

SUPPLY CHAIN OF THE FUTURE

White Paper

February 2017

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INTRODUCTION

Since the invention of the internet 27 years ago there has been a seismic change to the world in which we live. Communication is the fastest it has ever been. We carry computers in our pockets daily. We connect with those around the world at the touch of a button. We can broadcast personal details of our lives to whoever will watch. From Google to Twitter, YouTube and Amazon, the online world shapes and dictates our daily lives.

Perhaps the biggest difference in society that can be directly attributed to the influx of technological developments is our attitude. As consumers, we want greater choice, faster service and cheaper prices; for everything. The end-user is king and the retailers are adopting new practices and inventing new technologies to meet these needs and capitalise on them.

The retail landscape is currently consumer driven and the supply chain is feeling the effects of this. The line between online and offline is becoming increasingly blurred, with online retail giants linking with the big UK supermarkets to develop a full-service offering. In an increasingly unpredictable market, it's clear to see that the food and drink sector and the supply chains that serve them are in the midst of a revolution unlike anything experienced before.

This transformation has been a long time coming, with consumer demand growing over the years and the emergence of the 'savvy shopper'. Brand loyalty is a thing of the past as shoppers search for the best quality food at the lowest prices. The weekly shop has made way for lower spends several times a week as shoppers are happy to research and shop around.

All of these factors are having a knock-on effect for the supply chain, from producer to retailer, which are having to make significant changes to their operation and implement increased efficiencies to meet the rising expectations and stay in-demand and ahead of their competitors.

In this time of change, there is high risk of businesses falling behind if they don't adapt. But conversely there is vast opportunity for those businesses that do identify new spaces to take advantage of new technology and capitalise on it to grow prominence in their sector.

OUTLINING THE OPPORTUNITY

Developments in technology and growing consumer expectations are important issues facing the global food industry, alongside environmental responsibility and limited food resources.

Following the leaps and bounds that technology has made in recent years and is continuing to make, at pace, consumers are expecting more. This marks a shift in the retail landscape and in turn puts pressure on the entire supply chain to meet these expectations.

Technology is having both positive and negative effects on the supply chain as consumer technology puts pressure on the supply chain to be reactive and flexible, while maintaining quality assurance and profit margins. However, technology is also working to increase the supply chain's capability to react to demand with advancements in food product, logistics and retail creating the ability to improve efficiency and service.

While technology is continually being developed and offers future opportunities for manufacturers to capitalise on, there still exists a fragmentation between these technological innovations such as drones, working alongside a fragmented and non-standardised selection of processes and solutions. While disparity still exists within each element of the supply chain, with providers lacking co-ordination, scale and awareness to drive end-to-end efficiencies, the opportunities for growth will be limited.

The traditional organisation of vehicles, pallets and equipment that were standardised to drive efficiencies across the supply chain were built for a system that no longer exists. Networks and services built to serve big-box retailing are now no longer relevant. Consumer demand has driven the introduction of a multichannel world which has meant traditional supply services are being retro-fitted with solutions to suit the ever-changing landscapes, proving complex and costly.

In order to create a successful supply chain from producer to end user, a holistic approach is needed. Aligning operations with shopper demand requires businesses to focus on barriers both internally and externally. From retailers and suppliers to packaging and raw material producers, the businesses that are most likely to reap success will look to synchronise processes across trading boundaries, moving away from an introverted way of working.

We will be analysing the supply chain from producer through to end user and looking at how technology is impacting as well as contributing to increased efficiency and innovation across the food and drink industry.

CONSUMER HABITS AND EXPECTATIONS

Consumers are as knowledgeable now as they ever have been. Following the financial challenges of the banking crisis, habits and attitudes have changed significantly and consumers are more conscious of spending their disposable income wisely.

Shoppers have easy access to price comparisons and are prepared to shop more frequently in their search for value and choice. Technology enables these attitudes and habits to progress; shoppers don't even have to leave their home to shop anymore, with the ability to track their order from warehouse right to their front door.

With the main criteria for shoppers being good value and convenience, pressure is growing on the supply chain to respond to increasingly unpredictable shopping patterns.

The changing consumer

Statistics show that the total spent by consumers online, across all retail sectors has increased 22% in September 2016 from the previous year, with online shopping now accounting for 15% of total retail spend.¹ The average UK shopper spends £1,372 per year online, with PC-only shoppers spending less at £1,014. However, those that use a range of devices; PC, tablet, mobile, to shop spend 94% more with an average of £1,962.² Consumers are comfortable shopping around and doing their research, mainly online, before committing to a purchase.

Consumers are becoming more demanding and as businesses satisfy these demands, consumers will only expect more. Over 66% of UK adults own a smartphone, up from 39% in 2012, spending an average of two hours a day online, with 90% of users shopping online with their smartphone.³ This increase in mobile shopping has played a key part in raising expectations; it is the glue between online and offline and provides shoppers with the seamless experiences they crave.

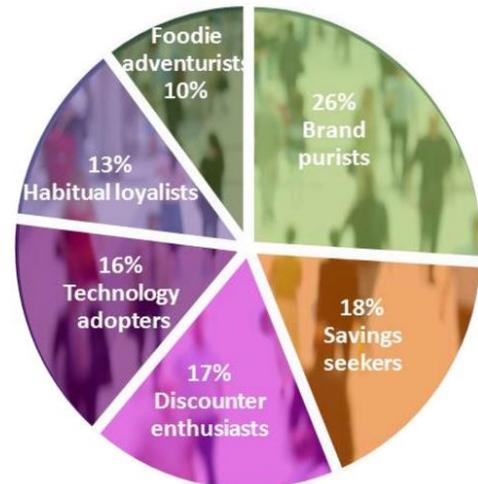
¹ ONS, 2016, *Retail Sales in Great Britain: September 2016*. [Online]
Available at: <http://www.ons.gov.uk/businessindustryandtrade/retailindustry/bulletins/retailsales/sept2016#sector-summary>

² Internet Retailing, 2015, *UK shoppers to spend £60bn online in 2016: study*. [Online]
Available at: <http://internetretailing.net/2015/09/uk-shoppers-to-spend-60bn-online-in-2016-study/>

³ Ofcom, 2015, *The UK is now a smartphone society*. [Online]
Available at: <https://www.ofcom.org.uk/about-ofcom/latest/media/media-releases/2015/cmr-uk-2015>

IGD recently conducted a study⁴ which analysed shoppers' approaches to food and grocery shopping and developed a segmentation approach driven by customer values and attitudes. The results identified a new demographic dubbed the 'technology adopters' who represented 16% of respondents.

The findings showed that 41% of this demographic use online channels for food and grocery shopping, compared to the 25% average and this is mainly driven by the endeavour to save time. They are a younger consumer, generally leading very busy lifestyles and use the latest gadgets to make life more convenient.



According to 2015 IGD shopper data, online shopping is set to double over the next few years and this will be hugely impacted by Generation Z.⁵ They are the first generation to have never lived in an internet-free world and are currently the product's end user, rather than the shopper. However, when their ability to spend increases, they will be the leaders of change and the demographic that retailers should target to achieve success in a shifting landscape.

Single-person households

The demographic of the UK is shifting, with the population of over 60s predicted to hit 30 million for the first time ever in 2020. Lifestyles are also dramatically changing as people are choosing not to settle down until later in life, if at all. Between the 2001 and 2011 censuses, single-person living increased by 564,000 and in 2015 there were 7.7million people living alone, making it the second most common household type after family household (two parents with children).⁶

One explanation of the rise in single person households is the growth of the busier career-led lifestyle, which has thus impacted shopping habits. The weekly 'big shop' is dead, as consumers are buying less, more often. Traditionally, retailers focused on catering for the family, with marketers

⁴IGD, 2016, *Convenience and the six different shopper groups*. [Online]
Available at: <http://igd.com/Research/Shopper-Insight/Convenience-and-the-six-different-shopper-groups/> - [Accessed 13th October 2016]

Image – as above

⁵IGD, 2015, *Shopper Vista, Shopper Vista Channel Focus Guide – Understand Your Online Grocery Shoppers*, IGD 2015 [Report]

⁶ONS, 2015, *Statistical Bulletin, Families and Households: 201*. [Online]
Available at:
<http://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/families/bulletins/familiesandhouseholds/2015-11-05>



projecting the ‘mums as the heart of the household’ ideology as aspirational. However, with the significant shift in demographic, retailers have already had to start adapting to meet the needs of this growing single-person market. Tesco have tapped into this early with the recent launch of two-portion chicken fillets in a packet that has a separate compartment for each fillet. A tear seal

between the two allows consumers to ‘eat one, keep one’,⁷ tapping into the need for one-person meals as well as aiming to reduce food waste in the home.

The future consumer

These changes in shopping habits have been a long time coming, progressing alongside the technology that enables them. They represent a significant shift in the retail market but are not guaranteed permanency. As technology continues to develop, expect consumer expectations to stay consistently high, developing in-line with the advancements of product and technology.

⁷Packaging News, 2016, *Tesco aims to reduce waste with new chicken fillet pack*. [Online] Available at: <http://www.packagingnews.co.uk/news/markets/food/tesco-aims-to-reduce-waste-with-new-chicken-fillet-pack-28-06-2016>

Image – as above

THE FUTURE OF THE RETAIL LANDSCAPE

The future is here

We're already starting to see retailers adapting to their customers' demands, adopting new practices and technologies to fit in with their busy lifestyles and ever changing priorities.

In 2014, Asda, Waitrose and Tesco partnered with Amazon to launch Click & Collect services across the London tube network⁸ allowing customers to collect their shopping from designated lockers as they pass through on their journey. Such initiatives add a new level of



convenience to online shopping by eradicating the need to plan around a delivery slot. However, this move to buying less, more often will require a shift in every element of the supply chain as suppliers must find ways to fulfil these irregular shipments without seeing a dip in efficiency and profit margins.

Similarly, third party delivery services are continually on the rise, tapping into consumers' demand for more choice. Food delivery services such as Just Eat, Deliveroo and more recently, UberEats have boomed in recent years, capitalising on the time-pressed with their home and office delivery services, opening up an entire virtual marketplace for businesses.

Businesses such as Argos and Sainsbury's that target the same consumer are consolidating to expand their customer offering and increase convenience for customers by positioning themselves as the one-stop shop, creating a clear point of difference from their competitors.

The next step

Retailers are investing in making the in-store experience as customer-centric as possible. However, as technology advances, expect to see more solutions entering the home as we capitalise on the *Internet of Things* and the increasing connectivity of our devices, so shoppers can auto-replenish product in the home.

⁸ BBC News, 2014, *Tesco, Waitrose and InPost sign up for London Tube Click and Collect*. [Online] Available at: <http://www.bbc.co.uk/news/uk-england-london-25941699>
Image – as above

A recent article⁹ predicted that Amazon's latest technology, the *Internet of Things* Dash Button could steal 20% of UK supermarket online sales by 2020, while Ocado recently (Oct 2016) announced it has intentions to develop in-home smart technologies.¹⁰

Amazon have also alluded to further developments of their automated shopping services including the Dash Replenishment Service (DRS), which recognises when you are out of a product and automatically re-orders it for you. This suggests they are trying to reintroduce brand/retailer loyalty in their customers, almost subconsciously. If a customer is hooked in to such a convenient way of ordering, repeatedly, and has this



convenience inside their own home, they are gradually going to become more comfortable skipping the grocery store altogether. With select retailers leading the way in innovation by a considerable margin, it is likely the competition between the big retailers will only intensify as they each vie for that ever-important customer spend. For the supply chain, this further fragmentation of channels will only disrupt the predictability of demand and require further structural re-think of practises in order to maintain efficiency.

Focusing the retailer on you

Personalisation is becoming increasingly prevalent among consumer expectations and reflected in retailer development. Steps have been taken in this area through the use of data allowing online retailers to suggest products and 'remember' recent purchases to provide a more seamless shopper experience. Perhaps more of a consumer gimmick, but recent examples of personalisation include the individually named Coca Cola bottles used as a marketing ploy, or the limited edition personalised Nutella jars.

However, the rise of wearable tech including smart watches will enable retailers to hyper-target the customer and interact with them in the real world. Beacon technology is gradually being rolled out and will send product information and offers to a customer in-store or in the vicinity, offering a personalised incentive to purchase.

⁹ Food Manufacture, 2016, October issue, *Life in the fast lane*. [Print]
[Accessed 23rd October 2016]

¹⁰ The Grocer, 2016, *Ocado adds TP-Link products to new smart home technology section*. [Online]
Available at: <http://www.thegrocer.co.uk/channels/online/ocado-unveils-new-smart-home-tech-section/542884.article>

Digital eyewear is currently being trialled for use in-store, with the intention of offering shoppers product information and even price comparisons when they look at a product, delivering an online experience amongst physical products. In terms of customer service, the device will store information on the customer's shopping habits such as recently bought items and relevant offers to provide customers with a swift and highly personalised service.¹¹

Tech of the future

As consumers' demands continue to rise, retailers will continue to react with developing technology and practices to stay at the forefront of the retail landscape. A clear trend emerging is the movement of retailers into the consumers' everyday lives almost on a subconscious level through the developments of auto-replenishment, voice command technology and other in-home smart technologies.

Amazon are currently trialling drone development, with government support, with intentions of being able to deliver customer parcels in under thirty minutes.¹²



Amazon has also recently launched the Echo¹³, a voice recognition pod for the home that allows the user to order and check the whereabouts of their products, including grocery and takeaways, via voice command, firmly cementing Amazon as the leader in in-home smart tech.

¹¹ Retail Innovation, 2015, *The Future of Retail with Wearable Technology*. [Online]
Available at: <http://retail-innovation.com/the-future-of-retail-with-wearable-technology/>

¹²BBC News, 2016, *New trials for delivering goods by drones*. [Online]
Available at: <http://www.bbc.co.uk/news/business-36887325>

Image – as above

¹³Engadget, 2016, *Amazon Echo's UK owners can now shop just by talking*. [Online]
Available at: <https://www.engadget.com/2016/10/20/amazon-echo-alexa-voice-shopping-uk/>

TECHNOLOGICAL INFLUENCE ON LOGISTICS AND OPERATIONS

How can supply chains react to the changes across the retail landscape to achieve success?

As consumer expectations continue to rise, forcing retailers to introduce more inventive ways of exciting the consumer, the need for improved costs and efficiencies also grows. Manufacturers will inspect every aspect throughout the supply chain for opportunities to add value.

Already, supply chains are facing issues following the death of the weekly shop, as smaller deliveries are required more often, creating less predictability and increasing the need of a seamless warehouse management system. The supply chain has to adapt, finding ways to improve efficiency, reduce errors and ensure warehouse operatives are fully utilised and productive, which is essential for being able to cater to these new shopping habits without seeing a drop in profitability.

Consolidation and collaboration

As the pressure to meet demand intensifies, more and more businesses are seeing a tangible return through consolidating their services and collaborating with partners.

In-house, companies can begin to make changes by identifying a number of manufacturers with the same needs and working closely with them to manage the sharing of resources, which can result in a high quality and cost effective, efficient service.

However, when working with third-parties, the dynamics change. The supply chain is traditionally transactional, and this is often where partnerships between manufacturer, logistics and retail can break down. However, in order to make these partnerships successful, a new attitude needs to be adopted and trust built to allow transparency between companies.

The recent collaboration between Tesco and P&G for example, took a holistic approach and saw P&G invest in optimisation from factory to Tesco depot, while Tesco optimised from depot to shelf. The two companies worked together through initiatives including stockless operations to reduce inefficiencies, resulting in CO2 emissions being cut by a fifth and costs reduced by 25%. It also resulted in a significantly more responsive supply chain, with production-to-shelf time decreasing from 15-20 days to just two.¹⁴

¹⁴ IGD, 2014, *Winning in Supply Chain's New World*. [Online]
Available at: <https://www.igd.com/Research/Supply-chain/Strategy-planning-technology/22319/Four-key-factors-in-the-new-world-of-supply-chain/>

A range of collaborations are being implemented across the food industry, with suppliers and manufacturers teaming up with 3PLs to use each other's expertise to their advantage. Transport 'pooling' for example, sees logistics companies liaising with their customers to consolidate any deliveries that are going to the same place at a similar time. By combining shipments in this way, carbon emissions can be significantly lowered, with fewer trailers on the road and less unused space. This strategy also enables more frequent deliveries for smaller suppliers.¹⁵

The improvements in vehicle telematics are also creating game-changing differences on the roads. Vehicles are linked by the telematics which allows customers access to an abundance of real-time information, including proof of delivery, analytics and direct electronic interchange links to the warehouse. This paperless communication between companies allows for fluid and speedy workflow.

The role of big data

Martijn Bertisen, UK country sales director, Google, described data as the 'secret sauce' to maximise sales. Retailers and manufacturers are beginning to see the opportunities in collaborative data to develop their offering and streamline their supply chain.

One of the biggest issues for the supply chain, caused by the ever-increasing consumer demands for convenience and speed, is the ability to fulfil smaller orders more regularly without impacting profit. Collaborative data can make marked improvements on food waste, efficiency and quality by creating a real-time view of the supply chain from end-to-end.

The vast amounts of data allow for a clearer view of what is happening at each point in the supply chain, thus allowing issues to be identified and resolved or improved in real-time. However, the sheer amount of data leaves room for incomplete or inaccurate outcomes if it is interpreted incorrectly.

In order to implement data effectively, there needs to be an industry-wide move from the 'silo' approach to manufacturing, in-turn favouring full supply chain integration from the start to the point of delivery, allowing every stage to be analysed in detail.

As efficiency and maintaining margins becomes increasingly difficult yet important for manufacturers, technology that capitalises on the availability of data is expected to be implemented more widely across the industry. We will see manufacturers using the *Internet of Things* on the shop

¹⁵Food Manufacture, 2016, October issue, *Let's get together*. [Print]

floor to work alongside a centralised ERP system, allowing data to be accessed via user portals or business intelligence tools, allowing real-time decision making.

The opportunities to analyse elements of the supply chain in real-time that are offered by new technology and its data will make unprecedented changes to the reactivity of the supply chain. Already, harvesters in the US are implementing the technology, using hand-held devices to identify the class of product before it goes out to their customers.¹⁶

Data quality issues are costing the retail sector as much as £2bn in lost sales,¹⁶ so the ability to identify an issue before it has even reached the packing environment will increase efficiency, and remove avoidable costs and errors.

Automisation in the supply chain

Across food and grocery retailers, fully automated supply chains are currently fairly rare, with previous attempts at automisation being deemed unsuccessful and ineffective.¹⁷ However, as consumers gain increased control of the channel they buy from and the way in which they receive their products, supply chains are slowly revisiting automated solutions as a long-term investment to keep up with demand. DHL, for example, has recently launched an innovative warehouse pilot, trialling collaborative order picking with robots.¹⁸

The EffiBOT, trialled in Germany, is designed to work with and complement a human order picker, with a key focus on reducing the physical workload for the employee. The fully automated EffiBOT cart works safely with and around people, following the picker through the rack system to be loaded up accordingly. Once at full capacity, the picker automatically sends the cart to a designated drop-off zone, while another cart arrives to take its



¹⁶Food Manufacture, 2016, October issue, *Data is in your hands*. [Print]

¹⁷ IGD, 2016, *UK Supply Chains: The Robots are Coming!* [Online]

Available at: <https://www.igd.com/Research/Supply-chain/The-robots-are-coming/>

¹⁸DHL, 2016, *DHL employs robot as picker's best companion*. [Online]

Available at:

http://www.dhl.com/en/press/releases/releases_2016/all/logistics/dhl_employs_robot_as_pickers_best_companion.html

[Accessed 27th October 2016].

Image – as above

place. DHL Supply Chain Site Manager Michael Artinger describes how ‘this solution makes moving from single to multi-order picking a more efficient and ergonomic process.’

DHL’s development suggests that while fully automated systems may still be approached with caution industry-wide, the collaboration between human skills and those of programmed robots could well be seen entering the supply chain as a first step to addressing efficiency and speed in the warehouse.

Leaders in automation

Leading the way in fully automated warehousing is Ocado.¹⁹ Recently, they announced a major step forward in the development of their Smart Platform, a system which sees 1,000 machines move hundreds of thousands of crates. The complex machines can be controlled in real-time and in parallel, significantly increasing efficiency across Ocado’s network and offering the ultimate level of reactivity in the supply chain.



In the current environment of low-growth, high expectations, small but incremental changes are not to be dismissed and can add up to deliver significant improvement across the overall supply chain efficiency.

Forecasting

As shoppers continue to purchase little and often, this translates back through the supply chain as purchases spread across multiple forecasts; thus 67% of businesses are finding it more difficult to forecast product demand.²⁰

This fragmentation of demand across channels has resulted in smaller aggregations of data from which to forecast. Conversely, these changing consumer habits make accurate forecasting more important than ever, increasing the challenge and complexity of the process.

¹⁹IGD, 2016, *Ocado transforms warehouse automation*. [Online]
Available at: <http://supplychainanalysis.igd.com/Hub.aspx?id=32&tid=7&nid=3662>
Image - as above.

²⁰IGD, 2015, *Forecasting demand in a world of uncertainty*. [Online]
Available at: <http://igd.com/Research/Supply-chain/Forecasting-demand-in-a-world-of-uncertainty/>

As better forecasting systems and access to analytics slowly make their way into the mainstream, a close relationship is needed between commercial teams and supply chains. With promotions and offers now firmly part of the retail landscape, competitor activity is the second biggest influencer on product demand, following seasonal events. However, it is not well understood, with only 27% of manufacturers actively taking its impact into account.²⁰

Traditionally, suppliers favour forecast accuracy as it enables advanced planning which in-turn can reduce costs and allow for effective decisions to be made. However, as the landscape shifts and accurate forecasting becomes less effective, suppliers will find that by recognising the increasing amount of activity happening at short notice and adopting flexible processes will allow for a responsive and effective approach. Ideally, equal focus needs to be put on both forward planning and real-time changes in order to allow wiggle room for flexibility when unpredictable external factors create volatility in the supply chain.

MATCHING FOOD PRODUCT SUPPLY TO DEMAND

Population-to-land ratios are getting smaller. Between 1967 and 2007, crop yields grew 115%, while the area of arable land in agriculture grew just 8%.²¹ From now to 2050, the world's population is set to grow from 7.2bn to 9.6bn, requiring a 70% increase in food production, without the additional land or natural resources available to do so.²²

Currently, 90% of crop production is coming from higher yields and crop intensity, but as food production is forced to grow further, we will see limitations to the types of crops that can be grown on the land available. This might not necessarily match up to consumer product demand, so other resources will need to be tapped into.

Consumers aren't the only ones to be hit by a potential reduction in food production, as retailers rely on vast availability of product to stay competitive with their customers. Waitrose, for example, sees sales rise by £20m with profits up £1.5m if on-shelf availability increases sales by just 1%.²³ However, conversely if an out-of-stock product is added to an online shopping basket, it is automatically replaced with its higher value equivalent, without the difference in price being charged. Therefore, poor availability online can become very costly.

With finite resources and an ever-increasing population, technology will be relied upon to help produce a safe, abundant and nutritious food supply.

Precision agriculture

Precision agriculture uses real-time data, brought together across all aspects of the harvesting process to aid farmers in making accurate and proactive decisions about their crops and resources.

Sensors are placed across the field to measure factors such as soil temperature and humidity of the surrounding air, while drones and satellites take images to be analysed. Using the data collected along-side 48-hour weather predictions models and simulations are created, allowing farmers to make proactive decisions around planting, fertilizing and harvest.

Collecting real-time data on all aspects of the harvest can make a measurable impact on its efficiency by making sure each element is optimised. If this element of the supply chain is fully optimised and

²¹IGD, 2013, *Land for food production*. [Online]

Available at: <http://igd.com/Research/Nutrition-food-and-farming/Land-for-food-production/>

²²Food Insight, 2015, *The future of food: food production, innovation and technology*. [Online]

Available at: <http://www.foodinsight.org/newsletters/future-food-food-production-innovation-and-technology>

²³IGD, 2014, *Improving product availability*. [Online]

Available at: <http://igd.com/Research/Supply-chain/Improving-product-availability/>

as efficient as possible, this then impacts on the rest of the supply chain, feeding data back through to inform every process.

While precision agriculture technologies are currently used mostly by larger companies, IBM researcher Ulisses Mello predicts that future developments will allow smaller farms to optimise their agriculture through mobile devices and crowd sourcing.²⁴

The opportunities for future precision agriculture include farmers taking a picture of their crops with a smartphone and uploading it to a central database to be assessed by an expert. Farmers could monitor their crops' temperature and humidity and align it with centrally available data to manage and maximise their own crops and resources. This creates opportunities for smaller operations to be competitive in the supply chain against bigger rivals.

Food Waste

According to the Institution of Mechanical Engineers, as much as half the food produced in the world, around 2bn tonnes, is lost before it the consumer even gets the chance to eat it.²⁴ In the UK, as much as 30% of crops are simply not harvested as they will fail to meet

retailers' exacting standards on physical appearance. This had led to big supermarkets including Asda and Tesco introducing 'wonky veg boxes', encouraging consumers to buy the less aesthetically pleasing

products at a reduced price in order to cut food waste across the supply chain, while giving farmers as fair a deal as possible.



However, while these investments from retailers will help in the effort to reduce waste, it is up to the supply chain to lead the way. Better, more efficient processes across supply chains, as well as new technological innovations need to be implemented together to cut as much food waste as possible, before it reaches the consumer. With demands on the global food supply chain growing, it's vital that agricultural resources are maximised, as sustainably as possible.

²⁴Institute of Mechanical Engineers, 2013, *Global Food, Waste Not, Want Not*. [Online]
Available at: <http://www.imeche.org/docs/default-source/default-document-library/global-food---waste-not-want-not.pdf?sfvrsn=0>

Image – Asda, 2016, *We're trialling wonky veg boxes in our 'Beautiful on the Inside' range* [Online]
Available at: <http://your.asda.com/news-and-blogs/wonky-fruit-veg-boxes>

Development in food production technology

As digitalisation is coming to the forefront of retail and logistics, GlobalGAP Summit 2016 keynote speaker Adjiedj Bakas predicted that farming will also make this move in future years, with a number of developments.

To tackle the diminishing farming space available on land, he predicts an increase in urban 'vertical farming' which sees crops being grown on top of each other in skyscraper-like buildings, bringing the crops into the city space of those who ultimately consume them, maximising available land. Developments of sea farms are also



expected to become the norm, with salt water being recycled to grow vegetable crops in abundance.

Currently in its infant stages and mainly used by high-end experimental restaurants is 3D food printing. Several versions are currently in development, but the ability to produce food on-demand to meet exact needs, including timing and nutrition, could significantly cut food waste while meeting consumer demand.

As well as making the most of the land we have and developing new ways of creating food, it is likely that the future will see biotechnology applied to crops and livestock on a larger scale. Through this genetic modification, the food produced can be tailored to the exact needs of the market and consumer, meaning that food waste will be minimal as only what is needed will be produced. The technology is currently being used in crops covering over 222 million acres and being trialled with animals. The product most likely to be commercialised in the near future is a specific variety of salmon that grows to maturity more quickly than its non-biotech equivalent.²⁵

'Trendwatchers' across the industry have identified a number of technologies that, in the long-term, will improve the efficiency and capability of the farming industry, including driverless tractors, fully automated harvests and farmbots to herd livestock. However, what is needed in order to make these changes a functional reality is a change in attitude across the farming community. Farming is often seen as the most traditional of practices, but farmers will need to welcome the innovative and the 'crazy thinkers' to reap the benefits they offer.

²⁵ Food Insight, *Background on food biotechnology*. [Online]
Accessible at: http://www.foodinsight.org/Background_on_Food_Biotechnology
Image – as above

In terms of how these developments to food production will affect the supply chain, it is clear that personalisation and speed are key factors. The potential roll-out of inner city 'vertical farms' would see a potentially huge reduction in food miles as food will be produced 'on the consumer's doorstep', while innovations such as 3D printing will reduce food waste with the ability to produce food in-line with demand.

CONCLUSION

The world we live in is and will continue to be more and more focused around technology and the opportunities it creates. In the retail sector, this translates into a consumer-driven industry, with the supply chain working to meet these demands in an efficient and profitable manner.

Managing a supply chain successfully through these changes to the landscape involves integrating efficient and financially viable practices into the supply chain from producer to end-user, including all elements along the way.

End-to-end collaboration needs to become part and parcel of the day-to-day supply chain. Implementing technology effectively across supply chain management and practices will allow organisations to continue to offer an effective and high quality product or service, while meeting the increased demands put upon them by the consumer and retail market.

Businesses must make the most of the technology that is available to them and be open to continually updating their practices in order to optimise their efficiency and effectiveness. With the pressures that technology creates from a consumer stand-point, organisations need to be strategic in their approach and recognise the opportunities that technology offers to stay on the front-foot as these changes continue.

As we have shown, the world in which we live has altered dramatically in a short space of time and traditional supply chain models have become in danger of being out of date. These changes are far from complete, with technological advancements only expected to affect the way we live further, so the supply chain needs to maintain an open mind and be open to the innovation available.

From large businesses to SMEs, every business is facing the same issue and will see the potential for success maximised by collaborating with highly experienced logistical partners who can bring their network, flexibility and range of solutions to create a high quality and cost-efficient service. Those businesses that work with experienced partners who can listen, respond and deliver strategic plans will likely see the most success as the supply chain continues to evolve.

As the consumer becomes more technological-focussed, so must the food and drink sector and supply chains that serve it. It is imperative that to remain relevant and future-proof, all members of the supply chain prioritise innovation, collaboration and co-operation in their business objectives.

The businesses that take these changes and develop alongside them will ensure they are at the cutting edge of the changing face of retail.

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