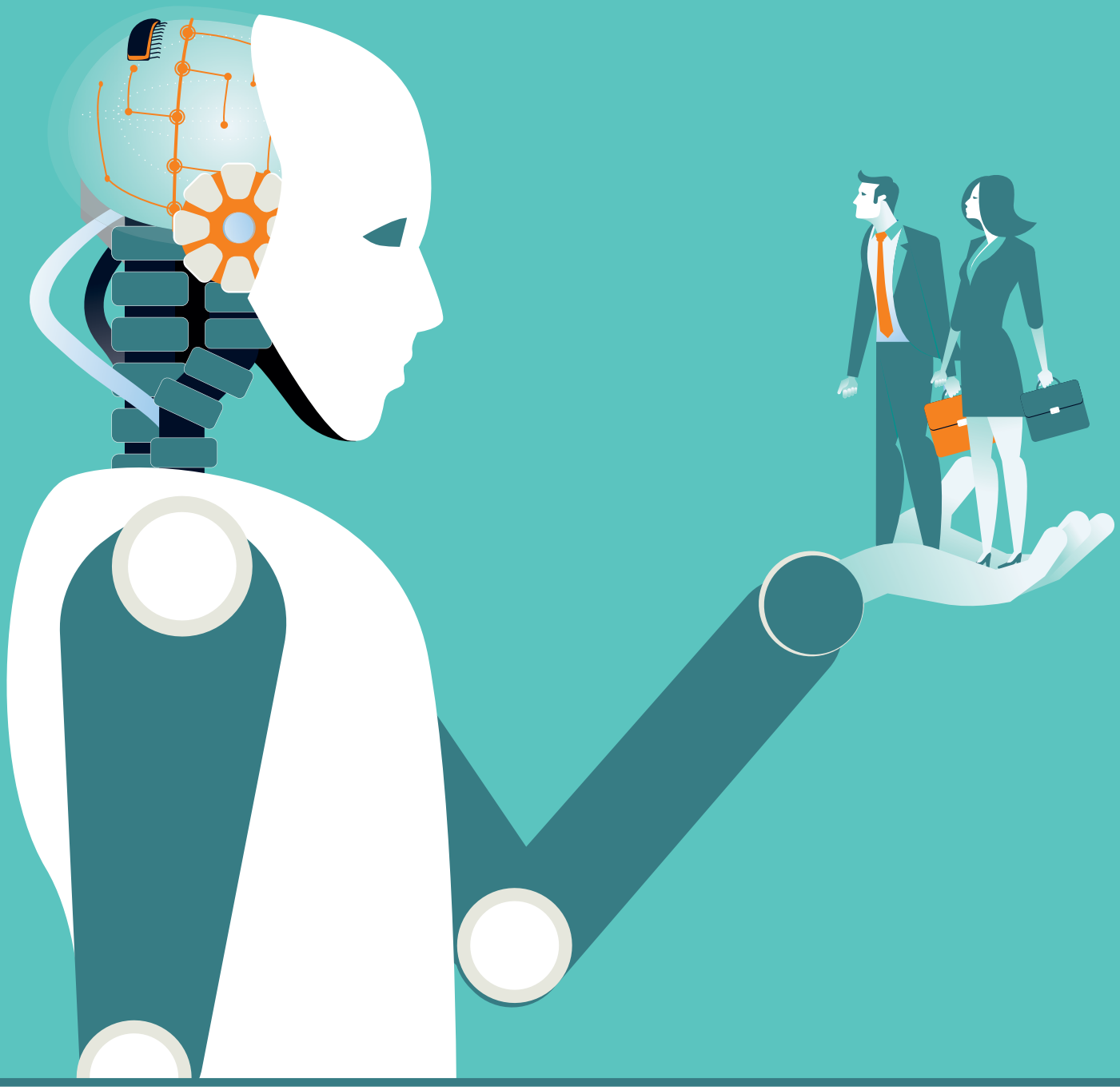
DEMYSTIFYING AI

HOW DATA SCIENCE WILL TRANSFORM RETAIL



RetailWeek CONNECT

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CHAPTER ONE

AI: ASSESSING THE OPPORTUNITY

Artificial intelligence, or simply AI, is the buzz phrase du jour in retail with good reason. A report by PwC published in 2017 forecasts that it will boost UK GDP by 10%, or as much as £232bn, by 2030.

The consultancy says key drivers will be increased product quality (4.5%), and more personalised and a greater variety of goods (3.7%), as well as increased productivity as a result of a changing workforce and the automation of jobs (1.9%). The scale of the opportunity is clear – but what exactly is AI and what does it mean for retail?

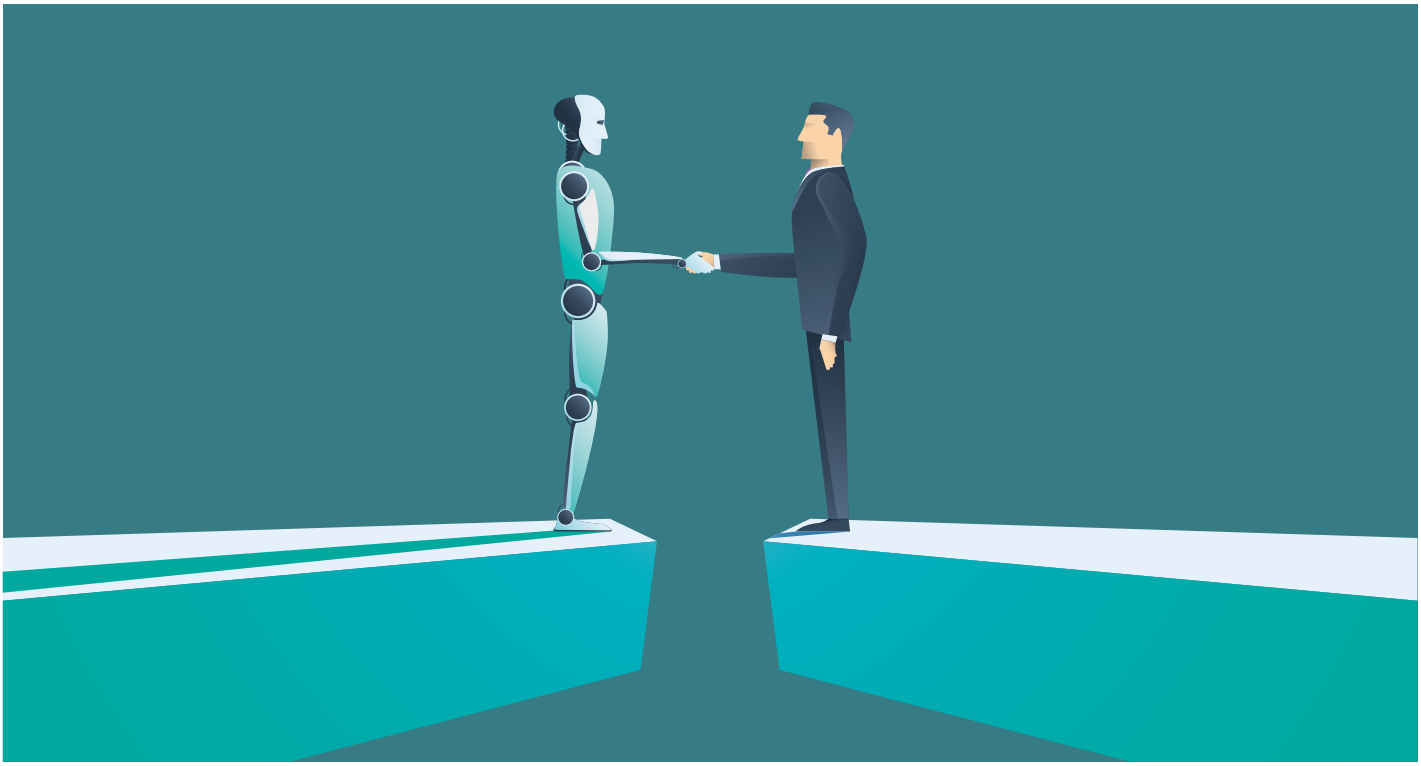
According to Pat Achakulwisut, head of strategy and implementation for AI, technology and investments at PwC: "There is a lot of ambiguity and misused words out there, because for me it really is a collective term for maths models that can be trained to recognise patterns in data. So, in a nutshell, better maths on a bigger set of data."

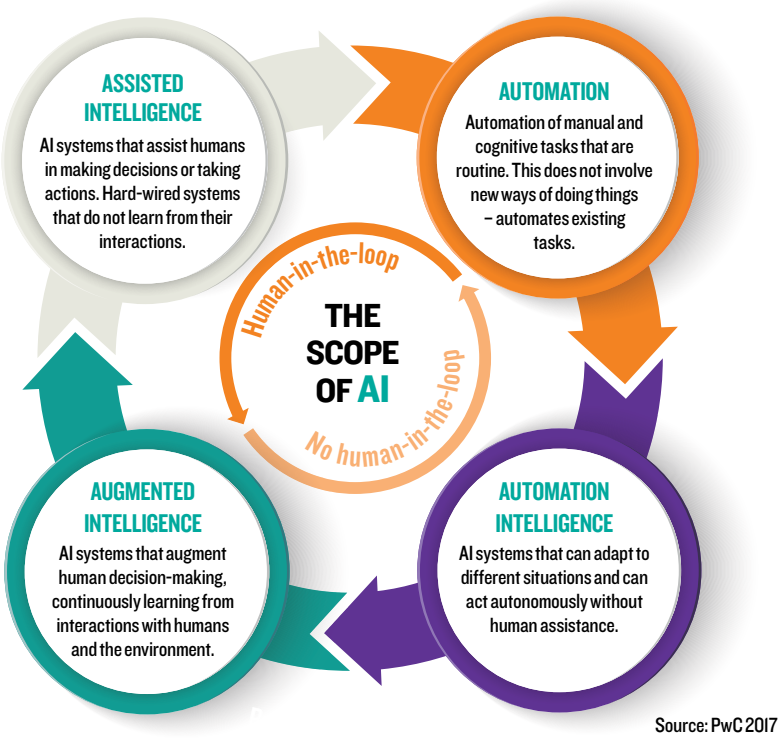
Last month, the House of Lords Select Committee on Artificial Intelligence published a report entitled *AI in the UK: Ready, Willing and Able?* It found that the wealth of data used to train AI systems, together with advances in computer processing power, the development of more sophisticated algorithms and the accessibility of cloud computing platforms, from Alibaba, Amazon and Microsoft in particular, have allowed businesses to tap into huge stores of computing power with ease.

Nearly every aspect of life has been digitised, and today retailers find themselves operating in the data economy. Despite last month's introduction of the General Data Protection Regulation (GDPR) placing restrictions on data gathering, handling and use, retailers regardless hold masses of data, derived from a whole ecosystem including customer, employee and supplier data, as well as external considerations.

Artificial intelligence is about to learn from complex data sets, take decisions, and then learn from its actions and mistakes.

Typically, people use the terms AI and machine learning interchangeably, but the latter is just one part of a family of terms that fall under AI. Specifically, machine learning involves applying





Source: PwC 2017

an algorithm to make a future prediction based on patterns of historical data.

In fact, AI capabilities stretch across the spectrum of retail, from back-end areas such as intelligent and automated warehouses utilising robotics, through to more customer-facing areas such as conversational commerce in the form of chatbots, natural language processing and voice technology. AI then takes us right through to the final mile in the form of autonomous vehicle home delivery (see chapter four).

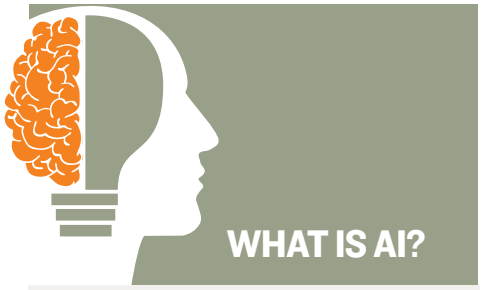
Dr Andy Pardoe, founder of the network Informed.AI, was listed as one of the top 30 AI influencers globally by IBM Watson in 2017. He says that widespread adoption of AI will impact what consumers look for from retailers.

"AI has the potential to transform businesses and the interactions with their customers. The general public are becoming exposed to AI technologies in their personal lives, which is setting the bar higher for the interactions expected of the businesses they deal with," Pardoe says.

Paul Clarke, chief technology officer at online grocer Ocado – itself right at the forefront of AI application in retail – agrees.

"AI is going to become almost like the new drug," he says. "I think people will start wanting it all over the place – in their cars, in their homes – because it offers the opportunity to take a lot of friction out of daily life and give them the time to do the things they want to do."

> **AI is going to become almost like the new drug. People will start wanting it all over the place**
>
> **Paul Clarke, Ocado**



WHAT IS AI?

There is no widely accepted definition of artificial intelligence, but essentially it means systems that are able to sense and observe the environment around them, and then act and learn.

Key AI terms:

- Algorithms: These form the basis of everything computers do and are a series of instructions for performing a calculation or solving a problem.
- Machine learning: This gives computers the ability to learn through action, without being explicitly programmed. When programmed with data, they can learn to make predictions or solve problems.
- Deep learning: A more recent variation of neural networks, which are loosely inspired by the human brain, where layers of processing nodes attach weight to data to make decisions. A step on from neural networks, deep learning uses many layers of artificial neurons to solve more difficult problems. It is often used to classify information from images, text or sound.

Source: *AI in the UK: Ready, Willing and Able?* House of Lords Select Committee on Artificial Intelligence, Report of Session 2017-19

AI IN NUMBERS

£232bn
the 10% boost AI will make to the **UK economy** by 2030 [PwC]

44%
of UK wholesale and retail trade **jobs** at potential **high risk** of automation from robotics and AI [PwC]

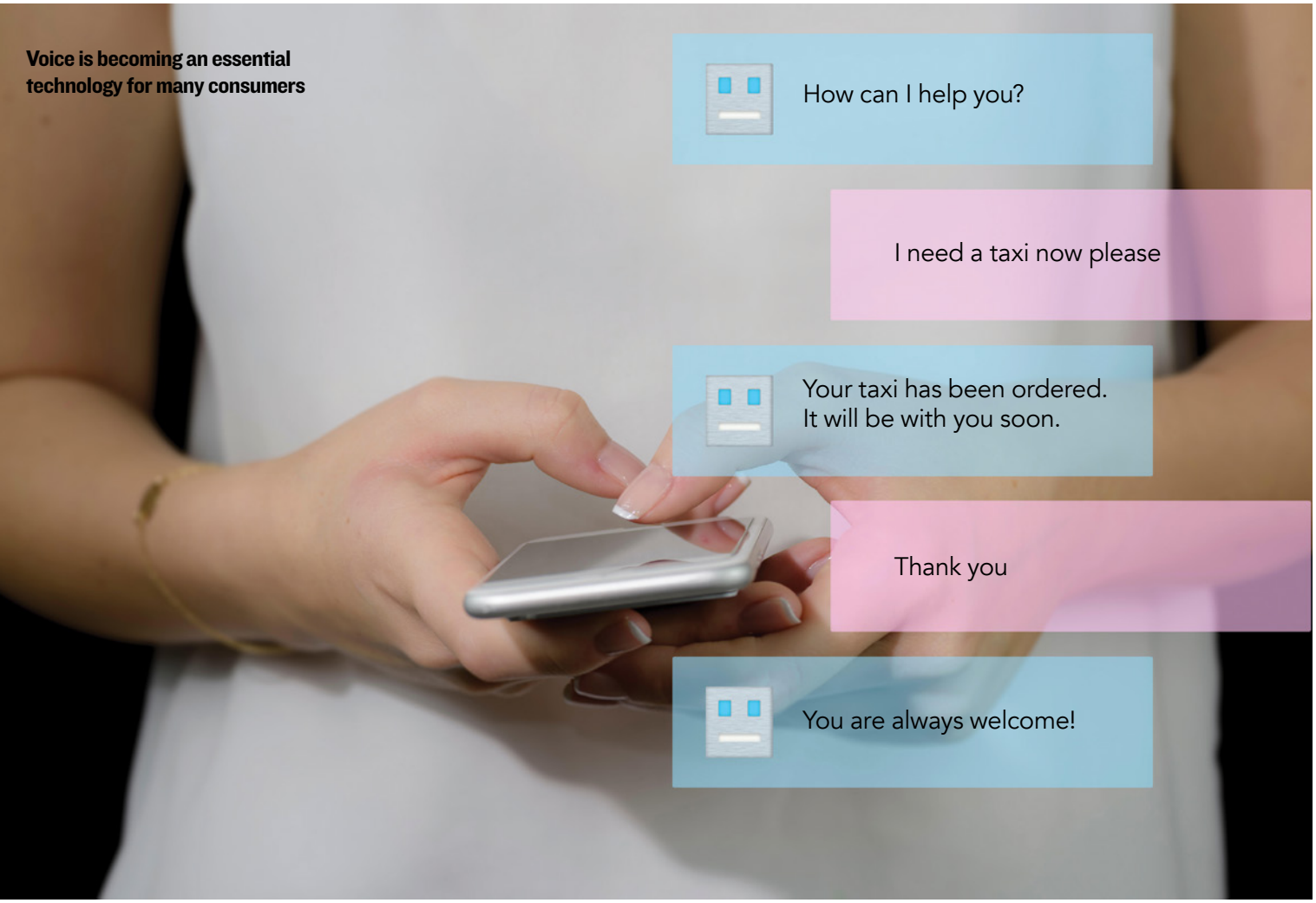
59%
the boost in **profitability** AI could deliver for UK wholesale and retail businesses by **2035**, **higher than the overall 38%** [Accenture]

40%
of data science tasks globally will be **automated** by 2020 [Gartner]

2.3 million jobs
generated globally by AI by 2020, exceeding the ...

...1.8 million
it will remove [Gartner]

8%
greater **profit margins** enjoyed by early adopters of AI in the UK [McKinsey & Company]



Voice is becoming an essential technology for many consumers

CHAPTER TWO

AI: WHERE TO INVEST

The exciting possibilities of AI were on full display in May when Google stunned attendees at its I/O 2018 festival by unveiling the new capabilities of Google Assistant.

Chief executive Sundar Pichai played a phone call in which the Google Assistant booked a hair appointment with a receptionist at a hair salon. In equal measures fascinating and eerie, the voice sounds completely natural – even at one point punctuating the conversation with an "Mmmm-hmm".

The company has been working on the technology, called Google Duplex, for years. It understands the nuances of conversation and can complete most tasks itself before handing very complex enquiries over to a human operator.

Google plans to conduct early testing of Duplex inside Assistant this summer. The technology could be used by consumers to make enquiries and book all sorts of appointments, and shows the direction of travel that voice technology could take.

This may be right at the cutting edge, but AI-powered technology is already prevalent across the market in other ways.

Analysts at RBC Capital Markets estimated that in 2017 Amazon sold 33 million Echo smart speaker devices, which host its digital assistant Alexa.

Voice capabilities have been built into Google since 2009, and Apple introduced Siri in 2011. Today, Google says 20% of all Android searches in the US are carried out by voice.

WHERE TO INVEST

Digital assistants: As demonstrated by Google Duplex and Amazon's Alexa, the use of AI-powered voice technology will eventually transform customer services.

Visual search: The way consumers want to use websites and apps is changing. AI will enable retailers to dynamically facilitate this journey.

Supply chain: The pressures retailers are under to deliver a seamless experience will only increase. Investment in AI to intelligently manage stock, and even robotics, will become crucial.

Rise of the chatbots

There are a suite of other consumer-facing technologies transforming the way businesses operate. Chatbots are one of the most visual manifestations of AI, and are designed to enhance the user experience on websites, offering human-style interactions. They work via natural language processing to understand voice and text questions, which they answer with human-like responses.

Integrating personalisation means customers can benefit from tailored recommendations, while the retailer benefits from 24/7 customer service cover and reduced labour costs.

Sex toy retailer Lovehoney is currently at proof-of-concept stage with a chatbot proposal, but chief information officer James Spencer says it will only be used for simple enquiries as consumers still value its human customer services.

Shop Direct was one of the first to launch a chatbot, via its Very app in 2016.

Lidl has also successfully combined its chatbot with human customer services. Margot the Winebot launched on Facebook Messenger this year and helps customers match wine with food. Lidl's customer services team then monitors messages for any indication the customer wants to speak to a human, and intervenes if needed.

"Over the past 20 years, a lot of UK tech trends have been based on looking at Japan, and increasingly China and Korea," says Mark Brand, data strategy and analytics director at consultancy Thoughtworks.

"What is most impactful in terms of tech take-up there will tell you what the next big things will be here. We do a lot of work in China, and conversational commerce within limited bounds – but with quite a lot of autonomy – is an example of something we expect to grow here significantly."

Getting visual

Visual search is also gaining traction as retailers continue to adapt to the way

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> Mark Brand, Thoughtworks

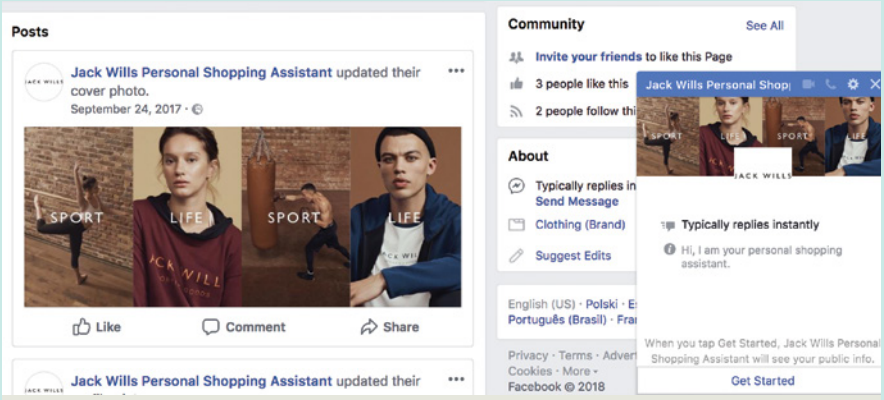
JACK WILLS: TESTING AND LEARNING VIA CHATBOTS

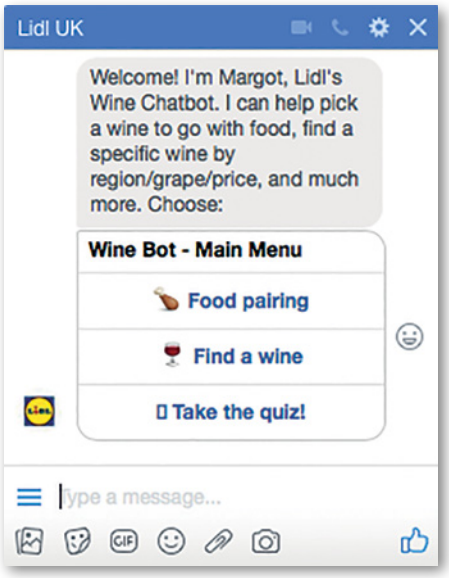
Jack Wills is one of the latest retailers to launch a chatbot, having unveiled its Jack Wills Personal Shopping Assistant, or Jack-bot, two months ago.

The fashion retailer kept costs down by partnering with a start-up. "It has been a successful trial," says managing director of multichannel Mark Wright.

"We have had quite high interaction levels and orders taken through the chatbot. It has proven there is a place for doing this, albeit that, for our brand, a unique customer experience [from humans] is something customers expect and I don't think we can quickly replace that in a business our size."

Wright adds that it is very much a case of test-and-learn, and if the initiative doesn't start to drive revenue then it may be ditched.





consumers want to shop. In March, eBay launched 'Shop the Celebrity Look'. Users simply hover over a photo of a celebrity and can shop for the exact items they are wearing in the photo, or find more budget-friendly versions via eBay's marketplace.

AI is also helping retailers understand consumer sentiment – something they have struggled to do in the past. Natural language processing is helping retailers such as Ocado measure customer emotions by analysing the full range of customer enquiries – from emails to chats and phone calls. They can then prioritise the most urgent queries and tailor their communications accordingly.

Planning for the future

Meanwhile, N Brown-owned Figleaves is using an AI application to determine its marketing spend. "It is being able to see into the future that is so hard for us," says chief executive Miriam Lahage. "As retailers, we spend so much time understanding history and trying to plan against it, and I don't think any of us can afford to just do 2017 better. That isn't what 2018 is about."

Knowing what you need, where and when, is easier said than done. However, AI can automate the process and allow retailers to base decisions on a variety of factors, from the weather to local events.

AI is also being used to transform the supply chain. Chinese etailer Alibaba is perhaps leading the field with its smart warehouses, where robots do 70% of the work, while closer to home Ocado is taking innovative strides (see chapter four).

Morrisons has partnered with technology supplier Blue Yonder to boost its demand-forecasting capabilities and analyse data to inform buying decisions, right down to the individual store.

Blue Yonder worked with three years' worth of sales data for every store, together with weather reports in those locations over the same time period. The system is then fed live weather data and any mistakes add to the machine learning. The results speak for themselves: Morrisons has reduced gaps on shelves by 30%.

Retailers face a shopping list of potential areas in which to invest. Smart warehouses and demand-forecasting are some of the investment options demonstrating the greatest traction at present, as retailers seek to digitally transform their businesses.

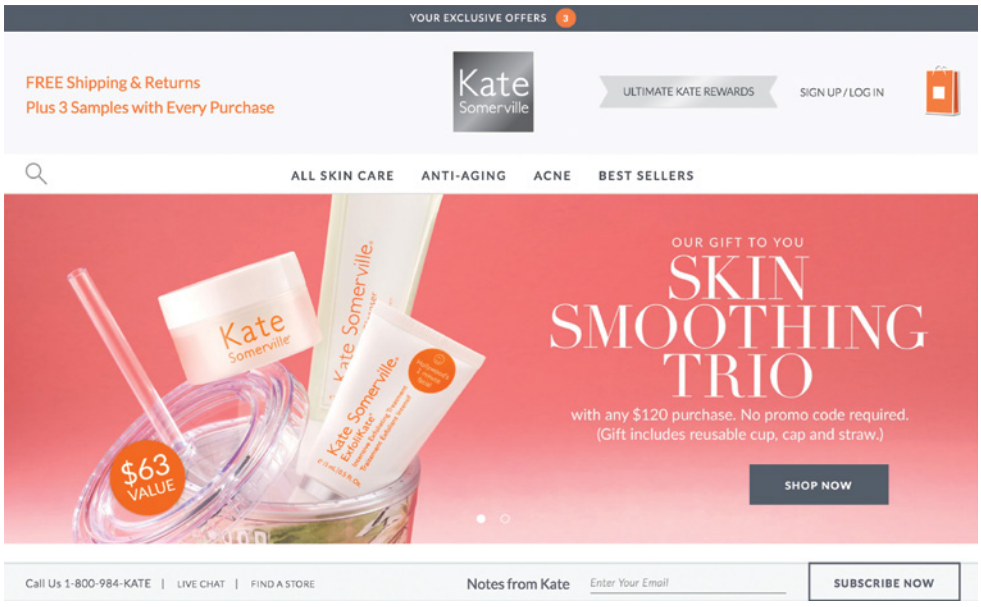
KATE SOMERVILLE: USING MACHINE LEARNING TO POWER ONLINE MERCHANDISING

Kate Somerville opened its LA skincare clinic 25 years ago, but like many brands moving online presented a challenge in delivering the consistent, personalised customer service found in store.

In skincare, the perfect product is very individual, with factors ranging from gender, to age, skin type and ethnicity all playing a part. The brand was struggling with outdated UIs (user interfaces), limited tracking, manual processes and a lack of personalisation, so teamed up with ecommerce personalisation solution provider Nosto and ecommerce solution provider Guidance to deliver a more individual experience online.

Guidance designed, built and launched the Kate Somerville website on the Magento Commerce Enterprise Edition platform in early 2017, partnering with Nosto to deliver more personalised product recommendations via machine learning based on past search and purchase data.

This led to a 14% increase in revenue, and 16% increase in transactions and session duration. Automatic cross-sell and upsell product recommendations have also led to a 5% increase in conversion.



CHAPTER THREE

OVERCOMING THE HURDLES

Disruptive technologies bring with them a fresh set of organisational challenges, and the retail sector is going to have to adapt if it wants to enjoy the full benefits of AI.

Retail is arguably behind relatively more AI-mature industries, such as financial services, where the technology has been used around mortgage decisions and credit ratings. Telecoms is another example, with providers using AI to determine what bundle to give customers in terms of the mix of phones and data.

"I think where those industries are ahead is that their data is in a relatively clean format on one platform," says PwC's Achakulwisut. "The tricky thing with retail is that data can be spread between stores, online and wholesaling. Those are on different systems and they are not all compatible."

Mapping the journey

AI relies on having access to clean data from multiple sources. Retailers need to be able to map every aspect that impacts the customer journey, so that they can plan the learnings and artificial responses.

This includes both the multichannel operations that face the customer and the various elements of process and supply chain that traditionally do not. It is then about drawing together those data points to deal with the customer in the most effective way.

Valter Andersson, technical solutions manager at ecommerce personalisation solution provider Nosto, says: "To enable effective automation in retail, the first and most important step is to focus on the quality of the data: collect all available data points, validate them and constantly keep this data up to date to deliver a consistently personalised experience for shoppers."

Jan Soerensen, general manager for North America at Nosto, adds that it is a good idea to approach AI and machine learning pragmatically. "Start with applying tools with a proven ROI and that influence a large share of your revenue. Then, move into use cases that are more marginal. In an ecommerce context, you might still make more money by displaying a 10% discount coupon on a simple trigger – such as every time a shopper visits a product page X times – rather than implementing predictive targeting based on customer-lifetime value."

Thoughtworks' Brand says newer businesses are less constrained by legacy systems and can make relatively radical

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> **Retailers underestimate how important it is to keep the first AI application really simple, and to test and learn a lot so as to tailor it to a very clearly addressable use case**
>
> Mark Brand, Thoughtworks

choices. In practice, this means creating data platforms where AI is more easily integrated in what he describes as "the last mover advantage".

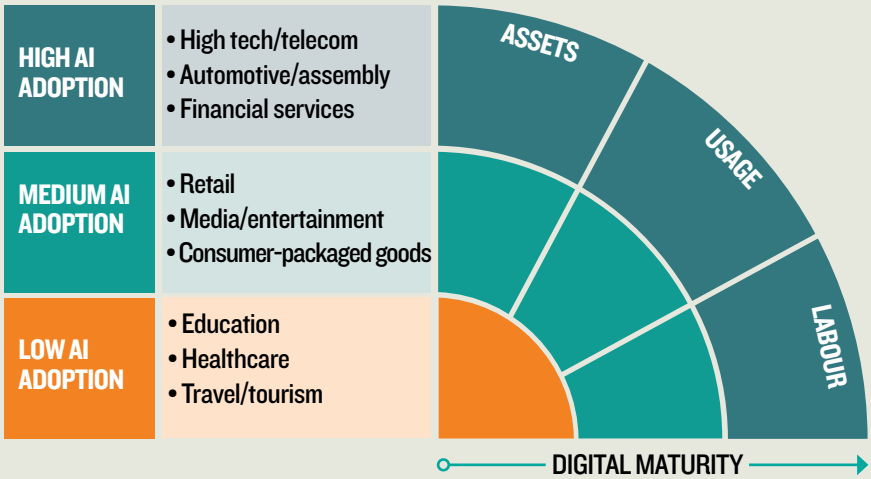
However, Brand adds that if customer journeys and processes are mapped well, then AI can work in relatively bounded domains very effectively without necessarily having to be integrated with the core business systems.

"What we tend to find is that retailers overestimate the difficulty and complexity of setting up the technology, the computing and store to run AI," he says.

"They overestimate the complexity of the basic intelligence, consideration sets and algorithms that are the starting point. They underestimate how important it is to keep the first AI application really simple, and to test and learn a lot so as to tailor it to a very clearly addressable use case, so you know if you are succeeding or failing."

HOW COMPANIES ARE ADOPTING AI

AI adoption is greatest in sectors that are already strong digital adopters



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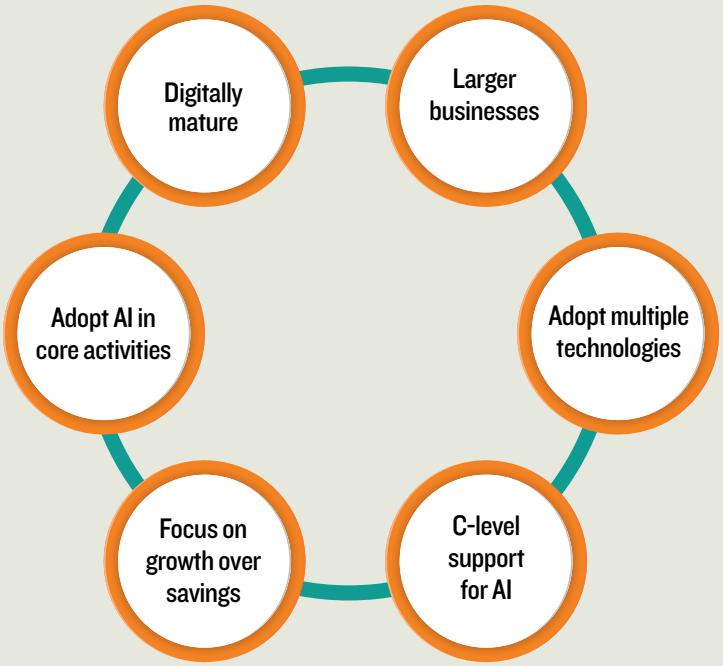

Source: McKinsey and Company June 2017

Man vs machine

If machines are now able to think, learn and act, what does this mean for humans and the shape of the retail workforce?

PwC forecasts that 44% of UK wholesale and retail jobs are at potential high risk from robotics and AI.

However, research and advisory firm Gartner says that for the 1.8 million jobs that AI will replace by 2020, 2.3 million new ones will be created. And, rather than retail headquarters swarming with data scientists, 40% of data science tasks will be automated.

Brand doesn't expect big reductions in the workforce. "Good AI has good product ownership within an enterprise. Those people are typically people with good commercial understanding, people such as buyers, merchandisers and commercial directors. In order to teach the AI and tune it, and for it to learn, really it needs a human guide."

"I think this is a real misunderstanding in the market today. This is about empowering humans to make many more good decisions."

Dr Andy Pardoe agrees. "The workforce of the future will evolve with the introduction of AI-driven technologies," he says.

"However, typically this is about augmenting the workforce to make it more effective and efficient, and allowing it to devote more time to higher-value-add tasks and processes."

The result could be more poly-skilled people, who potentially might be more expensive to employ, operating large parts of the business.

CHAPTER FOUR

OCADO: INNOVATING IN AI

Grocery etailer Ocado, which provides fulfilment for supermarkets Waitrose and Morrisons, is now known as a technology provider as much as a retailer. And it is right at the forefront of technology innovation and AI in retail.

This year alone, Ocado has earmarked £210m of capital expenditure for technology investment. Ocado fulfils hundreds of thousands of orders a week with 98.9% accuracy. In particular, the etailer is known for its focus on robotics and intelligent warehousing. It refers to its Andover warehouse as the 'hive' in which a three-storey block comprising hundreds of plastic boxes of groceries is staffed by hundreds of robots. Known as 'the swarm', they work collaboratively to shift boxes and collect orders.

Since 2015, Ocado's five-year SecondHands project has been developing robots to pick and pack groceries, and in January 2018 it unveiled the first prototype of its collaborative robot, which will act as a second pair of hands to assist engineers looking after its automated handling systems.

The etailer also experimented with self-driving electric vehicles last year, partnering with specialist technology company Oxbotica as part of its Gateway project to fulfil deliveries in Greenwich.

Retail Week spoke to chief technology officer Paul Clarke to find out more.

INTERVIEW: PAUL CLARKE, CHIEF TECHNOLOGY OFFICER, OCADO

Can you tell us about your AI strategy?

Our uses of AI machine learning are about managing complexity, oversight of our operations and real-time optimisation, and there are applications from end to end.

So if we start at the front end, it is about predictive analytics, trying to anticipate what customers will want even before they have a clue themselves.

That is what we call building this broad band of groceries, where the right groceries turn up at the right time as if by magic.

We were also the first UK supermarket to launch voice-controlled shopping via Amazon Alexa.

That is the start of a much wider journey to do with conversational interfaces, whether it be on voice hubs like that or connected cars or smart appliances in the home, or chatbots, or voice enabled mobile-apps.

A big area for us is making sure the customer can carry on the conversation across all of those.

You're also known for your intelligent warehouses. Could you tell us a bit more about them?

In new warehouses, like the one in Andover and the one that is going live in Erith soon, we are orchestrating swarms of thousands of robots in real time.

On a higher level, we also stream all of the data from those robots up into the cloud and there we are creating machine learning that will look after the health of those swarms.

So it will say a particular robot needs its battery pack, or another one's acceleration or deceleration is not what it should be, so bring it in for a service.

You can't do that with engineers looking at screens in real time, and of course we are going to be building lots of these warehouses around the world for our Ocado Smart Platform users. That is a powerful example of something where machine learning lets you do something humans couldn't do.

We are also looking at embedding machine learning into the robots themselves to help them with things like diagnostics and handling.

Where else will you focus investments in AI this year?

We are doing work on automated picking and packing of goods, and there we are at the stage of exposing the robot and the vision system to the full 50,000 different products that we have.

Our Andover warehouse is at the stage of creating a living lab for those robots to test out the different gripper technologies that may be required.

The way you pick up a tin of beans is very different to how you pick up a bag of oranges.

Demand forecasting will also be a key area. There is lots of parallel activity in this area. Following the trial in Greenwich, we are hatching ideas of how to do more experimentation with autonomous vehicles, which I can't talk about just yet...

Ocado trialled self-driving electric vehicles in a partnership with Oxbotica

PARTNER COMMENT

There seem to be two significant challenges in the retail industry's understanding of AI. Firstly, a delay between AI academia and what can be applied in a business context. For instance, despite the latest technological developments, Instagram continues to use a two-year-old algorithm for image recognition.

Secondly, an increase of noise around the topic that is dominating the current retail ecosystem. Companies that offer basic programmes and solutions are leveraging buzzwords such as 'AI', 'data mining', 'scalability', etc, to attract consumers. The challenge is differentiating retailers that are actually using these technologies to automate and improve their product from those who are simply leveraging.

Big data vs small data

One of the hottest developments in machine learning is deep learning, or neural networks. This approach attempts to replicate how neurons in the brain work, which requires a great amount of data. What is often ignored is that many applications – especially in ecommerce – must utilise shallow learning.

Sometimes you will only have a small amount of data because a product may only be in stock for a few days, or on-site engagement may be limited to a few clicks. As ecommerce retailers, you still want the ability to learn from this limited data in order to offer personalised, relevant experiences.

Machine learning + human intervention can't be beaten

Despite the automation potential behind machine learning, it still needs to be guided by a human hand. For instance, by adding filters and simple rules on top of recommendations generated by machine learning, Nosto's intelligence engine can increase site conversion by 30%.

To drive success, companies should focus on solving challenges with clearly defined goals and be aware of pain points that can be solved by automation, rather than simply throwing technologies behind their product for the sake of promoting AI.

But challenges considered, the retail industry is continuing to mature and better understand that, rather than focusing on anything plastered with an AI label, it should set its sights on technology that makes the best use of its data through machine learning.

The retail industry is a great proving ground for these new technologies as there is incredible competition and generally any technological developments can be monetised quickly.

Jan Soerensen, general manager for North America, Nosto

PRACTICAL NEXT STEPS FOR RETAILERS

- **Collect all available data points, validate them and constantly keep this data up to date to deliver a consistently personalised journey for shoppers.**
- **Approach AI and machine learning pragmatically. Start by applying tools with a proven ROI that influence a large share of your revenue.**
- **Next, move into use cases that are more marginal. In an ecommerce context, you might still make more money by displaying a 10% discount coupon on a simple trigger (such as every time a shopper visits a product page X times) rather than implementing predictive targeting based on customer-lifetime value.**
- **Despite the automation potential behind machine learning, it still needs to be guided by a human hand. Add filters and simple rules on top of recommendations generated by machine learning in order to increase on-site conversion.**

ABOUT NOSTO

Nosto enables online retailers to deliver their customers personalised shopping experiences at every touchpoint, across every device. A powerful personalisation platform designed for ease of use, Nosto empowers retailers to build, launch and optimise one-to-one multichannel marketing campaigns without the need for dedicated IT resources. Leading retail brands in more than 100 countries use Nosto to grow their businesses and delight their customers. Nosto supports its retailers from its offices in Helsinki, Berlin, Stockholm, London, New York, Los Angeles and Paris. To learn more visit **nosto.com**.

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