In what is being described as a ‘revolution’, retailers are facing profound change and many are turning to automation and technology to cope with its consequences. By Neil Tyler.

“Meeting the demands of increasingly tech-savvy shoppers requires a more innovative approach to distribution and an ability to ensure on-shelf availability.

“Gross margins are being squeezed and overheads for traditional retailers are enormous. To deliver the level of in shop experience demanded by the consumer, and demonstrated by the likes of Apple, is financially impractical for most. Retailers can no longer manipulate prices as was once the case. Consumers have become far more price conscious and have the tools, via the internet, to seek out better deals,” he explains.

“As a result many retailers are engaged in a race to the bottom, cutting costs – which means losing jobs. What we need to see is significant investment in both people and technology and much better management of the supply chain. The mal-distribution of stock is a significant problem and technology has a crucial role to play here,” Oxley suggests. “At present, the supply chain is based on a forecast model – ‘what are consumers going to buy?’.

In future, better data management and the use of artificial intelligence (AI) will enable us to better understand individual consumer behaviours.”

Set up in 2000, Ocado is best known as one of the world’s most
Ocado’s engineers and technologists.
To handle this kind of volume, the warehouse essentially moves the shopping aisles to and from a human ‘personal shopper’, who then selects product from boxes delivered to them via a 25km conveyor belt. The ‘shopper’ stays in one spot.
Shaikh explains the process.
“We receive pallets from our various suppliers which need to be unloaded. They are divided up into totes, which are then transported around the warehouse. Each tote holds one type of product, from which our ‘personal shoppers’ fulfil a specific order. The number of totes will be determined by the type of product and the more totes, the more popular the product.
“We have to be able to handle millions of items and process 150,000 orders each week at Hatfield, both product diversity and volume is exceptional.”

Connectivity is essential and Ocado has worked hard to streamline its processes though the development and use of AI software systems developed in-house and which manage the system end-to-end.
“We have developed a forecasting algorithm, using things such as what people are ordering, seasonality, special offers and so on, which determines what we should buy,” says Voica. Few of the thousands of products wending their way around the Hatfield warehouse are surplus to requirements.

Artificial intelligence
“AI pervades everything we do here at Hatfield,” Shaikh explains, “whether that’s how we order stock, track data or forecast what we need to buy. That intelligence enables us to deploy staff in the warehouse more efficiently and to manage our fleet of delivery vans more effectively. Van routing software, for example, feeds information back into the system, which prioritises orders at Hatfield. Everything we do is framed by improving levels of efficiency.

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“Standard software is not capable of supporting the kind of system we have developed and, alongside the AI software developed in-house, we have designed system diagnostics and self-testing capabilities.”

The Hatfield facility is monitored in real time from a central control room. If the conveyor system stops for any reason, the control room will know, through a real-time computer simulation of all the products and their location along the chain, where and what the problem is and how serious.

“The control system can see tiny little dots representing totes moving around the warehouse,” explains Shaikh. “We can’t afford any significant down time, so we monitor problems in real time and can determine whether problems that arise warrant immediate action or can be postponed. On average, problems are fixed in less than 10 minutes.”

Shaikh notes Ocado’s software means the company can achieve very low substitution rates or missing items. “We have more than 99% customer satisfaction.”

“The grocery sector is different to the rest of online shopping,” suggests Voica. “Grocery purchasing patterns are regular and established; with other types of online retailing, the patterns are more irregular. It means we need to offer exceptional customer service, because if you don’t, at some point customers will switch supplier.”

The possibilities of making mistakes are many, but the end-to-end system developed by Ocado means that individual items can be tracked from the moment they enter the warehouse to when they leave as part of an order.

Thousands of sensors have been deployed across the conveyor system to ensure that no totes take a wrong turn and are monitored continuously.

“Our aim is to make things smarter. AI means we can learn what should be done in any scenario and that is a key efficiency. My hope is that we reduce software complexity by using AI. Many different things can happen at different levels but, with learning software, it should be easier to deploy systems, make them simpler to install and make modifications easier to manage.”

**Robots pick and place**

Beyond AI and data management, Ocado is looking at using robots to work alongside its workforce to do picking and placing.

Ocado Technology has created a robotic arm and gripper capable of grasping a variety of products. The project, part of the European Union’s Horizon 2020 programme, has resulted in a ‘gripper’ shaped like a human hand, with the aim being to make it as dextrous and capable as a human one.

“Crucially, we are developing human vision and machine learning systems that will enable the robot to identify various products as well as grip them in a way that won’t damage them and which will integrate well with our existing automated warehouse solutions,” says Voica.

Ocado has also developed a fully automated warehouse at its Andover facility in Hampshire. “Andover, which went live at the end of 2016, demonstrates our Smart Platform,” explains Voica, “and builds on our experiences at Hatfield.”

The facility combines densely packed stacks of goods within a grid structure, with products retrieved by what is described as a swarm of autonomous robots. “Hence the name ‘Hive’ that we’ve used to describe the facility,” explains Voica.

Once the crates of groceries have been selected, they are delivered to a human or robot worker, who packs the orders for delivery to customers.

Designed by Ocado, with the help of Newcastle based Tharsus, a developer and manufacturer of electro-mechanical systems, the robots are capable of accelerating and decelerating rapidly, reaching speeds of several metres per second and capable of stopping with millimetre accuracy. They can also pick up significant payloads, move them over long distances and run for several hours on a single battery charge. “Because we have developed so much of our own technology – whether software or hardware – we have been able to create our own Smart Platform offering,” explains Shaikh. “Now, we are looking to deliver these solutions to other retailers. We are already working with Morrisons, here in the UK, for example, but are looking to target a growing global market for this type of technology.”

With advances in robotics, AI, sensor technology and the Internet of Things the amount of new technology required by the retail space is set to increase substantially over the coming years – the age of the traditional retailer could be numbered.