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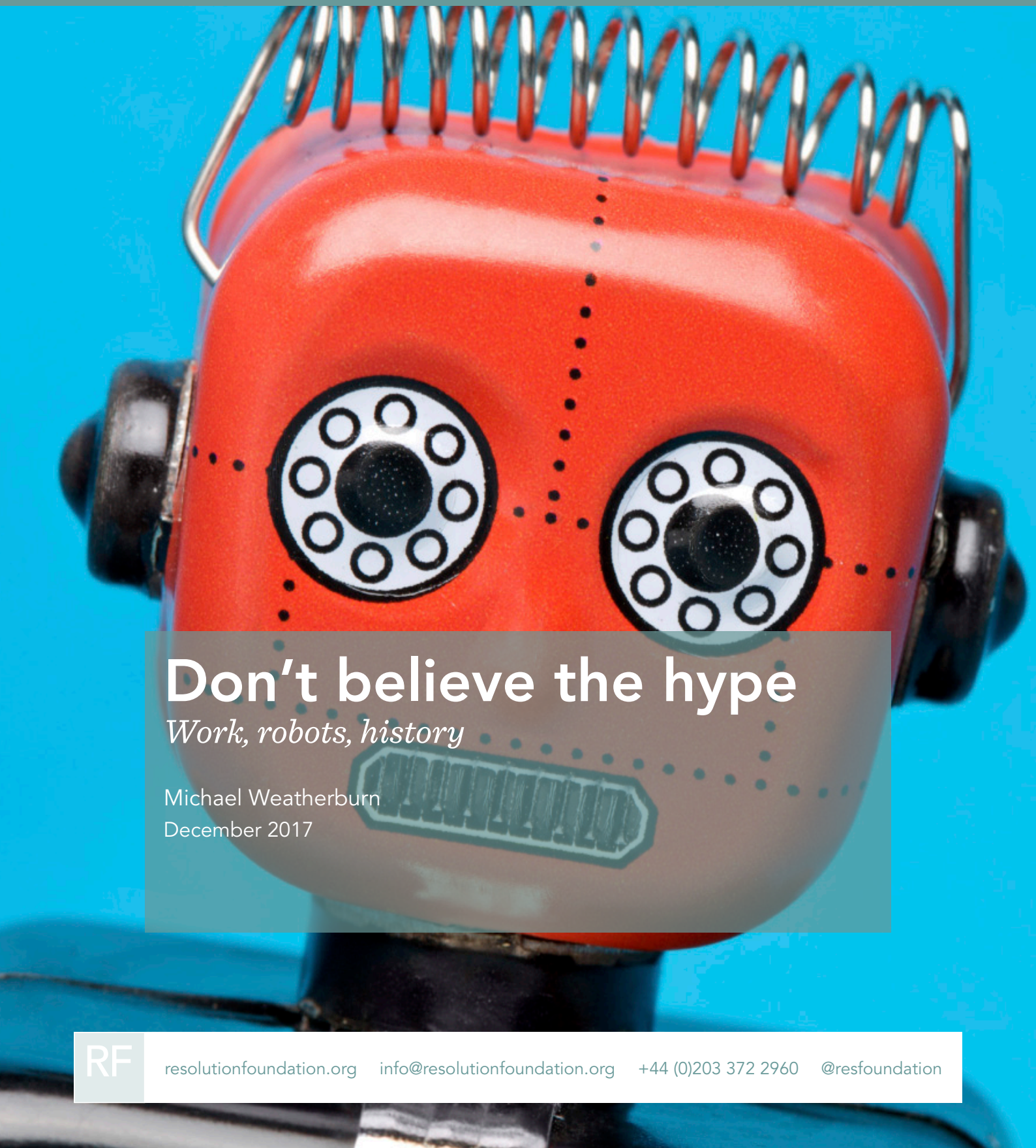

Don't believe the hype
Work, robots, history

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Foreword

History is often invoked to underline just how striking a current trend is. We know, for instance, that the UK is currently in the midst of its worst decade of productivity growth since Napoleonic times. But research into the past can also offer much-needed perspective, reminding us that today's concerns are seldom brand new.

That is certainly the case when it comes to technology and work, the focus of this paper written by Dr Michael Weatherburn as part of the Historians in Residence programme. His research unearths a rich tradition of commentators forecasting imminent change in the world of work, with many utopias and dystopias conjured up from the same developments. A healthy dose of scepticism toward such claims is undoubtedly a good starting point. Experience teaches us that new inventions tend to alter the workplace rather than revolutionise it.

But there is a danger of overcorrecting, as in the example cited here of those who painted the Internet as something of a niche commercial interest in the years before it became a global phenomenon. Outright opposition to new technologies is certainly to be avoided. Most economists would agree that if the UK's woeful productivity performance is to be reversed, greater capital investment – some of which will be robots – will be needed. When it comes to living standards, as the famous Paul Krugman quote has it, in the long run productivity is almost everything. Technological gains should lead to families being better off.

That doesn't mean everyone will fare equally however. To take one example, if or when they arrive, self-driving cars are likely to present a genuinely large shift in the labour market, potentially replacing many jobs. And even if such effects are less transformative across the whole economy and are instead more localised, we shouldn't be complacent about the harm that can be done. History again comes into its own at moments such as this. Learning the lessons of previous breaks with the past – particularly the process of de-industrialisation, the jobs that disappeared from the UK and how geographically concentrated impacts were – will be vital if future transitions are to be better handled.

But as many of the examples in this paper highlight, new technology usually has a bigger effect on the types of tasks people perform rather than overall employment rates. And it is in these situations that treating technological growth and its consequences as inevitably pointing in one direction becomes dangerous. Exploitation in the gig economy is among the best examples of an apparently novel concern – when, as Sarah O'Connor has described it, your boss is an algorithm – looking an awful lot like the bad old days of insecure employment. Focusing on the app can blind us to the ability of firms to decide how they treat their workers, or of governments to introduce legislation and ramp up enforcement.

Achieving this balance is essential not just in the world of work but across a range of economic issues. Intergenerational inequality appears to be one of the greatest long-term challenges facing the UK. It may be tempting to become complacent, writing off the generation-on-generation progress of the 20th century as a lightning bolt that is unlikely to strike in the same place in the 21st century. The proper response is to acknowledge the historically good economic and demographic weather that greeted the baby boomers, while aiming for policies that may help recreate some of those favourable conditions but at a minimum avoid reinforcing the luck and privilege of one generation at the expense of others.

A willingness to learn from history and use that knowledge to help guide the way is among the best tools policymakers have to achieve this. This paper is a helpful example of how that approach can be applied.

Conor D'Arcy

Resolution Foundation

Summary

This project sought to explore the historical development of digital technology in the UK workplace. It examines the use of the internet and digital technology in four sectors since 1990: warehousing and supermarkets, hospitality, taxis and care work. It examines the dotcom boom and bust, plus the related implementation of New Labour's Department of Trade and Industry internet strategy of 1998. Its key findings are that digital technology, and resistance to it, has pervaded in these sectors for substantially longer than present-day commentators in the media or politics may realise.

In so doing, it addresses broader claims by commentators such as the World Economic Forum and the UK government's Taylor Review in relation to the effects of robots and digital technology on how the UK workplace is developing, and may do so in the future. It also addresses the issue of whether robots are making people unemployed. A principal recommendation is to take alarmist projections with a pinch of salt: such hype has been evoked before and rarely comes true.

Included as appendices are a case comparison between the recent Taylor Review and a Ministry of Labour investigation of 1931-2 into workplace data; examinations of the future forecasts which in 1998 New Labour made for 2015; and insights into why the historical approach which this report follows, both in style of debate and practical research insights, is likely to become more necessary in the future.

Section 1

Introduction

Amidst the geopolitical turmoil facing the world in the second half of the 2010s, economists, academics, think tanks, politicians, political parties, trade unions, industry bodies, and activist groups have been increasingly focusing on an important factor in 21st Century global political economy: the past, present and future of work. Usually, the anticipated future absence of work is a particular concern. Often connected to such phenomena as big data, artificial intelligence, data mining, 3D printing, machine learning, and the internet of things, predictions for just how many jobs in Western-style economies are at high risk from digital technology vary from 10 per cent to 47 per cent.[1]

Other, related yet confusing phenomena pepper the news on an almost daily basis. At the time of writing, news stories covering technology and/or the economy include: takeaway website Just Eat leapfrogged the supermarket giant Sainsbury's on the FTSE 100;[2] the travel technology firm Uber, and similar firms, have recently been banned in London on safety grounds, with 40,000 Uber driver jobs at risk;[3] even more urgently, Bitcoin soars past $16,000, up from $1,000 earlier in 2017, with many warning of a bubble about to burst at any moment, and others noting the immense energy consumption of each cryptocurrency transaction.[4]

The general tone is even stronger than the statistical projections or specific examples: we hear how "the world is changing faster than ever".[5] Or, that the world is "getting faster, *faster*".[6] Consultancy firm McKinsey inform that "digital is changing our world, quickly and irreversibly," and "exponentially".[7] According to the World Economic Forum and its founder, Klaus Schwab, we are living in a "Fourth Industrial Revolution" whose "transformation will be unlike anything humankind has experienced before".[8] The UK government argues "technology is changing the way we live and work at a rate not seen since the Industrial Revolution".[9] Other authors similarly

[1] C Frey and M Osborne, *The future of employment: how susceptible are jobs to computerisation?* Oxford Martin School Working Paper, 2013 and M Arntz, T Gregory and U Zierhan, *The Risk of Automation for Jobs in OECD Countries: A Comparative Analysis, OECD Social, Employment and Migration Working Papers)_189*, 2016. For more recent comments on this issue, see L Mishel and J Bivens, *The Zombie Robot Argument Lurches On*, Economic Policy Institute, 2017.

[2] http://www.independent.co.uk/news/business/news/just-eat-ftse-100-sainsburys-supermarket-value-takeaway-food-delivery-a8073076.html

[3] 'Uber loses right to classify UK drivers as self-employed' *The Guardian*, 28 October 2016.

[4] http://www.bbc.co.uk/news/business-42260211 and https://grist.org/article/bitcoin-could-cost-us-our-clean-energy-future/?mc_cid=8c27ad094a&mc_eid=ce14e92f9b.

[5] http://www.unesco.org/fileadmin/MULTIMEDIA/HQ/SC/pdf/web_WWAP_Poster_Green_WWDR4_170212.pdf

[6] R Colvile, *The Great Acceleration: How the World is Getting Faster, Faster,* 2016

[7] A Swaminathan and J Meffert, *Digital @ Scale: The Playbook you need to Transform your Company*, 2017

[8] Klaus Schwab, *The Fourth Industrial Revolution*, 2017 and https://www.weforum.org/agenda/2016/01/the-fourth-industrial-revolution-what-it-means-and-how-to-respond/. For observations that the 'Fourth Industrial Revolution' is an old term, see David Edgerton, 'The Myth of the Weightless Economy' at: https://www.youtube.com/watch?v=OdfvTlg0hCc&t=2s and Elizabeth Garbee, 'This is Not the Fourth Industrial Revolution' Slate, 29 January 2016.

[9] BEIS, *Good Work: The Taylor Review of Modern Working Practices.* 2017

report that we are entering a "Second Machine Age".[10] Even the International Labour Organisation, founded in 1919, claims that the "world of work is changing faster than ever before".[11] Predictions of the outcomes from such change vary from utopian socialist democracies, to flat, mutualist cooperatives, to dystopian capitalist serfdom.[12]

As Gavin Kelly has observed, several constituencies have a vested interest in hyping the rate of workplace change: professional services firms describe futures which apparently only they can see, think tanks face a crowded market, business thought leaders need to energise TED talks, and academics must demonstrate the impact of their research.[13] Instead of looking at the science fiction, he argues, we should instead focus on the 'real shifts' which 'are currently staring us in the face'.[14]

Building on recent work by the Resolution Foundation, and similar studies by think tanks, academics, journalists, consultancies, trade unions, and activist groups, this project aimed to do precisely that. For example, the Resolution Foundation's 2016 study *Robot Wars* revealed that since 1993 there has been a 'hollowing-out' of routine jobs such as secretarial work, administration and manufacturing, but also a concomitant 'filling in' with new or reframed jobs in business, management, science, teaching, and care.[15] In contrast to the rather pessimistic tone many groups present, the Foundation advocates using more workplace digital technology to increase employee productivity, meet rising wage levels, and to compensate for the upcoming potential that EU migrants will no longer be available to fulfil certain roles.[16]

Building on this emergent interest in charting historical workplace phenomena, both medium and long term, this study investigated the digitalisation of the workplace since 1990 to add much empirical evidence but also to contribute a sense of depth, proportion, and gravitas to this important topic. We wanted to assess whether there really should be such a sense of urgency surrounding these issues, whether this hype is historically distinctive, and whether the impact of digital technology has been similar or different in both time period and usage across sectors. We then connect the project's findings to the Resolution Foundation's mission, including examining how blue-collar, private sector jobs were adjusted to meet the challenge of paying the National Minimum Wage (NMW) from 1999 onwards.

[10] E Bryndellson and A McAfee, *The Second Machine Age: Work, Progress and Prosperity in a time of brilliant technologies*, 2014.

[11] https://twitter.com/ilo/status/795359495975239680

[12] For the first, see N Srnicek and A Williams, *Inventing the Future: Postcapitalism and a World Without Work*, 2016. For the second, A Sundararajan, *The Sharing Economy: The End of Employment and the Rise of Crowd-Based Capitalism*, 2016. For the third, see https://aeon.co/essays/what-if-jobs-are-not-the-solution-but-the-problem.

[13] For more insights into what happens when we change the historical question being asked, see D Edgerton, *Shock of the Old: Technology and Global History since 1900*, 2006.

[14] https://gavinkellyblog.com/thestickingpoweroffalsenarrativef2cd80defaf3

[15] They also noted that large declines in employment in certain sectors are less due to the effects of automation and rather the reduction of younger people entering those sectors. For a case study of ATMs and retail banking, see J Bessen 'Toil and Technology' *Finance & Development*, 2015. See also L Mishel and J Bivens, *Zombie Robot Argument*, May 2017. The gender aspect of this shift is not considered in this report, but for insight into that debate, see H Rosin, *The End of Men: and the Rise of Women*, 2012; A Wolf *The XX Factor: How Working Women are Creating a New Society*, 2013; L Penny, 'Men will lose the most jobs to robots, and that's ok' *Wired*, 8 January 2017.

[16] A Corlett, *Robot Wars*, 2016 and S Clarke, *A Brave New World*, 2016.

Section 2

The rise of the New Economy

The popular 2010 movie *The Social Network*, which dramatized the origins and rise of Facebook, signalled that the creation of lucrative social media platforms and iconic digital technologies such as Apple's iPhone has now shifted from current events to historical memory and interpretation.[17] Beneath this story of the rise of heroic companies, brands and individuals, there is a history of the internet which is becoming increasingly forgotten because it does not match the present-day hype surrounding the 'Fourth Industrial Revolution'.

Part of this history is that the later 1990s was the period of the 'dotcom boom', a gigantic, largely American speculative tech bubble in which dramatic claims were made for how e-commerce, really a name for digitised logistics, would transform economies.[18] It initially seemed to pan out. In 1998 the return on venture capital funds focused on startups was 25 per cent and leading firms achieved 100 per cent annually.[19] New, small and now long-forgotten web companies, like WebVan (established by Louis Borders of Borders book store fame) and TheGlobe.com, reached record initial public offerings (IPOs) within minutes of floating on the stock exchange.[20] The following year, *Time* reported that "the NASDAQ is at a record high. Again. New companies are being born". "Companies that barely existed a year ago are publicly traded, their founders ungodly wealthy".[21] As such, *Time*'s person of the year was Jeff Bezos, founder of Amazon, with the magazine declaring that Bezos and Amazon had "helped build the foundation of our future".[22] Slower in uptake and scale, the British followed suit one year later, with the widely-hyped British company lastminute.com achieving a valuation of £800 million when floated on the London Stock Exchange in March 2000.[23]

Analytical commentators had much to say about this buildup. Alan Greenspan, Chairman of the US Federal Reserve, argued that this new economy was not actually new; there were many

[17] In alphabetical order by company: For Alibaba, see the documentary *Crocodile in the Yangtze*, 2012, and Duncan Clark, *The House that Jack Ma Built*, 2016; Amazon: B Stone, *The Everything Store: Jeff Bezos and the Age of Amazon*, 2014; Apple: A Lashinsky, Inside Apple : the secrets behind the past and future success of Steve Jobs's iconic brand (2012); the movie *Steve Jobs* (2015); B Merchant, *The One Device: The Secret History of the iPhone*, 2017; eBay: A Cohen *The Perfect Store: Inside Ebay*, 2002; *Facebook: The Social Network*, 2010; D Millller, *Tales from Facebook*, 2011; On Google, see RE Stross, *Planet Google: How one company is transforming our lives*, 2008; Uber: A Lashinsky *Wild Ride: Inside Uber's Quest for World Domination*, 2017. For a recent analysis of this sector more broadly, see S Galloway, *The Four: The Hidden DNA of Amazon, Apple, Facebook, and Google*, 2017.

[18] eBay was founded as AuctionWeb in 1995, the same year Alibaba was abortively launched as China Pages. This is earlier than social media companies such as Friends Reunited (2000), Friendster (2002), MySpace (2003), Facebook (2004), Twitter (2006), Instagram (2010), and Snapchat (2011). For a history of global logistics focusing on the shipping container, see M Levinson, *The Box: How the Shipping Container made the World Smaller* and the World Economy Bigger, 2006.

[19] RE Stross, *eBoys: the First Inside Account of Venture Capitalists at Work*, 2000, xvii.

[20] J Cassidy, *Dot.con: The Real Story of why the Internet Bubble Burst*, 2003, 197. R Lowenstein, *Origins of the Crash: The Great Bubble and its Undoing*, 2004, chapter 6.

[21] 'Jeffrey Preston Bezos: 1999 Person of the Year' Time, 27 December 1999.

[22] Ibid

[23] Cassidy, *Dot.con*, ix and J Cassy 'Lastminute maiden results surprise sceptics' Guardian, 5 May 2000.

historical examples of irrational speculative bubbles ballooning and later popping.[24] Contemporary historians like Arthur Norberg, Judy O'Neill, Janet Abbate, and James Cortada argued that the technology in question was much older than people realised, having underpinned some sectors for decades.[25] The British historian David Edgerton observed that claims of 'ever accelerating change' in technology and economics were unfounded.[26]

Some influential technology specialists also realised there was a deeper story beneath all the hype. From Morgan Stanley, Mary 'Queen of the Internet' Meeker and Chris DePuy's influential *The Internet Report* (1996) was relatively balanced (when compared to the tenor of present-day discussion), observing the internet's 30-year history, the growth in PC sales since 1980, and its potential for future growth. Specifically, Meeker and DePuy predicted the ubiquity of email for PC users within a decade, despite the slowing of PC sales in recent years, and, despite noting that the "development of the Internet won't be as easy as it sometimes appears", recommended stock in Cisco, Ascend, Cascade Communications, America Online, Intuit, and to a lesser extent, Netscape.[27]

Meeker and DePuy may have been wrong about which specific companies to bet on, but were right that things could go wrong. What is particularly interesting in the 'Second Machine Age', 'Fourth Industrial Revolution' and associated narratives, which are proudly historical in approach, is that their authors largely forget the 1997-2001 dotcom boom. But, perhaps more interestingly, also overlook the 2000-01 dotcom crash and its aftermath.[28]

The dotcom crash was important as it both damaged and in some cases obliterated some hitherto powerful internet companies, but also because it dented the futuristic confidence which their evangelists had been stoking over the prior five or so years. As Roger Lowenstein's *Origins of the Crash* (2004) noted, the dotcom crash created a widespread feeling that not only had the internet dramatically over-promised and under-delivered, but that the blame for the dotcom crash could not be placed on any particular person or company.[29] As John Cassidy, put it in *Dot.con*, "the promise of the internet wasn't just technological; it was also ideological" plus "the events of Tuesday, September 11, 2001, drew a thick line under the dotcom era".[30]

The boom period was superseded by suspicion and cynicism as to not just whether many internet companies would be as transformative as their enthusiasts had promised, but even whether they would survive at all.[31] For example, one former Amazon interviewee recalled that shares in Amazon plummeted from a peak of over $400 per share to under $20 per share in late 2000.[32] By this point, eBay had become worth more than Yahoo! and Amazon put together, and *Time*'s 1999 cover choice already looked unwise.[33] The value of Britain's dotcom poster-child, lastminute.

[24] Lowenstein, *Origins of the Crash*, 102.

[25] A Norberg and J O'Neill, *Transforming Computer Technology: Information Processing for the Pentagon*, 1962-1986, 1996; J Abbate, *Inventing the Internet*, 1999, and J Cortada, *The Digital Hand: How computers changed the work of American manufacturing, transportation and retail industries*, 2004.

[26] D Edgerton, 'Ever Accelerating Hype' *Prospect*, 20 April 1997.

[27] M Meeker and C DePuy, *The Internet Report*, 1996, chapter 1. For Meeker's career up to that point, see John Cassidy, 'The Woman in the Bubble' *The New Yorker*, 26 April 1999. Meeker still produces the annual Internet Trends report. See: http://www.kpcb.com/internet-trends

[28] E.g. Bryndellson and McAfee, *Second Machine Age*, 2014, 103-5.

[29] Lowenstein, *Origins of the Crash*, chapter 6.

[30] Cassidy, *Dot.con*, 317.

[31] On the US, see http://www.businessinsider.com/heres-why-the-dot-com-bubble-began-and-why-it-popped-2010-12?IR=T

[32] A Smith, T*otally Wired: On the Trail of the Great DotCom Swindle*, 2012, 19.

[33] Cohen *Perfect Store*, 9.

com, launched in March 2000, had fallen by 70 per cent by the following month.[34] Even office furniture manufacturers suffered as a result of the drop in new internet startups, with one, Steelcase, losing a third of its business by 2001.[35] In one of the odder stories of the dotcom crash, the industry-standard internet magazine, confusingly a paper magazine named *The Industry Standard,* reportedly went from being in 2000 one of the most successful magazines in human history to altogether vanish by the following year (for the concurrent replacement of paper with digital, see Appendix 3).[36]

The media tone really changed even though technology and its impact continued proceeding, albeit largely behind the scenes and unevenly depending on sector. It became personal. Meeker fell under attack as the 'lead villain in the destruction of dot-com stocks'.[37] In addition, as one sceptical BBC World reporter asked of Jack Ma, the founder of Chinese e-commerce firm Alibaba and at the time of writing (December 2017) one of the wealthiest people in the world

> **Reporter:** Tell us something we've never heard about the internet before. We're fed up with hearing what it might do. Tell us something we haven't heard before.
>
> **Ma:** In Asia, wherever you go on the street in Shanghai, Hong Kong, Beijing, all the young people talk about the internet and think about setting up internet business. So the flavour of the internet in Asia right now is trying to catch up the U.S.
>
> **Reporter:** Are you a millionaire?
>
> **Ma:** Now? No.
>
> **Reporter:** Do you want to be?
>
> **Ma:** Well, I hope. Naturally, if I can be.
>
> **Reporter:** Because in Hong Kong people are going bonkers about it. We've seen the scenes. But what is the money you're making? How will you make money on the internet and why should anyone wonder about it, if it's not making money?
>
> **Ma:** Today. The site: right now we do not make any money out of our site. It's totally free because we want to try to attract more attention.
>
> **Reporter (interrupting):** Can you see why people think it's so much hot air? You don't make any money. You've got extraordinary claims, and yet you make nothing.
>
> **Ma:** That's the internet.
>
> **Reporter:** Yes, but what's the point?[38]

We see here that just as the future successes of the internet, both financial and technological, became overrated in the dotcom boom of 1997-2000, so too they became too underrated as a consequence of the scepticism produced by the bubble bursting. Beneath all this, digital technology had been diffusing across many UK workplaces and had substantial results with which most analysts had little or no conscious contact.

[34] 'London survives market nerves as technology stocks fall further', *The Guardian*, 18 April 2000.

[35] S Holhatkar, 'Welcoming our New Robot Overlords' *The New Yorker,* 23 October 2017.

[36] J Ledbetter, *Starving to Death on $200 Million: The Short, Absurd Life of The Industry Standard,* 2003.

[37] https://web.archive.org/web/20060425084308/http://www.thestandard.com/article/0 per cent2C1902 per cent2C24064 per cent2C00.html.

[38] Interview featured in *Crocodile in the Yangtze*, 2012. Online at: https://www.youtube.com/watch?v=RkVJNOQ7B74, 25:00-26:13.

Section 3

The New Economy, e-commerce and UK government digital policy

The term 'New Economy' came to the fore in the UK in the 1990s, a time when, after the surprise collapse of Soviet communism, and the symbolic futurism of the year 2000 approached, technology, politics, and the media seemed particularly new.[39] Information and communications technologies (ICTs) in combination with 'New Media' and 'multimedia', were to be the key drivers of the New Economy.[40] The 'Knowledge Worker', a term dating from 1959, shot to the fore to describe the worker of the future, and even entered New Labour's policy terminology.[41] These knowledge workers, we were influentially told, would soon be *Living on Thin Air*.[42]

After winning power in 1997, New Labour's Department of Trade and Industry (DTI) published its competitiveness review, *Our Competitive Future: Building the Knowledge Driven Economy* the following year.[43] Drawing on a variety of research reports, public and private sector, *Our Competitive Future*'s stance on 'e-commerce' was bold and optimistic. Noting that 15 per cent of UK adults had visited the World Wide Web, the review observed relevant historical developments such as mainframe and personal computers, as well as observing that the internet could be useful for better relations with suppliers, operations, distribution, marketing and sales, and after-sales care.

Interesting were two DTI forecast scenarios for the year 2015, 'Wired World' and 'Built to Last' (see Appendix 4).[44] Other projections about the future were included in *Britain's Competitive Future* and, examining them nearly two decades later, it is possible to test their accuracy. The DTI cited consultancy firm KPMG's projection that at some point over the next five years (1998-2003) there will be an explosion in the growth of Internet marketing and Internet transactions, saying "we project that this will come shortly after the year 2000, as Y2K and euro-based projects are completed and release financial and human resources for electric commerce based projects".[45]

Figure 1 compares KPMG's projections and the historical reality as we can now study it. It shows that the projections were far too optimistic. with UK internet sales only reaching 16 per cent of total retail sales in 2017, 14 years later than expected.

[39] J Curran, 'Rethinking Internet History' in *Misunderstanding the Internet*, 2012.

[40] AM Webber, 'What's so new about the New Economy?' *Harvard Business Review*, 1993.

[41] PF Drucker, *The Landmarks of Tomorrow*, 1959

[42] C Leadbeater, *Living on Thin Air: the New Economy*, 1999

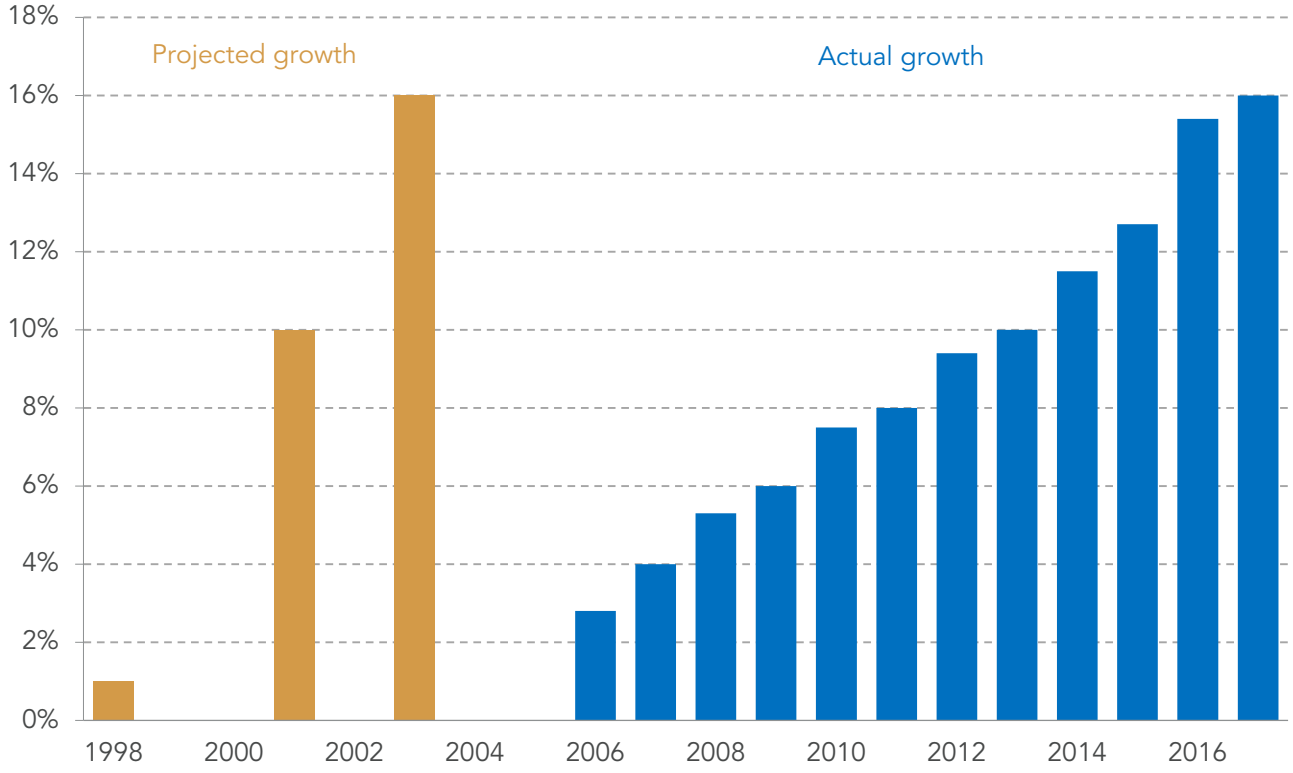
[43] http://webarchive.nationalarchives.gov.uk/20010628130156/http://www.dti.gov.uk:80/comp/main.htm

[44] The DTI stated: 'It is often said that we over-predict change in the short-term and under-predict it in the long-term. The year 2015 was chosen as an appropriate reference point as it is far enough in the future to have allowed recent innovations to have had a major impact on the way we organise our working lives, yet near enough to make any outcomes useful for current policy planning.' Archived online at: http://webarchive.nationalarchives.gov.uk/20000829131528/http://www.dti.gov.uk:80/future-unit/scenarios/index.html

[45] KPMG, *Electronic Commerce*, 1998, 1.2.

Figure 1: Projected and real growth of UK internet sales

Projected and actual growth of internet sales (% of total retail sales): UK, 1998-2017



Source: KPMG, Electronic Commerce Research Report (1998) and ONS Internet sales as a percentage of total retail sales (2017)[46]

But this only charts the rise of the internet from a consumer, retail perspective. Of course, the focus on e-commerce would bring about changes to many workplaces, which remain hidden from our studies of the internet in this period. This is important because current-day alarmist narratives really focus on the recent diffusion of digital technology and the internet to the domestic and leisure spheres, and connected retail sectors. A consideration of the longer and deeper history of the internet in the UK workplace reveals a very different story.

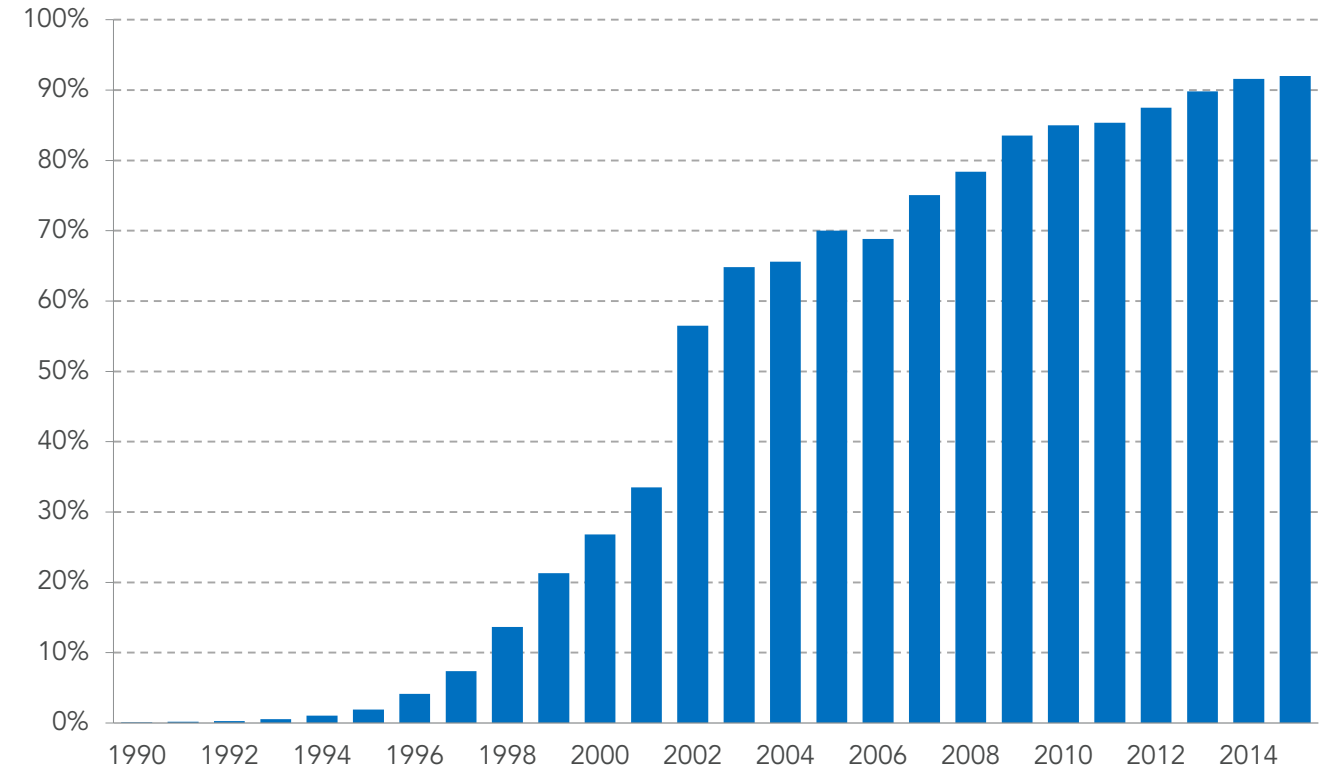
The diffusion of the internet in the UK bears little resemblance to the hype of the period. In terms of the uptake of the internet, the UK was similar to other advanced countries, with 57 per cent of the population online in 2002 compared to 59 per cent in the United States that year.[47] Figure 2 shows the rate of uptake of use of the internet by UK individuals since 1990.

[46] https://www.ons.gov.uk/businessindustryandtrade/retailindustry/timeseries/j4mc/drsi

[47] W Chen and B Wellman 'The global digital divide–within and between countries' *IT & society* 1.7 (2004): 39-45. J Cortada, *Digital Flood: the Diffusion of Information Technology across the U.S., Europe and Asia*, 2012.

Figure 2: UK individuals using the internet

Proportion of all individuals using the internet (%): UK, 1990-2015



Source: World Bank internet use statistics

As can be seen, the internet took over a decade to have a substantial impact on individuals' daily lives in developed economies like the UK, and indeed in terms of rate of growth of use, the internet is really a technology of the first decade of the century (nearly 30 per cent in 2000, 80 per cent in 2010). This said, important things were changing behind the scenes from the 1990s onwards.

Section 4

The internet, digital technology and work

The mood swings of the media and politics, both at the time and since, have not matched historical development as it happened on the ground, and how it affected normal people's lives and workplaces. A key reason why the most recent phase of discussion about the effects of the internet and digital technology on the workplace has been met with particular alarm is much of the initial implementation of the internet and digital technology had very low public prominence. This work was performed in tasks in behind-the-scenes operations such as back offices and logistics rather than where the casual observer or customer could easily see or use them. It is only in more recent years that consumers can affordably see the technology in their hands, advertised on recently-launched apps, and on branded clothing and vehicles in the street.

Supermarkets and warehouses

The BBC's 2013 *Panorama* documentary 'Truth Behind the Click' argued that "there's been a revolution in the way we buy", buying more online but "the physical side done by other people –we don't see that anymore". The film covertly examined Amazon fulfilment centres and condemned the handheld 'picking' technology deployed there, which treats its employees as 'robots', directed to products and assigned specific times to each shelf pick (around two per minute).[48] Interviewees revealed how "we are basically machines, we are basically robots". "Maybe they [management] don't trust us as human beings to think for ourselves". "Every second counts, with workers racing a computerised clock". Moreover, the GMB union attacked the use of this technology at Amazon.[49]

More recently, in 2016, the governing Conservative Party controversially intervened in the British supermarket sector, its productivity and digital technology use. Observing that French supermarket shelf pricing labels are digital, and can be changed in large numbers at the touch of a button, in contrast to Britain, where the price labels are still changed by hand, the then Minister of State for Skills Nick Boles argued that this was indicative of the "entrenched British disease" of technologically-conservative British employers refusing to invest in new technology, which in turn meant low productivity and low pay for employees.[50]

These two perspectives, one of which reports an excess of shelving technology and the other its concurrent absence, do not really match and it is the purpose of this section to explore the real truth behind the click, which goes historically deeper and wider than these examples.

[48] BBC Panorama, *Amazon: The Truth Behind the Click*, 29 November 2013. See also 'Amazon accused of "intolerable conditions" at Scottish warehouse' The Guardian, 12 December 2016. For related comments on Amazon's offices, see J Kantor and D Streitfeld, 'Inside Amazon: Wrestling Big Ideas in a Bruising Workplace' *New York Times*, 15 August 2015.

[49] https://www.theguardian.com/technology/2015/aug/18/amazon-regime-making-british-staff-physically-and-mentally-ill-says-union

[50] Sarah O'Connor, 'Supermarket Shelf Gamble behind UK Minimum Wage' *Financial Times*, 8 March 2016

As in the United States, an important site of UK digital innovation at the earliest stages was in logistics and distribution; the less-seen backbone of the supermarket sector.[51] When the development of British supermarkets since 1990 and their supply chains is incorporated into the story of the emergence and diffusion of the internet and related digital technologies, a very different picture emerges to that implied by these two scenarios. It reveals a sector driven by productivity goals, enthusiastic to embrace and invest in the most technologically sophisticated systems in the world, and which was seen to be world-leading. The reason why this is not well-known is because the innovations were deployed behind the scenes rather than where the casual observer or customer could see them - a point *Panorama* identified but one which has a substantially older history than the programme realised.

There were three main reasons why the 1990s UK logistics sector was ripe for what was called 'disintermediation'.[52] First, because a contemporary price war between UK supermarkets forced efficiency savings onto the supply chain, and particularly transport and warehousing within the supply chain. Second, because some industry specialists believed that UK haulage taxation was relatively high, thus necessitating increased efficiencies in order to remain competitive with other EU hauliers.[53] Third, some industry specialists recognised that the internet really did enable new kinds of relationships to be established and new transactions conducted.[54]

With The 'Asian tigers' struggling, deflation predicted, and supermarkets striving to maintain profit margins with decreasing prices, Professor Martin Christopher argued that 'there are now fewer opportunities than ever to find cost reductions anywhere other than the supply chain'. But, it seems the British were very good at this. 'So good', were British distributors, 'that delegations from retail organisations the world over regularly travel to the UK to look, learn, and gasp in awe at exactly how it should be done'. [55] Apparently even Boris Yeltsin's creaking post-Soviet distribution network and its correspondingly 'beleaguered economy' turned to British logistics specialists for 'help and advice'.[56]

Online shopping was predicted to change the entire infrastructure of the retail sector as instead of supplying customers from the stocks held at local stores, large American suppliers, particularly Amazon,[57] had apparently demonstrated the importance of large distribution centres.[58] *The Grocer* continued by noting that e-business 'can provide an ideal way of accessing new markets for niche players':

> A lot of companies are getting into e-business by Web-enabling the IT systems they already have. This is quick and relatively inexpensive and can yield some dramatic results.[59]

[51] For the USA, see Cortada, *Digital Hand*, 309

[52] In layman's terms, 'cutting out the middle man'. See Stross, *eBoys*, chapter 10.

[53] 'On the rack' *Warehouse News*, 26 May 1999

[54] For example, one interviewee, Stefano L. Tresca, a founding member of the technology accelerator Level 39, recalled that in the 1990s the lemon orchards of his local Sicily were criticised from mainland Italy for not using industrialised production methods and therefore producing old-fashioned, small, and unattractive fruits. Luckily, he recalled in interview, the emergence of the internet in the mid-1990s coincided with the emergence of the middle-class fashion for organic food, so the internet and its specialist chatrooms in which wholesalers circulated enabled him to sell the same fruit as marmalades and sauces to new customers overseas at considerably higher prices. Interviewed 24 March 2016.

[55] 'Pride and Progress' The Grocer, 13 February 1999

[56] Ibid

[57] Stone, *The Everything Store*, 96

[58] 'Invasion of the Cyberbrands', *The Grocer*, 29 August 1998

[59] Ibid

From inventory and stock control, to delivery and logistics, seemingly due to scale and industry pressure, the sector embraced the internet en masse; long before most people had it in their homes let alone in their pockets.[60] With the emergence of online shopping in the 1990s, the internet was also useful as it linked the online store to suppliers, and increased customer expectations, which in turn necessitated the increased use of picking technology to speed up picking work in both warehouses and supermarkets.

Was all this hype? Writing in 1999, one warehousing insider thought so:

> Anyone reading many trade magazines could be forgiven for thinking that the entire country was chock full of hyper-efficient supply chains, featuring state-of-the-art warehousing and distribution centres. Time after time, anything from counterbalance trucks to computer systems claim to improve efficiency (a rather feeble euphemism for being able to get rid of more staff) and provide many other wonderful benefits.[61]

Indeed, comparisons with similar efficiency gains in the 1970s made the 1990s look weak. In the 1990s, the debate in the large supermarket sector was a comparison with the massive productivity gains made in the sector since the 1970s, plus how to achieve additional efficiency savings in the supply chain in order to render retail more competitive.[62] Barcodes and scanning had enabled centralised purchasing and conveniently-located distribution centres had been built. The Grocer proudly declared how 1990s retailers delivered five times the range of goods with a quarter of the inventory.[63]

Some realised the complexity being introduced. Professor Michael Browne argued that these technological changes were actually making future predictions harder, with five-year future projections being more difficult to make than they were five years prior. He also predicted that either the popularity of e-shopping might cause road gridlock and necessitate road pricing, or that big out-of-town stores will be abandoned in favour of high street stores, "or whether there will be no high street" at all.[64]

This interest in efficiency went all the way down to the performance of work itself and with customers almost never visiting warehouses, it is unsurprising few can recall this. In a scenario similar to that outlined by Panorama, albeit substantially earlier than its programmers realised, portable scanning and inventory-processing computers have been in use in the UK for two decades. They were introduced at the jam and preserves producer Chivers Hartley in early 1997. There, according to one report, "staff find it [the technology] very comfortable, simple to use, reliable and robust".[65] So 'the truth behind the click' actually predated not just "The [Amazon

[60] 'Stocklin prepares for UK automated warehousing growth' Warehouse and Logistics News, 17 December 1999. 'Logistics firms lead in e-commerce' Warehouse and Logistics News, 12 November 1999. This research supports these recollections. Warehouse and Logistics News is replete with discussions of how best to use the internet from the mid-1990s onwards. In 1999, Graham Smith, MD of UK Stocklin, a Swiss-based logistics company, predicted the rise of the automated warehouse, given changing investment attitudes and the emergence of e-commerce. Indeed, that year, Warehouse and Logistics News noted that 'transport and logistics firms are currently generating more revenue from e-commerce than any other industry sector'.

[61] 'On the Rack' *Warehouse and Logistics News*, 15 October 1999

[62] Recent work into the history of the British bacon industry has noted the importance of efficiency savings made in bacon supply chains since the 1990s. A Bowman, J Froud, S Johal, J Law, A Leaver and K Williams, *Bringing Home the Bacon: from Trader Mentalities to Industrial Policy*, CRESC Public Interest Report, 2012.

[63] 'Pride and Progress' *The Grocer,* 13 February 1999.

[64] 'Pride and Progress' *The Grocer,* 13 February 1999. For a recent revisiting of the latter, see Fabian Society, *At the Crossroads: the Future of British Retail*, 2017.

[65] 'Preserving profitability at Chivers Hartley, RDTs bring real time benefits' *Warehouse and Logistics News*, 21 March 1997. See also 'Stocklin prepares for UK automated warehousing growth' *Warehouse and Logistics News*, 17 December 1999.

customer's] Click" but even Amazon's first UK branch, established in October 1998.[66] Organised resistance to this technology is also older than most people realise, and is examined below.

Such technology has also been in use on the supermarket floor, in front of customers, for some time, following UK supermarkets' entry into the internet order-and-delivery business in the late 1990s.[67] For example, one 2004 *Grocer* report investigated a day in the life of one of eighteen pickers at a Sainsbury's store in West Hove. Issued with a handheld barcode scanning device, one picker described the complexities of making sure she picked the right stock, and in the absence of the correct product, predicting what alternative the customer may like. Issued with an order of 27 lines and 94 items, "it is 12.11pm and the target is to get it done by 1.03". Following the completion of many orders, she became "convinced the key to online picking is to employ staff who do their own food shopping. Retailers put much effort into delivery and the ordering process but with availability issues dogging the industry it's the store picker who has to get into the mind of the shopper and choose the best substitution".[68] As we shall see, supermarkets and warehousing were unusual in deploying digital technology at the point work was being performed. The next section examines the hospitality and food services sectors, where its use was even more obfuscated.

Hospitality and restaurants

Like retail, government, and other sectors, the internet bug also bit tourism in the late 1990s. The fact that key UK website lastminute.com's core product was nearly-expired travel and hotel deals, is testament to this. In addition to predicting online retail sales, management consultancy KPMG also projected how the internet would affect the transport, leisure and tourism industries. Recognising that only 3 per cent of sales in 2000 were made online, KPMG projected that this would rise, at a similar projected rate to that which had been predicted for retail sales, to 27 per cent within three years (compared to a UK average of 17 per cent).[69]

Some contemporary commentators did note the deeper and longer-term ramifications of the internet to the hospitality sector, while also recognising that it would also be useful to customers once they were online. One commentator in Hospitality, Patrick McCole, noted the infrastructural possibilities created by the internet and suggested that it would have wide ramifications in the future. He noted that the internet was transforming global distribution networks in which the constituents of a distribution system unite, and it is dramatically affecting how travel products are distributed in the travel industry. This emerging distribution channel facilitates the multi-dimensional flow of information and transactions – with any intermediary in the channel able to distribute travel information and complete a transaction directly with customers.[70]

Again, the internet was used more for organisation and administrative tasks rather than where customers mentally connected it to the services they were purchasing. Lastminute.com was the tip of the iceberg: Hospitality magazine recorded that as pricing structures were becoming more transparent due to 'e-commerce', the internet could be used for advertising, price comparisons, and online reservations, though of course bookings were largely confirmed on desktop computers at home or work rather than on a mobile phone in a public place.[71]

[66] Stone, *The Everything Store*, 2014, 96

[67] Iceland was the first, in 1999. See 'Is Iceland now cool?' http://www.bbc.co.uk/news/business-38991243. That year, Amazon starting trialling UK home grocery delivery. See 'Amazon.com ventures into the grocery jungle' *The Grocer*, 22 May 1999.

[68] 'Picking a plum job' *The Grocer,* 16 October 2004

[69] KPMG, *E-commerce in the Transport, Leisure and Tourism Industries: Research Report* (London: KPMG, 2000). Unlike in the retail case, due to time constraints it has not been possible to test KPMG's projection for this sector.

[70] P McCole, 'Hind Sight, Fore Sight, or a Web Site?' *Hospitality,* April 2000.

[71] 'Get Connected' *Hospitality*, Jul/Aug 2000

The story was similar for the food services sector, too: Peter Backman, a specialist on the sector, recalled that even in many thousands of small restaurants, the internet and related digital technology has long been useful for accountancy, ordering, and scheduling but that its deployment in customer-facing scenarios has until relatively recently been more problematic.[72]

The main difference with the deployment of digital technology in hospitality compared to warehousing is the fact that hospitality workers are often customer-facing. Our interviews revealed it has been far harder for digital technology to be deployed at the point of customer service than behind the scenes, even in hospitality contexts, and when it was, customers did not like it very much. For example, Backman noted that although Burger King and McDonalds restaurants introduced digital kiosks and touch-order screens up to fifteen years ago, they are far from replacing human-manned counters. After all, he suggested, when customer service is the main source of value-added, especially for older customers, technology which makes service more efficient can actually "get in the way" of personal service. Moreover, he observed a long-standing tension between the back office staff used to process-driven changes, and front-of-house staff drawn to the empathetic aspect of customer service.[73] Similarly, Chris Sheppardson of the Chess Partnership also argues that some aspects of the hospitality sector - whose focus are stadia and similar large venues - have sometimes been 'over process-driven'. This has led to 'less relationship and less personal touch'.[74]

Taxis

Transport for London's refusal to renew Uber's private hire operator licence in September 2017, and the November 2017 news of the firm's massive data breach, has brought Uber and the taxi sector to the fore again.[75] Indeed, in recent years, Uber has become a byword for not just the effects of the internet and digital technology on the 21st century workplace, but also the 'gig economy', and its platform basis. It has even recently given rise to a somewhat negative verb: that of Uberisation.[76] Uberisation combines notions of a precarious workforce, the aggressive disruption of traditional sectors, 'nudge' algorithms, excessively masculine workplace behaviour, the over-ranking of human interaction, and the magnetic omnipresence of the smart phone in modern life.[77]

It is not immediately obvious why Uber, and services like it, have shot to the fore in this way, especially given how long digital technology has been deployed in other work contexts. It seems to have been a combination of being the most publicly visible firm in a controversial sector, specific company policies, and bad luck. Digital actually came relatively slowly to the taxi sector. As in smaller-scale hospitality ventures like hotels and restaurants (where customers could not see it), the taxi sector's embrace of the internet happened in back room offices substantially before it entered the realm of the employees, in this case the taxis themselves.

Chris Williams, Senior Lecturer at the Open University, describes long-standing tensions raised by the application of the internet and digitised technology to the taxi sector. He characterised the system from the 1960s, when cars became far more numerous, as two-tiered: black cabs, some

[72] Interview with Peter Backman, 23 December 2016

[73] Ibid

[74] Interview with Chris Sheppardson of Chess Partnership, 23 December 2016

[75] https://tfl.gov.uk/info-for/media/press-releases/2017/september/licensing-decision-on-uber-london-limited and https://www.bloomberg.com/news/articles/2017-11-21/uber-concealed-cyberattack-that-exposed-57-million-people-s-data

[76] Jessica Elgot, 'John McDonnell: We must stop 'Uberisation' of the workplace' *The Guardian*, 17 February 2017.

[77] For a recent study of the Uber company, see Lashinsky, Wild Ride, 2017. For specific aspects of the firm, see also A Mahdawi, 'Are you ready for a future where we're all reviewed like Uber drivers?' The Guardian, 15 March 2016; S Knight, 'How Uber Conquered London' The Guardian, 27 April 2016; D Lee, 'Uber investigates "abhorrent" sexism claims' BBC Technology, 20 February 2017; N Schieber, 'How Uber uses Psychological Tricks to Push its Drivers' Buttons' New York Times, 2 April 2017;

of which were unionised, which operated with barriers to entry and a finite number of licences available (to those with 'The Knowledge') and a monopoly on taxi ranks. Second, private hire firms ('minicabs') which one cannot hail from the street but which have lots of business with local authorities. He speculates that app services like Uber and Lyft present a third alternative: a monopoly on the intermediary organisational technology (the app in this case) but not of the taxi business itself.[78]

Ben Taylor, policy analyst at the House of Lords informed us that the last technological innovation which had an important influence over the working life of taxi drivers was the introduction of the radio dispatch systems in the 1960s. This meant that instead of completing a journey and having to return to base, or to find a new customer in the street, taxis could be directed from one job to the next from a central office, thus saving on the time and fuel it took to return to base each time. However, as dispatch did not remain on the radio at all times, directing cab drivers to their destinations, 'The Knowledge', as it is known in London, remained fully intact.[79] Taylor reported that beyond this, apart from innovations made in the vehicles themselves, little changed for decades. Some individual taxis and firms incorporated the internet, computers and other digital equipment over the 1990s and later, usually in back office functions such as dispatch, and some did not; the important point is that either way it did not directly affect how the taxi drivers did their jobs as drivers.[80] Since the mid-2000s, some drivers and firms started to incorporate digital technologies like GPS, sending images of drivers to customers, and conveying details of bookings to drivers.[81] This technological development was then largely forgotten when Uber started expanding outside the USA from 2012 onwards, where it was combined into the more general Uberisation phenomenon.[82]

Care

There are some similarities between the hospitality and care sectors which relate to the desire to provide a quality personal service. However, the historical links between care work and digital technology are more slender. Despite some contemporary debate on the topic, our research has uncovered very little evidence of the historical deployment of digital technology anywhere in the care sector, even in back offices or similar contexts.[83] The question was therefore more to evaluate why this was the case. One explanation, is that, like food preparation and serving, cleaning and janitorial work, grounds cleaning and maintenance, security and protective services, care work requires a great deal of physical adeptness and fluent spoken language.[84] Another, more specific to the UK is that it is only relatively recently that it has been recognised there is a care sector to analyse at all.[85] It was only in the 1990s that different types of care work, including disability care, elderly care, and mental health care came to be included in the broader, increasingly formalised category of *carer* (of which there are presently around 6 million in the UK).[86] Even then, the fact that much care work is unpaid means it is not always included in economic studies or analyses of the effects of technology on work.

[78] Interview with Chris Williams, 7 April 2017. For the history of Lyft, see Lashinsky, *Wild Ride*, 114-120

[79] Interview with Ben Taylor, 4 March 2017

[80] For examples in Stockport and Birmingham, see 'All White Taxis: cheaper by Miles' Private Hire and Taxi Monthly, July 2010 and 'Birmingham gets the 'Royal' Treatment!', Private Hire and Taxi Monthly, September 2010

[81] For example, see 'Innovative Manchester PH firm sends driver photo' *Private Hire and Taxi Monthly*, February 2010

[82] Lashinsky, Wild Ride, 2017, 111

[83] E.g. G Dewsbury, *The Social and Psychological Aspects of Smart Home Technology within the Care Sector,* 2001

[84] D Autor, 'Why are there still so many jobs? The history and future of automation' *Journal of Economic Perspectives,* 2015, 12

[85] For a qualitative account of care work, see Joanna Biggs, All Day Long: A Portrait of Britain at Work, 2015, chapter 8.

[86] C Sewell, 'The Emergence of the Carer: Mental Health Care in England and Wales, c.1946-1999', *Warwick University PhD thesis*, 322-334

In addition, the issue has been partly structural. As Martin Green of Care England noted in interview, given the financial resources formally available in hospitals but now unavailable to small, private providers (who make up 60 per cent of the care sector), the squeeze on the sector has led care providers to believe that they cannot afford to invest in infrastructure including digital technology. He noted that at the time of interview, few private care suppliers had a website, and some did not even have an email address.[87] Recent projects across the UK suggest that this situation may be changing, with carers using tablets like iPads to organise their shifts, particularly when care company management chains are being thinned to make care companies more cost effective.[88] The next section examines employee resistance to the internet and digital technology in the UK workplace since 1990.

[87] Interview conducted with Martin Green of Care England, 9 December 2016

[88] See: http://www.communitycare.co.uk/2014/06/27/case-work-go-ipads-shaking-social-work-practice-nottinghamshire/. On the thinning of management in care work, see A Baluch, I Cunningham and P James, 'Line Managers and Staff Commitment in Outsourced Social Care Work', *International Labour Process Conference 2016 paper,* Berlin.

Section 5

Resistance to the internet and digital technology

Much rich historical research has been conducted into how workers and worker organisations have engaged with, and sometimes resisted, technological and organisational change since the industrial revolution.[89] This is still an important issue: one recent study has shown that nearly half of UK workers say they have little or no influence in how they work with new technology or software, and 68 per cent would like more influence in this respect.[90]

Reflecting on this issue for the present day, one of the most interesting factors to consider about digitised workplaces is how one would resist them if one wanted to. Largely free from collectivist institutions like trade unions and professional associations, and facing agile, digitised capital and globalised workflows, workplaces are often more atomised than they were for the postwar generations.

Change is afoot in each of the sectors analysed. Algorithms may be globalised and opaque, but when the service in question is personal and localised, such as with food delivery companies like Deliveroo, some activists seek to organise workers into new forms of trade union.[91] UNISON recently discussed that when work flows are more globalised, one could resort to digital picket lines, top-down legislation, hacking, or more prosaic forms of collective bargaining around whatever data, be it pay, hours, or output, is available (see appendix 2).[92]

Two cases of resistance against digital workplace technology emerge from our historical case studies: warehousing and taxi drivers. For example, in the warehousing sector in 1999, and building on prior experience, one sector specialist noted that computer systems had in fact caused many problems in the past, though this had already been forgotten:

> Some idiot in charge of the computer systems [in the 1980s] running a highly sophisticated, automated, £multi-million warehouse managed to wipe out every single record of inventory and locations (who said all the ham-fisted loons drive forklift trucks). Rumour has it that staff using mountaineering gear were abseiling down the racking recording what they found, on good old pencil and paper...[93]
>
> Where are all the stories about equipment we wish we hadn't bought (only for some poor sod down the road to make the same mistake a few months down the line), all the software gone bad, all the huge ERP [Enterprise Resource Planning] systems, which are 18 months late, massively over budget and still don't deliver. **We ought to be told.**[94]

[89] E.g. EP Thompson, *The Making of the English Working Class*, 1963; C Littler, *Development of the Labour Process in Capitalist Societies*, 1982, chapter 9; M Glucksmann, Women Assemble: Women Workers and the New industries in Inter-War Britain, 1990, chapter 5

[90] C Tait, *A good day's work: What workers think about work, and how politics should respond*, 2016

[91] The situation is ongoing. See Sarah O'Connor 'Deliveroo fends off couriers' demands for union recognition' *Financial Times*, 14 November 2017.

[92] https://soundcloud.com/organising-to-win/episode-13-july-2017-disruptive-technologies

[93] 'On the Rack' *Warehouse and Logistics News*, 15 October 1999.

[94] Ibid

In addition to coping with equipment when it does not deliver on its promises, there have also been formal attempts to block the introduction of hand-held digital technology, particularly in the warehousing sector.

While *Panorama* covered the use of picking technology at Amazon in 2013, the first formal dispute over the use of 'wrist-held computers' in Sainsbury's and Tesco warehouses appears to have emerged earlier, in 2005. The dispute was lodged by the GMB union who claimed these technologies were being used to 'monitor staff and are creating an enslaved workforce'.[95] In June *The Grocer* reported that there were threats of strikes over the deployment of this technology at Tesco and Sainsbury's depots, plus also at Morrisons and Asda. A Tesco spokeswoman remarked that:

> Feedback from depot workers had been positive and added: 'The technology is not capable of tracking staff, it is used to pick products correctly and get them to stores as quickly as possible'[96]

Sainsbury's added that:

> The system is not used to monitor movements of break times. Colleagues tell us these units make their jobs easier.[97]

In response, GMB spokesman Steve Pryle 'insisted the new systems were being used to dictate working conditions and cut pay'.[98] The GMB union also petitioned the EU to ban "spy chips" such as Radio Frequency Identification (RFID) and GPS satellite linked wearable computers, arguing that these technologies were being used to "tag European workers and to seriously invade their right to privacy", issues which could ultimately affect 1,315,700 workers in UK wholesale distribution'.[99] Reflecting on the overall situation, *The Grocer* concluded that "distribution workers had become the latest victims of the supermarkets' price war".[100]

Another well-known labour dispute of recent years is that of strikes in London by black cab drivers against the taxi app Uber. Famously, on 11 June 2014, the Licensed Taxi Drivers Association (LTDA) organised a strike in London of 12,000 taxi drivers, arguing that the Uber app acts like a meter, which private hire cars are not allowed to use. Newspapers reported on that day that 'key capital arteries around St James, Leicester Square and Piccadilly [were] in gridlock', though black cab drivers may have scored a Pyrrhic victory as faced with a lack of black cabs many customers installed and used the Uber app instead.[101]

Despite the term Uberisation, examined earlier, Uber is only one firm within the broader emergence of what analysts term the 'platform economy' or 'gig economy', even within the taxi sector.[102] Moreover, just as there are other platform taxi firms, there has been additional, sometimes even concurrent, resistance to them. For example, although less well-known than the 2014 London Uber strike, the month prior 40 or so taxi drivers attacked the London headquarters of Hailo, an British app similar to Uber, spraying 'JUDAS' and 'SCABS' on the walls, and forcing the Hailo founders to barricade themselves into their offices.[103] In response to this incident, Grant

[95] 'Discontent rife at depots' *The Grocer,* 11 June 2005

[96] Ibid

[97] Ibid

[98] Ibid

[99] http://www.labournet.net/ukunion/0507/gmb8.html. See also http://mlog.edelivery.net/magazine/19/storminateacup.shtml

[100] 'Discontent rife at depots' *The Grocer*, 11 June 2005

[101] 'London at a standstill but Uber still claims taxi strike victory' *Telegraph*, 11 June 2014

[102] M Marriage and A Ram, 'Call for Employment Law Reform to Prevent "Uberisation"' *Financial Times*, 20 November 2017.

[103] 'Appreciating Apps: Hailo staff barricade themselves in as HQ vandalised' *Private Hire and Taxi Monthly,* June 2014.

Davis of the 1,600-strong LTDA, replied that it was not that 'black cab drivers are like the mafia or we're dinosaurs who can't move with the times', and that many black cab drivers actually liked Hailo as it gave them access to new areas of work. To Davis, the problem was that TfL allowed Uber access to this work also.[104]

It would be wrong to assume, as some do, that black cab drivers' protest is solely Luddite opposition against the incursion of digital technology into their workplace.[105] Striking taxi drivers have often been more concerned with the willingness of transport authorities, in this case Transport for London (TfL), to break down old demarcations between public black cabs and private hire vehicles, plus to allow less regulated drivers into the market.[106] These developments are far from being a London, even UK, issue.[107] Austerity policies have been stimulating the deregulation of taxis in many countries, including in Greece in 2011, Italy in 2012, plus France and Australia in 2013.[108] Even New York and its famous yellow taxis, licensed like London black cabs,[109] have been increasingly run on a leasing system since the 1980s,[110] and ran a competition in 2012 in which competitors included London-based Hailo and Tel Aviv-based Get Taxi, with the winner winning an exclusive contract to supply apps to the city's lucrative taxi sector.[111]

[104] 'Appreciating Apps: Hailo staff barricade themselves in as HQ vandalised' *Private Hire and Taxi Monthly,* June 2014

[105] For Luddism, see https://www.thetimes.co.uk/article/passengers-declare-black-cab-boycott-over-uber-licence-ban-2kmllj3xk.

[106] R Hartley-Parkinson, 'Why Uber was stripped of its licence to operate in London', *Metro*, 22 September 2017

[107] 'Uber Update UK', *Private Hire and Taxi Monthly*, May 2015. By May 2015 approved Uber applications had expanded to some thirty councils across the UK, although in some cases like Oxford there are still no Uber cars in the city. See 'Taxi firms celebrate as Uber's Oxford licence application declared void and council U-turns over Westgate ban' *Oxford Times,* 22 July 2016. At the time of writing, Sheffield has also banned suspended Uber's licence: A Agerholm, 'Uber Sheffield Ban' *Independent,* 7 December 2017. For a study of what happens when cities ban taxi app services including Uber and Lyft, see S Levin, 'There is Life After Uber: What happens when cities ban the service?' *Guardian*, 23 September 2017.

[108] 'World Wide Taxi Focus' *Private Hire and Taxi Monthly*, August 2011; 'World Wide Taxi Focus' *Private Hire and Taxi Monthly,* February 2012; 'World Wide Taxi Focus' *Private Hire and Taxi Monthly,* February 2013; ' World Wide Taxi Focus' *Private Hire and Taxi Monthly*, March 2013

[109] Interview with Chris Williams, 7 April 2017

[110] G Hodges, *Taxi! A Social History of the New York City Cabdriver*, 2007, chapter 7

[111] 'New York's Taxi App Competition Shifts into Overdrive' *Private Hire and Taxi Monthly,* August 2012

Section 5

Pay and digital technology

Stephen Clarke has recently reported that while employment levels are at a 40-year high, Britain is experiencing an unexpected pay squeeze due in part to currency-driven inflation, 'simply making us all poorer'.[112] In agreement with numerous other analysts of this issue, part of the Resolution Foundation's solution is to correct UK's long-standing 'productivity puzzle'.[113]

Given current debate about the productivity puzzle and the related topic of the affordability of the National Living Wage,[114] it is intriguing to consider why the matter of technology was not brought up more in relation to the implementation of the National Minimum Wage in 1998-9.[115] Let us not forget that in that period, in addition to the high-flying dotcom boom, already examined, the world economy was *also* said to be on the brink of financial collapse, due to economic contagion spreading from South East Asia.[116]

From the sources studied during this project, it seems that employers met with the challenge of paying the NMW policy of 1998-9 by absorbing the increased costs into operations, some of which were of course being simultaneously made more efficient by the application of digital technology further down the supply chain. Some were paying already the mandatory rate of £3.60 per hour: one 1998 survey in *The Grocer* reported that more than half of small retailers questioned were already paying equal to or more than the minimum wage, plus 88 per cent said they would not have to lay off any staff.[117] In the care sector, Geoffrey Hodgson of *Caring Times* agreed that care providers were more able to afford the NMW than they anticipated:

> Care providers in the round were to a certain extent 'crying wolf' because the meltdown they foretold didn't eventuate. Then again, social care providers were much more heavily dependent on local authority placements (and therefore state funding) than they are now.[118]

The UK National Living Wage policy, implemented in 2016, coupled with the public prominence of hand-held digital technology in the workplace, has prompted some more explicit engagements with this topic. The recent government report, *Good Work: The Taylor Review of Modern Working Practices* (2017), raises several issues relevant to the topic of pay and digital technology.[119]

[112] A Monaghan, 'Pay Squeeze Intensifies as wage growth falls further behind inflation, *Guardian*, 14 June 2017.

[113] On the UK productivity puzzle, see D Harari, *Productivity in the UK, House of Commons Library Briefing paper 06492*, July 2017; http://www.bankofengland.co.uk/education/Documents/resources/loap/productivitypuzzle.PDF.

[114] https://www.fsb.org.uk/media-centre/press-releases/small-business-owners-stretching-to-meet-national-living-wage-costs

[115] No doubt some employers did invest in digital technology, both infrastructural and hand-held, for specifically this reason, but it is also hard to say. Even bearing in mind the confidentiality of employee records, one would need access to detailed archival sources which are not yet available.

[116] http://news.bbc.co.uk/1/hi/special_report/1998/asian_economic_crises/45468.stm and J Cassidy, 'The New World Disorder' *The New Yorker*, 26 October 1998.

[117] 'Independents OK for £3.60 an hour level' *The Grocer*, 13 June 1998.

[118] Interview conducted with Geoffrey Hodgson of *Caring Times*, 21 November 2016

[119] Companies highlighted included Deliveroo, Uber, City Sprint, and Tesco

The first is to highlight potentially positive outcomes which may emerge from the application of digital technology to increasing numbers of jobs. The authors noted that the granular digital data produced and accumulated by digital devices could be useful for productivity and wage calculations:

> Platforms would be able to compensate workers based on their output (i.e. number of tasks performed), provided they are able to demonstrate through the data that they have available that an average individual, working averagely hard, successfully clears the National Minimum Wage with a 20 per cent margin of error.[120]

More specifically, the review also notes that digital data could allow the UK workforce to retain the flexibility desired by both employees and employers, while allowing the data to be used for 'information sharing, bringing workers together and calculating and accessing benefits'.[121] Organisational changes are noted, too. The review cites the supermarket chain Tesco, which is, across 2017-18, rolling out an app through which staff will 'be able to take control of their work schedules by using an app to manage their hours, overtime, shifts, holidays and leave.' Not dissimilar to care workers using iPad schedules, already examined, and perhaps disintermediating some aspects of Tesco's middle management, "the new technology will enable them to select overtime across a number of stores and departments, giving them more opportunities to work additional hours at a time and location that suits them".[122]

[120] *Good Work*, 38

[121] *Good Work*, 76

[122] *Good Work*, 93.

Section 6

The future of work

While we may have disputed certain projections in the 1998 DTI e-commerce report, particularly those based on the KPMG data, it is worthwhile recapping how it preceded its own predictions for 2015: 'It is often said that we over-predict change in the short-term and under-predict it in the long-term.[123] These observations seem to have been generally correct.

As seen in our opening remarks, predictions for how many UK jobs are at high risk from digital technology range from 10 per cent to 47 per cent.[124] Building on the findings of many recent studies, and as discussed throughout this research report, it seems likely that the actual outcome will be on the conservative end of the spectrum. Moreover, there will be new jobs: as the Resolution Foundation and other commentators have noted, there has been a 'filling in' of new or expanded jobs at the same time as old jobs have been eliminated. New jobs will also be created on the back of other new jobs such as the management, sales, analysis, and deployment of data created by digital systems (see Appendix 2).

Moreover, as Gavin Kelly has observed, some constituencies have a vested interest in exaggerating the rate and scale of change. In these projections, time spans also vary: one recent report from the McKinsey Global Institute (MGI) estimated that only 5 per cent of current work tasks can be automated using modern technology, though of course the technology is likely to increase in technical skills. The MGI estimates that this figure will slowly but surely rise to 50 per cent of work tasks, although it will take two decades to get there.[125]

As in the case of taxis and the other areas studied in this period, the future of the blue collar roles of course remains uncertain. The 'Taylor Review' predicts that driverless trucks will over the coming decade eliminate the roles of 20 million heavy truck drivers worldwide.[126] However, current predictions are that fully autonomous vehicles are some way off, probably many years.[127]

As the Resolution Foundation's research has shown, one thing we can predict about the future of the UK workplace is that over the coming few years, due to a rising wage floor, labour will get more expensive.[128] Our interviewees made some specific predictions, particularly in those sectors in which we found very little digital technology had been previously deployed. Peter Backman suggested that the restaurant sector can improve its productivity while improving customer service in three ways: online ordering of restaurant supplies (where much is still performed by someone on the phone), further enabling the internet for booking tables, and point of sale equipment which makes use of digital systems. Both, he suggests, will be attractive to 'internet-savvy' millennials and generation Z. He also stated that the true value-enhancer and disruptor in

[123] http://webarchive.nationalarchives.gov.uk/20000829131528/http://www.dti.gov.uk:80/future-unit/scenarios/index.html

[124] Frey and Osborne, *The future of employment*, 2013 and Arntz, Gregory and Zierhan, *The Risk of Automation for Jobs in OECD Countries*, 2016

[125] https://www.mckinsey.com/global-themes/employment-and-growth/technology-jobs-and-the-future-of-work

[126] *Good Work*, 88

[127] Lashinsky, *Wild Ride*, chapter 10.

[128] The National Living Wage and auto-enrol pensions will increase the cost of labour, and the likely departure of many EU migrants from blue-collar jobs will produce many vacancies in the coming few years.

the restaurant sector will be digitally-enabled delivery service providers such as Deliveroo and Just Eat; which in turn may also explain why these services have seemed so visible of late. These providers are important as millennial customers will likely choose these services over going to the supermarket to purchase their own ingredients, and will also spend more in doing so.[129] Also in the hospitality sector, Chris Sheppardson of the Chess Partnership predicted that digital technology will have new uses such as preordering food and drinks in stadia and museums, which can then be linked to a premium service whereby serving staff can bring orders to customers. This will, he notes, increase business productivity, improve customer experience and boost customer spending.[130]

Given the successes of modern medicine, and the relatively good predictions which can be made with demographic projections, the cost of the care, especially elderly care, is very likely to increase. Building on our prior analysis, as the term carer becomes more clearly defined, the topic will also become more prominent. Martin Green of Care England indicated where technology could both improve services and reduce costs: dictation technologies like Dragon could be used to cut down on time spent on producing and storing paperwork, and data gathering wristbands such as Amiigo could be used to store useful data about patients[131] Awareness of these possibilities is growing: *The Times* recently remarked that 'Granny tracking' technology, widely used in the USA and which enables care workers to track the movements and domestic behaviours of the elderly at a distance, could reduce care fees from annual costs of £30,000 per year to an initial outlay of £2,860 and £30 per month.[132]

As several authors, including Martin Ford, have observed, a primary reason why digital technology and the future of work are raising such alarm now is because commentators in white collar professions feel, perhaps for the first time, that their own jobs may be under threat.[133] After all, white collar employees are expensive, and current-day organisational logic dictates that reducing cost is paramount. While this phenomenon, or at least the perception of a phenomenon, is more recent than the many prior studies of blue collar labour, some studies have begun to emerge which examine law, consultancy, management, journalism, coding, and even medicine and related care work.[134] One report from the *New York Times* concluded that while the legal profession probably will change considerably as a consequence of technology, it will probably take from ten to twenty years to do so. What will disappear is lower-level junior legal work and research which computers have been eating away at anyway since the late 1990s.[135]

[129] A pizza restaurant can, in effect, convert a £4 supermarket sale into a £12 restaurant delivery sale while requiring no extra capability at the restaurant. He predicts that this may allow pizza restaurants to add 10 per cent in sales with little extra outlay. Interview with Peter Backman, 23 December 2016

[130] Interview with Chris Sheppardson of Chess Partnership, 23 December 2016

[131] Interview conducted with Martin Green of Care England, 9 December 2016

[132] *The Times*, 21 October 29016.

[133] Ford, *Rise of the Robots*, chapter 4.

[134] On the future of coding, see https://www.wired.com/2017/02/programming-is-the-new-blue-collar-job/. On the challenges facing digitized journalism, see X Whittaker, *Analytics and the Digital Newsroom*, International Labour Process conference working paper, Berlin 2016. For a Financial Times journalist competing with a robot journalist, see: https://www.ft.com/content/92583120-0ae0-11e6-b0f1-61f222853ff3.

[135] Steve Lohr, 'A.I. is doing Legal Work but it won't replace lawyers, yet' *New York Times*, 19 March 2017 and R Hall, 'Ready for Robot Lawyers? How students can prepare for the future of law' *The Guardian*, 31 July 2017.

Section 7

Conclusion

Writing soon after the dotcom collapse and the 9/11 attacks, *New Yorker* writer John Cassidy warned against pessimism, despite the internet having not delivered on many of its more imaginative promises:

> Long after companies like Webvan and TheGlobe.com are forgotten, historians will look back on the 1990s as the decade during which the information society became a reality.[136]

While the historian who has conducted this project's research cannot confirm whether its readers will remember Webvan or TheGlobe.com (he regrettably does not), its research has revealed that Cassidy's point about the 1990s was generally correct. In that period, the internet did change how many workplaces operated, though largely behind the scenes such as in logistics, warehouses, back offices, and other interesting, though less-studied, operations.

A key issue raised by this research report is that there is usually a hidden story, both human and technological, hidden beneath historical stories of the rise of famous entrepreneurs, their iconic products, and companies. It has also aimed to reveal how fickle our historical memory can be, sometimes forgetting events of great importance, predictions which overpromise and under-deliver, and even how the mood towards technological innovations can change depending on geopolitical events. Perhaps we are presently passing through a parallel to the technologically optimistic 1997-2001 period, and a correction of some form will precipitate, perhaps also followed by a wave of disappointment.

While changes in the 1990s, analysed here, were significant, the last time major, sustained, and popularly-consumed analyses were conducted about the past, present and future of the workplace was, as Joanna Biggs and Martin Ford have recently observed, not in the 1990s but in the 1960s.[137] Writing in the fallout of that debate, in 1976, the sociologist Daniel Bell predicted that from three to five decades hence (i.e. 2006-2026), the West would see the rise of the 'post-industrial society' reliant on science-based technical workers and the service sector. Just as agriculture had been overlain by industry, he argued, so too industry would be overlain by services. Women would enter the workforce in large numbers and simultaneously benefit from the expansion of services, where they were disproportionately employed. Future society and its workplaces would be based on the 'economics of information' rather than the 'economics of goods'.[138]

[136] Cassidy, *Dot.con*, 319

[137] Autor, 'Why are there still so many jobs?', 2015; 'Artificial Intelligence: March of the Machines' *The Economist*, 25 June 2016. For one such unfolding contemporary debate, see, in date order: D Bell, *Work and Its Discontents*, 1956; EP Thompson, *The Making of the English Working Class*, 1963; EP Thompson, 'Time, Work Discipline and Industrial Capitalism' *Past & Present*, 1967; Turkel, *Working*, 1972; H Braverman, *Labor and Monopoly Capital: the Degradation of work in the Twentieth Century*, 1974; AR Edwards, *Contested Terrain: the transformation of the workplace in the twentieth century*, 1979; AR Hochschild, *The Managed Heart: commercialization of human feeling*, 1983

[138] D Bell, *The Coming of Post-Industrial Society*, 1976, chapter 2.

When examining employment statistics of specific countries such as the UK, rather than the global political economy, it is instinctively easy to agree that Bell was correct.[139] But that would be to ignore the evidence presented in this report, which was that the internet expanded so much in the 1990s – think of Amazon, eBay, and Alibaba, not to mention the supermarkets and their supply chains – precisely because they better facilitated the exchange of goods; either business-to-business or business-to-consumer. Indeed, it would be hard to imagine the present techno-boom of social media, the sharing economy, the platform economy, the gig economy, and digital Taylorism without it having built on the prior wave of the internet which was really a gigantic expansion and tightening of global logistics and storage chains. We are now just more used to seeing its effects in front of us, and interacting with it more directly and in a more time-sensitive fashion.

Some aspects of the world of work are changing, but as colleagues at the Resolution Foundation have argued it is not entirely due to digital technology and it is not entirely due to robots taking many jobs. Nor is it as unexpected or threatening as some commentators argue. Digital has transformed the warehousing and logistics sector, and the supermarket and business-to-business sectors which overlay them, but took two decades to do so, and appears to have barely impacted the care sector, let alone similar but unpaid work. It is more that employers and employees in many sectors, including white collars roles, understandably feel a sense of dislocation – what historians call a 'crisis of adaptation' – for which it seems easy to hold digital devices responsible, especially now they are in our consumerist hands all day, every day.

If we learn one thing from this historical study, it is that commentators on these issues, particularly the most evangelist, should be careful about what predictions they make, fully absorb the fact that people really do listen to their tone and projections, and that historians may even revisit these projections in the future in order to test them. It would therefore be helpful to conclude this report by recalling what happened the last time this debate was had on a large scale.[140] After being warned, even promised, via supersonic flight, the hydrogen bomb, the Apollo Program, Star Trek, colour television, Agent Orange, and many other such futurist 1960s projects, that for weal or woe the world of menial, repetitive work would soon be conducted by automated robots, in 1972 two researchers named Harold Sheppard and Neal Herrick published a study with the fascinatingly instructive title of *Where Have all the Robots Gone? Worker Dissatisfaction in the '70s.*[141]

[139] For comments on the 'weightless economy', a concept usually reliant on thinking of employment only in regional or national terms when the economic factors in question are global, see David Edgerton, 'The Myth of the Weightless Economy' at: https://www.youtube.com/watch?v=OdfvTlg0hCc&t=2s

[140] Ford, *Rise of the Robots*, chapter 2

[141] H Sheppard and N Herrick, W*here Have all the Robots Gone? Worker Dissatisfaction in the '70s* (1972). For recent analyses of UK job satisfaction, see Biggs, *All Day Long* and Tait, *A good day's work*.

Appendix 1: research methods and sources

This research, undertaken throughout 2016-17, set out to explore the dynamics of how different sectors of the UK private sector workplace were connected to the internet and deployed digital technologies since 1990. Building on research by the Resolution Foundation and others, it aimed to get beneath the top-down data deployed by national statistics bodies, to question some contemporary narratives, and to demonstrate that the historical approach can provide many insights useful to contemporary debate.

Covering four sectors within one country, this research and its findings make no claim to be comprehensive, but its author hopes other authors can draw on, and extend, its findings. As this research covered multiple, sometimes unrelated sectors, suitable research resources have accumulated in different ways, and varying times, and in different places. Similarly, the qualitative material and quantitative data contained in the sources vary considerably and had to be adjusted to provide comparability.

Sectors studied included warehousing and supermarkets, hotels and restaurants, taxis, and care work.[142] Sources used included interviews, published books and articles, and the sector trade journals *The Grocer, Warehouse and Logistics News, Caring Times, Hospitality,* and *Private Hire and Taxi Monthly.*[143] Each of these journals were digitised in the early-to-mid 2000s, so paper copies of earlier editions were studied in the British Library and the Bodleian Library, Oxford University. When interviews were conducted with sector specialists, especially for insights into the uptake of digital technology and how employers met with the implementation of the National Minimum Wage in 1999, double interviews using the same questions were obtained to obtain superior accuracy.

Some datasets were obtained from the UK Office for National Statistics and the World Bank. Academic theses were obtained from the British Library Ethos system at http://ethos.bl.uk and Imperial College Spiral system: https://spiral.imperial.ac.uk. Several contemporary sources were easily obtained, for example *The Internet Report* which can be obtained for a few pounds from Amazon.co.uk. The 1990s management consultancy reports used, primarily from KPMG, were the hardest sources to recover, being held in a private collection.

[142] Private security firms and retail banking were also investigated, but initial research was not as fruitful as had been hoped.

[143] *Warehouse and Logistics News* was Have I Got News For You's choice of specialist journal in November 2015. See http://warehousenews.co.uk/2015/11/warehouse-logistics-news-appears-on-bbc1-have-i-got-news-for-you/

Appendix 2: Taylor Review historical case comparison

One focus of recent debate has been on the influence of the American efficiency expert Frederick Winslow Taylor (1856-1915).[144] For example, Sarah O'Connor's Financial Times investigation examined the '"algorithmic management" used by the Uber taxi and delivery service, which might sound like the future but it has uncanny echoes from the past. A hundred years ago, a new theory called "scientific management" swept through the factories of America...The algorithmic management techniques of Uber and Deliveroo are Taylorism 2.0. Algorithms are providing a degree of control and oversight that even the most hardened Taylorists could never have dreamt of.[145]

The recent UK government Taylor Review (no relation) offers a contrasting perspective, noting that digital data can have positive uses: it could allow employees to retain the flexibility desired by both employees and employers, the data being used for 'information sharing, bringing workers together and calculating and accessing benefits'.[146]

An interesting historical parallel with the Taylor Review and the issues it discusses can be found in a Ministry of Labour file, LAB 11/1611, held in the UK National Archives. The dossier contains both official Ministry minutes and relevant research materials such as booklets and contemporary newspaper articles, gathered in an investigation not dissimilar to this one. The file contains a case from the Great Depression period, 1931-32, in which a new American system of measuring work – popularly known then, as now, as the 'time and motion study' - was coming into use in British factories, warehouses, mines, and offices.

The Ministry was investigating Trade Union Congress (TUC) claims of the unfairness of a specific work measurement system named the 'Bedaux System of Human Power Measurement', based on a work unit named the *B*.[147] Investigating from many sources, Ministry officials found the *B* confusing as, believing it to be a wage incentive system, they could not tell how to classify it: piece work or time work.

Investigators determined that the *B* was potentially exploitative, so needed careful and experienced trade union supervision to negotiate its implementation and use.[148] They recognised that of the main advantages of the *B* data for the employer was it allowed management to standardise different kinds of work into comparable data, to 'pool' different kinds of work, and then to compare and contrast the efficiencies of different workers. Once data had been pooled the employer could, and

[144] For Taylor's life, see R Kanigel, *The One Best Way: Frederick Winslow Taylor and the Enigma of Efficiency*, 1997. For a full historical case study of the issues O'Connor raises, see HGJ Aitken, *Taylorism at Watertown Arsenal: Scientific Management in Action*, 1908-1915, 1960.

[145] Sarah O'Connor, 'When your boss is an algorithm' *Financial Times*, 8 September 2016. For 'digital Taylorism', see also B Frischmann and E Selinger, 'Robots have already taken over our work, but they're made of flesh and bone' *Guardian*, 25 September 2017. Scientific management has also recently been compared to how AI can be used to monitor workplaces: A Campolo, M Sanfilippo, M Whittaker, K Crawford, *AI Now*, 2017, 9.

[146] *Good Work*, 76

[147] For the historical development of the B unit, and the extraordinary life of its creator, Charles E. Bedaux (1886-1944), see M Weatherburn, 'Scientific Management at Work: the Bedaux system, management consulting and worker efficiency in British industry, 1914-48' Imperial College PhD thesis, 2014, chapters 2 and 3.

[148] W Citrine, *Bedaux: The TUC Examines the Bedaux system of payment by results*, 1933.

did, combine the data into group bonus schemes used to incentivise large numbers of workers.[149] They also recognised informed critiques of the *B* system such as that the system caused employees to unreasonably speed up their work rate, or that the Bedaux consultants who implemented the system lacked experience in the sector in which they were presently working.[150]

The study was inconclusive but what officials did not realise was that, regardless of the payment method attached, the *B* data was important in itself. Derived from the time studies of Frederick W. Taylor of 'Taylorism' fame, the *B* system, and the data it generated, had already had positive effects in some progressive British firms.[151] One survey calculated from 15 applications of the *B* system in firms ranging from 60 to 3,000 workers in size, the *B* system had led to a 27 per cent reduction in labour cost, a 73 per cent increase in operator productivity, and an 18 per cent increase in operator earnings.[152] On a specific firm basis, *B* data had been used to aid collective bargaining over work outputs, wage levels and sector-wide wage negotiations in such firms as Imperial Chemicals Industries (ICI: now producers of Dulux paints), then Britain's largest private firm, and at Rowntree's chocolates of York which had been using a copy of the B, the *Mark*, since 1923.[153] *B* data had also been an integral part of introducing the first five-day working week at Mander's paint factory in Wolverhampton, run by Liberal MP Geoffrey Mander, and to similar effect at Boot's factory in Beeston near Nottingham, now known for its pharmacy outlets.[154]

In contrast to its generally positive effects at certain locations, the *B*, or more specifically the time study used to calculate the *B* units, sometimes brought workers out on strike such as at Rover in 1929 and Lucas in 1932.[155]A notable example was the six-week wildcat strike by female hosiery workers at Wolsey in Leicester across winter 1931-32, which received worldwide press attention.[156] The result of the Wolsey strike was that the *B* system was kept in place, but the data were more closely scrutinised for fairness and more experiments were conducted with fair workloads. Another strike at the wiredrawers Richard Johnson and Nephew in Manchester in 1934, which lasted for months, eventually made it to court, where the court ruled in favour of the employer and its consultants.[157]

More radical critiques existed: one noted, or at least argued, that the *B* data which the system generated – in terms of their existence rather than the specific numerical values they represented - were not neutral: abstract, standardised data were the result of a very long-term, excessive division of labour, and also that the *B* data allowed managers and trade unionists to entirely control the monetary value of all work in any given workplace. In this critique, the *B* signalled nothing less than the entry of a new phase of industrial capitalism in which the worker was more scientifically controlled than ever before.[158]

[149] For the 1930s, see Glucksmann, Women Assemble, 1990, chapter 5. For World War Two, see P Inman, *Labour in the Munitions Industries*, 1957, chapter 11.

[150] W.F. Watson, *The Worker and Wage Incentives: The Bedaux and Other Systems*, 1934

[151] For analysis of Taylor's positive impact elsewhere, see C Nyland, K Bruce, and P Burns. 'Taylorism, the International Labour Organization, and the Genesis and Diffusion of Codetermination' *Organization Studies*, 2014.

[152] *Bedaux' Shelf Appeal*, April 1938

[153] Weatherburn, 'Scientific Management at Work', chapter 4

[154] Weatherburn, 'Scientific Management at Work', chapters 4 and 7

[155] For Rover, see LL Downs, 'Industrial decline, rationalization and equal pay: the Bedaux strike at Rover automobile company' Social History, 1990, 45-73. For Lucas, see H Nockolds, *Lucas: the First 100 Years*, 1976.

[156] http://www.bbc.co.uk/legacies/work/england/leicester/article_1.shtml

[157] '"Human Power Measurement": Workman's Complaint Fails', *The Times*, 30 November 1934. See also M Jenkins, 'Time and Motion Strike' *Our History*, 1974.

[158] P Glading, *How Bedaux Works*, 1932

As perhaps we may see in relation to the digital data which Sarah O'Connor analyses, the *B* data produced new jobs. For example, the *B* system was implemented at ICI in the late 1920s, and its use grew over the decades.[159] By the 1960s, a study by the management consultancy firm McKinsey's reported that ICI employed 1,400 work study specialists, plus an army of clerical staff, who jobs it was to generate, analyse and forecast *B* data matrices for the firm.[160] The irony was that McKinsey proposed making many of these efficiency staff unemployed in order to make ICI more efficient.[161]

While ICI is largely now a historical memory, as is the 'time and motion man' of old, this history is still relevant today. The *B* data has had a longer history which stretches to the present day: it eventually became a BSI British Standard, BS 3138 (Work Study) in 1959.[162] For those unfamiliar with this standard, British Standard 3138 is still in full daily use in job evaluations for manual work, and is the method by which we accumulate data for comparisons such as the recent equal pay case raised by female Asda workers.[163]

[159] S Kreis, 'The Diffusion of Scientific Management: The Bedaux Company in America and Britain, 1926-45' in D Nelson *A Mental Revolution: Scientific Management Since Taylor,* 1992

[160] ICI's head of work study, Russell Currie, wrote an influential book about work study which in turn influenced the British Institute of Management (now the Chartered Management Institute) to adopt ICI's analytical methods. See R Currie, *Work Study 4th edition* (British Institute of Management, 1977)

[161] 'The McKinsey Report' Topic, 1 September 1962

[162] British Standards Institution, BS 3138: Glossary of terms used in Management Services, 1992 and Weatherburn, 'Scientific Management at Work', chapter 7.

[163] http://www2.cipd.co.uk/pm/peoplemanagement/b/weblog/archive/2017/08/31/asda-store-staff-can-compare-their-pay-to-depot-workers-says-eat.aspx#

Appendix 3: The growing corporate knowledge gap

A result of this research, plus its author's work on various projects as a consultant, has been to reveal that an unintended consequence of much digitisation has been to eliminate many paper records, but, and perhaps more unexpectedly, to also diminish the importance of analogue processes, skills, and thinking, old data, and even the notion that corporate memory is useful, indeed important, for both the present day and the future.[164] As Lowenstein's *Origins of the Crash put it:*

> Jack Welch, the most admired CEO in America, held that adapting corporate functions to the Web would occasion a spiritual renaissance. His program for reinventing General Electric was dubbed, in earnestness, destroyyourbusiness.com, meaning *GE*'s old business – the way GE had done business for a hundred years. It was an article of faith that not only was the digital economy bestowing miracles of progress but also that everything older was merely a hindrance; it had nothing to teach. *Destroy it*.[165]

The issues the quote raises are important. Building on the recent work of several historians it seems there a number of reasons why we can conclude that there is a growing gap in corporate knowledge, or institutional memory.[166]

Mergers and acquisitions have been increasing in size and value for some time.[167] These complex processes offer ample opportunity to unwittingly lose or destroy valuable sources and data. Britain is dangerously exposed to this issue: the UK is currently embarking on one of the largest and fastest de-mergers – leaving the European Union in two years – in human history.[168]

Digitisation and transformation programmes like that which Lowenstein mentioned at GE, have also been increasing in scale and scope over the past decade, facilitated by the pervasiveness of digital technology both in the workplace and at home.[169]

[164] See https://projecthindsight.co.uk/

[165] Lowenstein, *Origins of the Crash*, 119

[166] E.g. C Booth, et al 'Accounting for the dark side of corporate history: Organizational culture perspectives and the Bertelsmann case.' *Critical Perspectives on Accounting*, 2007; M Bucheli and RD Wadhwani (eds), *Organizations in Time: History, Theory, Methods*, 2013; M Rowlinson, J Hassard and S Decker, 'Research Strategies for organizational history: A dialogue between historical theory and organization theory, *Academy of Management Review*, 2014; M Gorsky, 'Sources and Resources into the Dark Domain: The UK Web Archive as a Source for the Contemporary History of Public Health', *Social History of Medicine*, 2015; P Godfrey, J Hassard, ES O'Connor, M Rowlinson and M Ruef, 'What is organisational history? Toward a creative synthesis of history and organisation studies', *Academy of Management Review*, 2016; H McCarthy, Political history in the digital age: the challenges of archiving and analysing born digital sources. Impact of Social Sciences Blog, 2016; S Cameron, 'Whitehall's Institutional Memory Gap' *Prospect*, December 2016.

[167] R Martin, 'M&A: the one thing you need to get right', *Harvard Business Review*, 2016

[168] As recently documented in the news, this issue is causing major problems as not only do government departments lack enough resources to properly conduct Brexit negotiations, but also to make projections about Brexit's future impact. See D Roberts, 'MPs feared a David Davis cover-up. Worse, he had nothing to hide', *Guardian*, 6 December 2017.

[169] See CMI, The Quality of Working Life: Exploring Managers' Wellbeing, Motivation and Productivity, 2016; Source Global Research, *Mega Trend #1 Digital Transformation*, 2017

Largely affecting younger workers, **increased employment flexibility,** is leading to valuable skills and information walking out the door every time an employee leaves for another employer.[170]

The **skill set of younger workers** differs considerably from that of older generations. This is important: one projection indicates that by 2020 'millenials' will be 50 per cent of the global workforce.[171] This is leading to a loss of both corporate memory and what I call the 'analogue thinking and working' skills required to rediscover and integrate historic aspects of long-term projects.

When old data and information are required, too often do we find that the **digitisation and storage efforts of the past** were less successful than might have been hoped. Obsolete software and hardware, plus degraded compact disks contribute to this problem.[172]

Where skills do exist to address these issues (i.e. universities), **slow academic publishing timeframes**, often lasting many months or even years, mean that, to the frustration of researchers seeking to contribute to public debate, research cannot be completed and published to match the speed of events in real life.[173]

Due to the relatively recent influence on the study of history by more theoretical subjects like sociology and anthropology, the **technical academic language** deployed in academic history can be difficult for non-specialists to read, let alone deploy in the day-to-day workplace.[174]

The **General Data Protection Regulation** (GDPR) comes into force on 25 May 2018.[175] Designed to bring a new set of 'digital rights', the GDPR seeks to enhance protection against some forms of storage or leakage of personal data. While the legislation focuses on the storage, retrieval and protection of data, there is little doubt that some organisations will simply destroy older data rather than be unsure as to what they can store or go through the laborious process of manually weeding it all.

[170] P Gregg and L Gardiner, *A Steady Job? The UK's Record on Labour Market Security and Stability since the Millennium*, 2015

[171] PWC, *Millenials at Work: Reshaping the Workplace*, 2011

[172] For insights into this issue, see: https://www.lib.umich.edu/files/services/preservation/PreservingPersonalDigitalFilesGuide.pdf

[173] See H Rogers, 'Academic Journals in the Digital Age: An Editor's Perspective' *Journal of Victorian Culture*, 2016; K Powell, 'Does it take too long to publish research?' *Nature*, February 2016.

[174] For example, see: BS Cohn, 'History and anthropology: The state of play.' Comparative Studies in Society and History, 1980 and G Steinmetz, 'The Relations between Sociology and History in the United States: The Current State of Affairs', *Journal of Historical Sociology*, 2007.

[175] https://www.eugdpr.org/

Appendix 4: 1998 scenario planning for 2015

In addition to drawing on a KPMG report to predict the rise of e-commerce between 1998 and 2003, New Labour's *Our Competitive Future* (1998), provided two forecasts predicting the Britain of the future. In the first scenario, 'Wired World', by 2015 large, corporatist organisations have shrunk and small entrepreneurs, enabled by technologies such as the 'secure mobile videophone', form a far larger part of the economy than in the year 2000. 40 per cent of the workforce is self-employed, and much government policy encourages small entrepreneurs and networks across the UK and the EU. The two problems reported are that it has firstly become hard to collect taxes from all these entrepreneurs. Secondly, some commentators raise concerns about an economy based on small entrepreneurs: entrepreneurs can get lonely, entrepreneurial work is psychologically burdensome, and the quantity of blue sky R&D has fallen due to the paucity of large organisations able to perform it. Importantly, due to the commoditised nature of work in 2015, everybody only gets paid for measureable tasks. The result: 'Everybody's performance is measured, giving rise to a pervasive culture of monitoring'.[176]

The second scenario, 'Built to Last', is in many ways the opposite. A recession at the turn of the millennium sent employees flooding from many small companies into large corporations. 'This was also, in part, a reaction to a sense of insecurity which pervaded working life at the time'. By 2015, universities have become entirely privatised and are owned by large corporations, who use them in an interlocking fashion for continuous training and learning. Thus while some roles such as clerical work are eliminated by digital technology – largely due to a 'video-net' and 'virtual lectern' which facilitate meetings and speeches at a distance – the rise of lifelong learning through one's employer allows companies to continually re-train staff for new tasks when old ones are eliminated. Now that universities and large companies have fused, large-scale R&D is more effective than fifteen years prior, and, given that companies are training their UK workforce with suitable skills for the work required, they have no reason to move their business overseas.[177]

Both scenarios are important for what they say and what they do not say. Implicit in the scenarios are that personal, desktop computers connected by electrical cables (literally a 'Wired World') would become more sophisticated, particularly in relation to displaying images and video. The internet was, to quote the 1999 report, an 'external networking technology'. Any concept of social media or applications or their transformative effect on, for example, social communications and the traditional print media, was entirely absent from either prediction. Handheld equipment featured a slightly more effective version of already existing technology, but connected to places outside the workplace in question.

There was little suggestion that smartphones, their software and apps would in fact by 2015 become a kernel of internet functionality, be huge money makers in their own right, and in some ways have actually eclipsed the use of, and need for, desktop computers. Nor was there an awareness of the emergence of the data generated by digital operations and equipment becoming a valuable and useful resource, even sector, in its own right. Moreover, there was seemingly little notion that the substantial increase in property prices, especially in large cities, and the increased financialisation of the economy in the intervening two decades would lead to employers encouraging the abandonment of the traditional desktop computer and in some cases the desk and even the office altogether.

[176] http://webarchive.nationalarchives.gov.uk/20000829131528/http://www.dti.gov.uk:80/future-unit/scenarios/index.html

[177] http://webarchive.nationalarchives.gov.uk/20000829131528/http://www.dti.gov.uk:80/future-unit/scenarios/index.html

Appendix 5. The *Historians in Residence* scheme

Historians are taking up greater opportunities to publicise their work beyond universities. But, they are often positioned as 'experts' who should be read and listened to with little dialogue. Our argument is that a closer engagement between history and public life can be mutually transformative. It helps public institutions develop more sophisticated and truthful understandings of the context they work in, providing a better understanding of how change happens for example. It also assists historians to ask research questions with public relevance. These benefits only come from face-to-face, often one-to-one conversations and collaborations, between historians and individuals working in think-tanks, museums, NGOs, government departments and other public institutions. The *Historians in Residence* scheme aims to develop these relationships by placing particular historians within particular institutions.

The scheme was launched in late 2015 at King's College London, with a keynote speech by former Minister of State for Universities and Science, David Willetts.[178]

The following projects have been undertaken as part of the *Historians in Residence* scheme.

2015-16

Bonnie Evans worked alongside the Institute of Public Policy Research (IPPR) to add a historical perspective to their work on childcare. Helen Carr used her history of Muslim integration in the UK to inform Bright Blue's stance on immigration. Michael Weatherburn was placed with the Resolution Foundation to aid their understanding of the impact of the internet on the workplace. Anna Maerker worked with Royal College of Surgeons redesigning the Hunterian Museum. Martin Gorsky is organising a conference on the history and future of the NHS with the IPPR.

2016-17

David Edgerton discussed technical change in the twentieth century with the IPPR. Tom Kelsey is working with the Resolution Foundation on inter-generational inequality. Simon Sleight is using his expertise on the history of childhood to inform the activities of the Fabian Society. Peter Shapely is working with the New Economics Foundation on housing policy. Angélica Agredo is working on historical UK government artificial intelligence policies at the House of Lords Select Committee on Artificial Intelligence.

For more information, see https://blogs.kcl.ac.uk/hir/

[178] https://www.kcl.ac.uk/artshums/depts/history/eventrecords/2015-16/Historians-in-Residence-Project-Launch.aspx

Resolution Foundation

Resolution Foundation is an independent research and policy organisation. Our goal is to improve the lives of people with low to middle incomes by delivering change in areas where they are currently disadvantaged. We do this by:

- *undertaking research and economic analysis to understand the challenges facing people on a low to middle income;*
- *developing practical and effective policy proposals; and*
- *engaging with policy makers and stakeholders to influence decision-making and bring about change.*

A Historian in Residence project with the Resolution Foundation and King's College, London.

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