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Why disruptive technologies may be damaging productivity

The term **disruptive technology** was first attributed Clayton Christensen in his 1997 book *The Innovator's Dilemma* in which he differentiates between sustainable innovations (creating value added products) and disruptive innovations.

Disruptive innovations produce cheaper, lower margin, poorer-quality products that target less profitable customers in order to undercut existing businesses in order to eventually dominate that sector. While he no doubt identified a fundamentally new business model, he was far from an iconic visionary, later going on to forecast (somewhat inaccurately) the failure of Apple's iPhone!

In recent years, the lack of productivity growth (our ability to convert labour and capital into economic or GDP growth), particularly here in the UK, has garnered increased media attention as growth continues to trail well behind pre-2008 levels.

Productivity growth not only increases income and business profitability, but when combined with innovation results in major leaps forward in GDP and living standards.

The greatest leaps forward in advancement are generally accepted as having taken place during 3 distinct Industrial Revolutions.

The **first Industrial Revolution** (early 19th Century) focused on coal, steam, railroad and textile innovations, while the **second Industrial Revolution** (late 19th Century) incorporated electricity, improved sanitation, fracking of petroleum products for refined organic chemicals, pharmaceuticals, communication and media.

Arguably the **third Industrial Revolution** has now ended and ran from post-WW2 euphoria of the 1950's to the dotcom bubble bursting in 2000. This primarily involved the development of new information technologies and telecommunication. Following each revolutionary 'jump', innovation follow resulting in the gradual adoption and incremental improvements.

The **second Industrial Revolution** is generally considered to have had the greatest impact on productivity and living standards.¹ Electricity became commercially viable (and continues to be our preferred source of energy), while the internal combustion engines combined with refined petroleum products revolutionised the transport and industry. So much so that *"A modern individual would find the world of 1970 familiar, though perhaps more basic in contrast, a 1970 individual would not recognise the world of 1870"*²

¹ Robert J. Gordon, 'Is US Economic Growth Over? Faltering Innovation Confronts The Six Headwinds' (September 2012).

² Satyajit Das, 'A Banquet of Consequences' (December 2015)

The **third Industrial Revolution** impacts our everyday lives. It focused on computers, evolving through both hardware (mainframes, minis, laptops, tablets, smart phones and wearables) and software (improved automation and efficiency in offices and industry). The most recent emphasis has been on connectivity, through sophisticated telecommunications, such as high-speed broadband and wireless.

The major impact on productivity of these changes occurred between 1970 and the mid-1990s and since that time we have seen, I believe, innovations that simply improve existing technologies, enhance efficiency, speed, capability and power

FAANGs³ take a bite

While I claim to be no IT expert, the majority of the potential trillion-dollar stocks, all appear to be based upon real invention created by the likes of Microsoft, Tim Berners-Lee and the development of fibre optic communications. We no longer seem to be advancing civilisation, just making it a little bit more comfortable and easier. Is a wi-fi washing machine really necessary?

The internet boom of the 1990s was based on email, search engines, e-commerce and online retail. Those that survived, most notably Amazon and Apple, have significantly altered their business models: Amazon now has a large presence in warehouses, logistics and web services and Apple has developed an entire ecosystem in order to distribute many types of media.

During the first two Industrial revolutions, existing industries were replaced with new technologies which were then further refined (innovation) over the following decades. Recent innovations have also focused on marketing, distributing and transforming existing goods and services. PC's became laptops and tablets, most significantly smartphones have replaced cameras, media devices, PDA's and many other items.

New technology also increasingly relies on aggregation (Google from newspapers, publishing and libraries), diversion (digital advertising from newspapers, magazine and TV advertising) and lower costs (Wikipedia, Uber, Airbnb, Deliveroo, Bird). Lower costs (disruption) are achieved by reducing the quality of the product as well as using untrained individuals or personal assets (with fewer protections), hence the gig economy.

Disruptive technology and long-term consequences

The **third Industrial Revolution** focuses on disruptive technologies. Businesses now also pursue disruptive technologies with limited long-term growth and productivity potential. Entrepreneurs, backed by venture capital, focus on innovation and monetisation hoping to extract short-term value from a buy-out funds or an IPO.

In Das's words (my emphasis) "the successful businesses and individuals that have emerged then ***engage in a destructive process, investing high-margin profits from their original products into risky, low-margin speculative projects***" that can often be commoditised. Amazon bought us dash buttons, Facebook bought us Oculus, Google underwhelmed with Google Glasses and the Apple Watch seems to add limited utility to anyone who is not already a dedicated fan.

³ Facebook, Apple, Amazon, Netflix, Google (Alphabet)

The most successful tech in recent years has tended to be social media apps intent on monetising the experience. The less said about the failed potential of Yahoo the better, and I would suggest given the regulatory attention both Twitter and Facebook have recently faced, Alphabet probably dodged a bullet with Google+. New technology seem to be celebrated in the way that online retail was in 1999 and the equity markets in 2007.

On a more positive note we should also acknowledge the genuinely ground-breaking work of those who have made their fortunes in the third industrial revolution: The Bill & Melinda Gates Foundation, dramatic leaps in space travel and increased awareness of clean and sustainable fuels. Some technologies do however offer genuine promise: AI, neural networks, improved online privacy, 3D metallic printing and increased automation (employment concerns notwithstanding).