Crossing the Chasm:
Have we Reached the Supply Chain's Tipping Point?

Sean A. Culey (FCILT, SCOR-P)

Introduction: A What without a Why

During the summer of 2012 I was the chairperson for a supply chain event in Madrid. During the conference I was fortunate to be able to listen to various speakers from around the world excitingly talk about new technologies that were being developed, that ranged from big data analytical tools to warehouse robotics. As I listened, I sketched out a picture of an end-to-end supply chain and overlaid these new technologies and the areas they would automate, and it dawned on me that no one was considering what would happen when these were all applied and started to converge. At the end of the day I quickly realised that a new wave of technology was poised to disrupt and transform the very nature of the supply chain.

Since that date, I have been fortunate to be asked to speak around the world on this topic, and in the Q&A sessions that followed, one reoccurring theme emerged, which was not to do with the technologies themselves, but rather their social and economic consequences. Being someone who is always curious to know 'why' things happen, and what the future implications are, this intrigued me, and this intrigue led to a five-year research project that resulted in my book 'Transition Point'.[i] One of the questions I examine in the book is what drives technological change, and why advancement in these areas comes in waves rather than as a liner progression. The answer to this is linked to the evolutionary concept of capitalism, its creative and destructive forces, and to its architects; the inventor, the industrialist and the investor. These waves are driven by the creation of a cluster of new technologies that spawn new energy, transportation and communication mechanisms, which in attract investors and their money, and this investment creates whole new industries and large numbers of new businesses. However, these new entrants inevitably destroy the old innovations and the businesses wedded to them. Hence why the Austrian economist, Joseph Schumpeter, named this process 'creative destruction'.

Gradually, then Suddenly

One of the interesting observations is that these evolutionary 'meta-waves' of technological change are almost identical in form to the waves of innovation diffusion, as originally defined by Everett Rogers back in 1962[ii], and expanded by Geoffrey A. Moore in his 1991 book 'Crossing the Chasm'[iii] and more recently by Gartner and their hype cycle model[iv]. The only difference is the scale and timeframe involved, for while Roger's diffusion was focused on individual innovations and their adoption by consumers, the meta-waves are driven by transformative technological paradigms, and their diffusion across industries. In both cases the diffusion has a definite 'S' shape, with adoption slow at first, as many innovations fall into what Gartner calls the 'trough of disillusionment', failing to cross the 'chasm' from innovators and into the mass market. Once the chasm is crossed, the innovations go from deceptive to disruptive, experiencing an exponential level of diffusion and progress, driven by the competitive need to keep up or be left behind. We have experienced five waves since the Industrial Revolution and are now in the early 'spring' period of the sixth.

True to form, when I started presenting on this topic back in 2012 and 2013, I showed exciting videos of radical new sixth wave inventions such as warehouse robotics, autonomous vehicles, drones,

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collaborative robots and the like, only to see little evidence of their materialisation outside of these experimental organisations. While the videos went viral, the innovations did not, constrained either by technological issues, a lack of supportive infrastructure, or legislation.

However, in April 2019, real evidence appeared that indicated that we had reached a tipping point, at least in the retail industry, as a series of demand capture and fulfilment innovations started to cross the chasm.

Making Buying Easy

Convenience is a major driver for consumers, and the most inconvenient aspect of the shopping experience is usually the bit at the end – unpacking the basket, repacking and paying. Sainsbury's, a UK based grocery chain, opened the first checkout free store in Holborn Circus, London, which allows people to scan the items they buy using an app on their phone, and then payment is made electronically.[v] The store is Sainsbury's response to Amazon and the introduction of their Go stores, which use using a variety of radical new technologies such as vision tracking, sensing technology, and machine learning, and which have been successfully trialled in the US and which are currently being rolled out to 3,000 locations over the coming few years. The opening of the Sainsbury store stole the headlines from Amazon, who had previously announced that it was identifying and procuring the sites for British rollout of the Go stores.

Also in April, Walmart announced that it had partnered with Google to enable people to 'order by voice', where the consumer can simply say out loud the things they need, and Google Assistant will identify your favourite brands, check prices, look for deals and place the order.[vi] According to Walmart, all you have to do is say, "Hey, Google. Talk to Walmart" and start adding food to your cart. The system uses your order history to know what brand and size you mean when you say, for example, 'orange juice' or 'coffee', and pops it automatically into your cart. The service works on any device where Google Assistant is available, such as Google Home Hub, Android phones, iPhones and watches. Again, this is in direct response to Amazon's voice ordering capability that is part-and parcel of its' Alexa service that is embedded in the Echo series of home hub devices.

Automating the Last Mile

Not only has ordering goods increasingly becoming easier and more convenient due to these recent announcements, but a series of delivery focused milestones were also achieved. The fulfilment of demand has changed rapidly since the rise of e-commerce and omni-channel ordering, and no longer does the consumer have to spend their weekends travelling to the out-of-town hypermarket, spending hours walking the aisles doing the weekly shop. Now the consumer not the retailer decides when and where goods will be collected, creating an exponential level of additional costs and additional complexity for supply chain teams. To try and provide solutions that increase the speed and flexibility while reducing the amount of manpower (and their significant labour costs) a series of radical new automated delivery mechanisms have been developed and worked on over the past few years, and now they are breaking cover.

Earlier in the year, Amazon unveiled a series of road delivery robots called 'Amazon Scout' which were rolled out for a trial in Snohomish County, Washington.[vii] For those who pay attention to these developments, it was difficult not to notice the glaring similarity between these robots and the ones developed by Starship Robots, other than the fact that the Amazon Scout was painted a nice shade of corporate blue. Starship had been trialling their robots for much longer, coming out of stealth mode back in 2015, and from 2017 has been undertaking grocery delivery trials with retailer Tesco in London,

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and in 2018 with rival chain the Co-Op in the Milton Keynes area. Then in April this year, Starship announced that their robots had safely completed 50,000 deliveries, covering 200,000 miles while doing so.[viii]

Another last mile delivery innovation – drone deliveries – had created much more excitement (and a little derision) when Jeff Bezos first went on the 60 Minutes show in late 2013 and announced that Amazon planned to deliver goods to customers by drone in the future. Since then, people realised that this was more than a mere PR stunt, and a race to operationalise these in order to drastically cut the cost of last mile deliveries ensured. Drone deliveries were successfully tested in the UK by Amazon and in Australia by Google, but it was the Chinese retailer JD.com who was the first to use them for commercial deliveries, mostly to rural areas.[ix] The issues in the West were primarily legislative not technological, something that is less problematic in China, and time it takes for this legislation to be agreed and signed off has kept drone deliveries firmly in the 'future' section. Then, in April, a trio of milestones were announced. Firstly, UPS and drone technology company Matternet initiated a medical-sample delivery system for hospitals in Raleigh, North Carolina.[x] Then, a California-based company called Zipline launched the world's largest vaccine drone delivery network in Ghana, that is expected to be able to conduct up to 600 daily, on-demand medical drone flights to 2,000 health care facilities across the country.[xi] Finally, and most importantly for the retail industry, in late April, the Google drone spinoff, Wing, achieved the Federal Aviation Administration's first certification for drone deliveries. It will start in Blacksburg, Virginia, delivering commercial packages that weigh up to 3 pounds using its 11-pound vertical-lift aircraft.[xii]

The Architect of Disruption

These new delivery mechanisms are going to be needed to cost-effectively meet the new promises that are being made to the consumer base. In February 2019, Amazon announced that it was offering its Prime Now two-hour delivery service on groceries purchased from its Whole Foods stores.[xiii] In late April, Amazon then announced that it was going to spend $800 million dollars in the current quarter to halve its delivery time and offer its US Prime members, free one-day shipping.[xiv] This caused an immediate response from Walmart who also offered one-day shipping, making a point of the fact that they were offering it without the need for a membership subscription.[xv]

The driver behind nearly all of these retail innovations – at least in the West - is the disruptive behemoth that is Amazon. These developments are either being driven by Amazon, or as a competitive response to Amazon, for this company no longer represents just another retailer, it represents the development of a new marketplace; the every onward aspiration by Jeff Bezos' to create the 'Everything Store'. In 2017 Amazon spent around $22.6 billion on research and development, a number it matched again in 2018. That's over $45 billion dollars on innovation development in two years. We are now seeing the outputs of Amazon's 2017 investments; we have yet to see the output of last year's inventiveness, but it is certain to be disruptive.

The Tip of the Iceberg

For those not in the retail trade, do not be complacent, for the one thing that has been true to date is that these new innovations do not respect industry boundaries. Once the customer gets a taste of ordering by voice, stores without checkouts and automated, same day delivery, they will expect a similar level of service in their industry. Yet April's technological milestones were not limited to just retail, but also included announcements about the progress of other innovations that will transform the whole of the supply chain.

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At the start of the month, Verizon and a number of South Korean carriers launched the world's first commercial 5G network, and the first commercially produced 5G smartphones.[xvi] Verizon plans to expand its 5G offering to more than 30 American cities before the end of 2019, and other countries are rolling out 5G networks in 2019 and 2020. Japan's government has recently approved plans by four mobile network operators to invest $14.4 billion in rolling out 5G networks over the next five years, and China is also about to launch 5G networks. 5G is important because it is the core infrastructure behind the consumer and industrial Internet of Things, otherwise known as Industry 4.0. The vision of a world of sensors that capture information on every aspect of consumer behaviour, and a related industrial version that unpeels the performance of the entire end-to-end supply chain is about to become real. This will create an avalanche of information, which will in turn drive mass adoption of AI powered analytical control tower systems that are capable of processing and making sense of all of this data, for analysing and understanding it will be beyond the capabilities of humans. The supply chain is about to become self-aware, monitoring and correcting its own performance.

April 2019 also saw world-wide climate change protests, and this pressure will almost certainly drive governments to impose restrictive legislation on combustion engine vehicles and non-renewable energy sources. This will drive greater adoption of renewable power generation, storage and usage, and congestion charges and increased taxation will almost certainly see electric cars cross the chasm into the mainstream, supported by mass investment in charging stations. It will also ensure that legislation is passed to enable the use of road robots and drones to become widespread in order to minimise the number of delivery trucks – and hence the congestion and CO2 emissions - in urban centres.

Talking of vehicles, Elon Musk tweeted out in February 2019 that *"I think we will be feature complete — full self-driving — this year. Meaning the car will be able to find you in a parking lot, pick you up and take you all the way to your destination without an intervention, this year. I would say I am of certain of that. That is not a question mark."*[xvii] So not only will electric cars become mainstream – they will soon also finally become autonomous., something that has been teased since Google started driving around Silicon Valley in their Priuses back in 2012. For autonomous, self-driving cars were perhaps the first of the new wave's technologies to appear in test mode, but one of the last to become mainstream. And once cars become autonomous then delivery vehicles such as trucks will also, driven by the need to maximise the utilisation of the asset and elimination of costs.

Elsewhere, numerous case studies are emerging that demonstrate the potential of the blockchain, the use of collaborative robots are growing rapidly in manufacturing, billions is being invested in 3D printing and other additive manufacturing capabilities, RPA (Robotic Process Automation) software is automating the back office, intelligent chatbots are manning the desks in the front office, warehouse robotics systems are being utilised across multiple industries, and urban logistics centres are being built to support the same-day delivery promises mentioned earlier. The technologies of the sixth wave are all emerging, converging and getting ready to transform the supply chain from a retrospective, transactional and labour-intensive industry, to a predictive, agile and automated one. And most companies are not prepared.

Conclusion

For seven years I have been talking to audiences about these technologies and the waves that drive them, and April 2019 gave real indication that many of the sixth wave's inventions are about

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to cross the chasm into the mainstream, creating an exponential level of progress as companies race to incorporate them simply to keep up. They will shift paradigms and create new business models and industries – but they will also destroy old ones. For while cars and trucks will now drive themselves, we have not yet determined what will happen to the current human drivers of trucks and cars. And here lie the concerns of those people in the audience who raised their hand during the Q&A's – what happens to those in society that are left behind? Investigating the answer to that question was the most interesting - and concerning - element of all my research.

Contact details

sean@seanculey.com
www.seanculey.com
+44 7779 237462
@seanculey

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