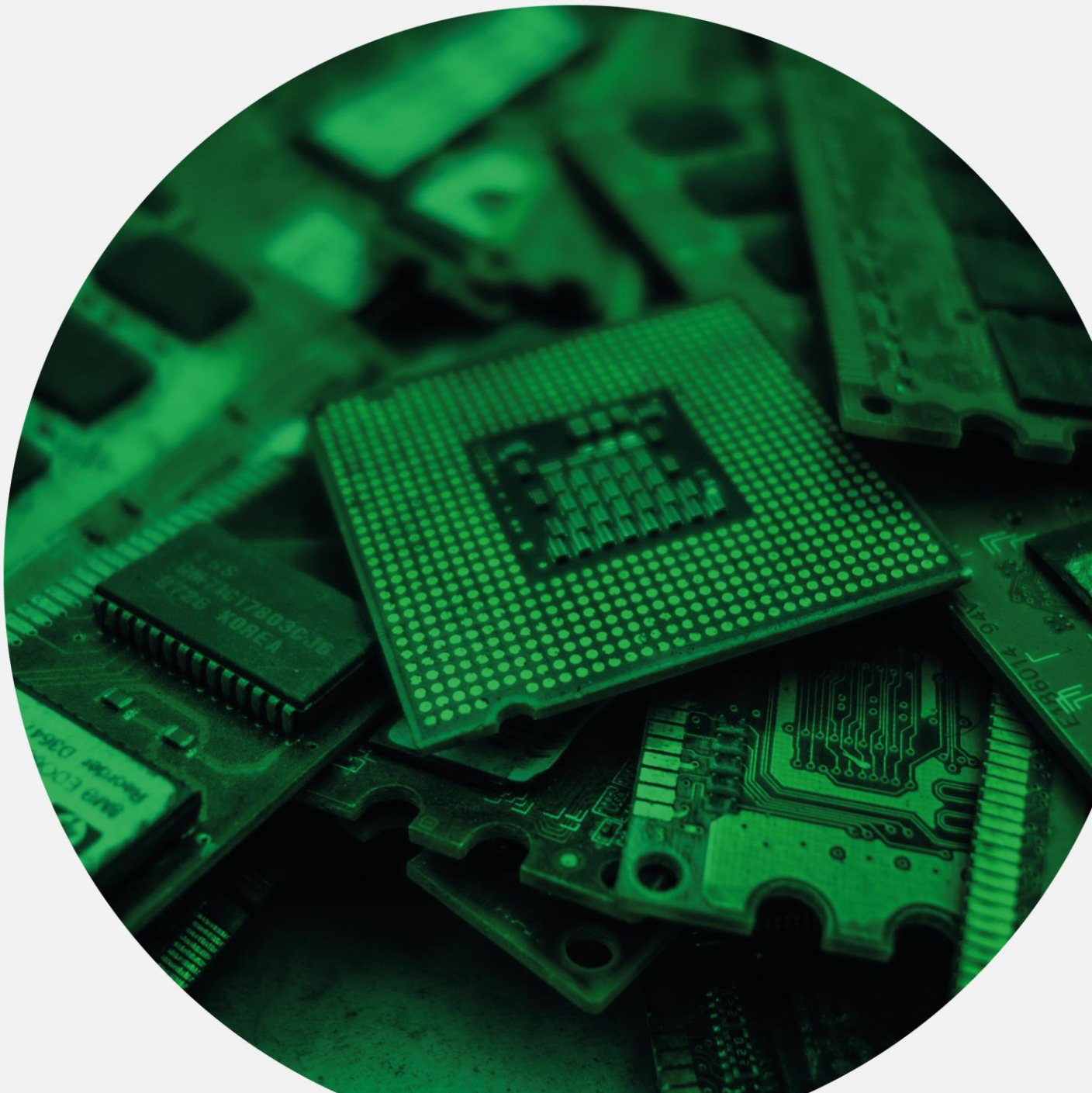




Better and cheaper public services

Ben Ramanauskas



Introduction

This is the introductory paper of a TaxPayers' Alliance campaign to promote a rapid increase in the pace at which public services are automated.

This is a positive and realistic assessment of the potential to embrace the new technologies that are already available to greatly improve the quality and reduce the cost of delivering public services.

The scope to automate the service functions of the state is considerable. Potential cost savings reflect the scale of this opportunity to release over 850,000 public sector staff. This could save up to £17 billion annually in public sector costs by 2030 and hence make room for tax cuts. £17 billion is equivalent to a £700 per year tax cut per household in the UK.

The staff released are very likely to find better, more interesting, and more productive jobs in the private sector which currently faces a severe skills shortage. We will advance proposals to help smooth this transition.

As well as identifying the areas that should be automated, this paper will highlight cases both in the UK and other countries where automation has been successful in improving both the standard and efficiency of public service delivery.

We do not subscribe to the pessimistic view of the effect of automation, robotics, and artificial intelligence on the labour market. By contrast this report will demonstrate the positive effects which technology and innovation will have on the economy, productivity, and jobs.

The effective use of technology benefits everyone by creating higher quality jobs and improving life prospects. Productivity growth in the UK has failed to return to the levels being achieved before the financial crash of 2008. The accelerated adoption of technology and automation in delivering public services can be a significant contributor to boosting productivity and living standards.

The adoption of automation is inevitable over time, as organisations utilise and embrace the benefits which new technology offers. This paper will advocate the increased application of available technologies and explain the exciting possibilities they bring.

What do we mean by automation?

The term automation refers to many different technologies that can be applied to the process of delivering public services. Specifically they would include:

- Computerisation
- Mechanisation
- Online access
- Robotics
- Artificial intelligence (AI)
- New and emerging technologies

The applications are as varied as the technologies, but some examples of how they are already utilised in the public arena are:

GP appointments

Accessing a doctor's appointment can be a frustrating and time consuming business for some patients. The traditional method of multiple phone calls and music on hold followed by a negotiation with the receptionist is not a great experience for some. Therefore it's hardly surprising that the job most people want to see automated is that of GP receptionist.¹ Moving to a secure online appointment, prescription and communication portal for the surgery saves time and effort for patient and surgery staff alike.²

Border control

The introduction of biometric passports and automated control gates at entry ports speeds up getting through passport control. It also reduces Border Force staffing levels, allows easier cover of unsocial hours, and flexibility to cope with traffic fluctuations.³

Patient monitoring

Automated processes are making increasing strides in the provision of healthcare services. The use of sensor technology can now monitor patients' vital signs. Not only does this free up nursing staff time to concentrate on other patient needs, the vital signs can be taken more frequently and also act as an alarm.⁴

Council Tax direct debits

Robotic process automation (RPA) can read and input forms submitted by the public to set up direct debits. This dramatically reduces staff and processing time whilst also improving accuracy.⁵

¹ HR News, *Replace GP receptionists and Train Drivers with robots, say UK workers*, January 2017.

² NHS England, *Dramatic annual surge in online GP services as patients sign up for convenience*, March 2018.

³ Sillers, P., 'Customs Technology is Going to Make Security Queues a Thing of the Past', *The Independent*, 30 June 2017.

⁴ Piette, J., Rosland, A., Striplin, D., Bernstein, S., & Silveira, M., 'Engagement with automate patient monitoring and self-management support calls: experience with a thousand chronically ill patients', *Med Care*, March 2013.

⁵ New Forest District Council, *A better way to pay*, 2017.

Asylum seekers

The use of a chatbot lawyer app can significantly reduce the need for taxpayer funded multi-lingual legal aid lawyers. This is currently being used throughout the US and Canada and the bot, called DoNotPay, helps auto-populate the necessary forms and provides the applicant with instructions for next steps.⁶

Parking control

Whilst not the most popular of public services, the use of automatic number plate recognition (APNR), combined with automatic billing does at least mean that the cost of raising parking tickets is minimised. As a result, traffic wardens are not needed to patrol controlled parking zones, which can be monitored around-the-clock if necessary.⁷

The above examples are just a small selection that illustrate the current versatility and potential of automation to transform the delivery of public services. If the technologies already available and those on the horizon are enthusiastically embraced by the public sector the standard of services will improve dramatically, while at the same time the cost of their provision will be substantially reduced.

⁶ Mehr, H., 'Artificial Intelligence for Citizens Services and Government', *Harvard Kennedy School*, August 2017.

⁷ International Parking Institute, *What's What in Parking Technology*, 2016.

The current level of automation in the UK public sector

Some public sector organisations in the UK and other countries have recognised the benefits of automation. Public bodies which have adopted automation have seen similar results to those of their counterparts in the private sector. There have been increases in the quality of services offered to the public, delivered in a more efficient and cost effective way. Productivity has improved and employee satisfaction increased as the more mundane tasks have been automated, allowing staff to focus on more challenging and rewarding activities.⁸ Where tasks and services have been automated, there has been an increase in the public's satisfaction with services provided by the local authority or government organisations.⁹

Case study 1

In 2015, Sefton Council became the first local authority in the UK to implement RPA in its revenues department. The project was designed to automate transactional processes and prove that the technology lends itself to being used in local government. Following the successful implementation, RPA now processes a number of high-volume tasks across the department, including inputting direct debits, single person discounts, refund applications and disability relief applications. Successes include Council Tax direct debit payment input times being reduced by 80 per cent, with 100 per cent accuracy and cost per transaction being cut from £1 to 20p.¹⁰

However, despite the many benefits of automation, it has been less enthusiastically received in the public sector than in the private sector. Many in government departments and local authorities are reluctant to automate services due to concerns about job losses. The roll out of automation across the public sector has been disjointed and lags behind the private sector. This has led to public dissatisfaction, with only 29 per cent of people thinking that their council was embracing the opportunities provided by new technology.¹¹

The public sector in the UK does not compare favourably with other developed countries in terms of the population being able to access public services electronically. For example, in a report by Ofcom examining internet use among advanced EU countries, the UK is leading the way in terms of ordering goods and services online, but when it comes to interaction with public authorities online, the UK ranks second to last.¹²

⁸ Accenture, *Emerging Technologies Make Their Mark on Public Service*, 2017.

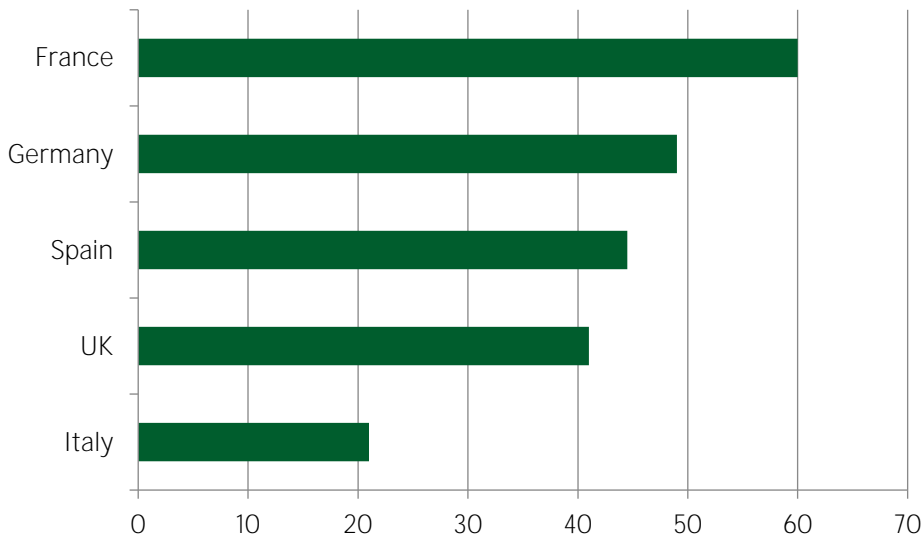
⁹ Deloitte, *Automate This*, 2017.

¹⁰ Arvato, *Balancing budgets and priorities*, 2017.

¹¹ Hitchcock, A., Laycock, K., & Sundorph, E., *Work in Progress: Towards a leaner, smarter public-sector workforce*, February 2017.

¹² Microsoft, *Digital Transformation Skills for Government*, 2016.

Chart 1: percentage of population who interacted online with public authorities¹³



It is disappointing that many government departments and local authorities have been reluctant to take advantage of the benefits advances in technology offer. Only 27 per cent of senior leadership in the public sector of the UK were aware of emerging technologies and their potential. This is compared with 90 per cent in Singapore, over 85 per cent in Japan, and 79 per cent in Australia.¹⁴ There is also a skills shortage in every major area needed to transform the public sector's uptake of automation. This includes strategic, change management and technical skills.¹⁵

Not only is there a lack of awareness of the benefits of automation among senior leadership in the public sector in the UK, many people working in the public sector have a pessimistic view of automation and the use of new technologies. Only 24 per cent of people working in the public sector in the UK believed that automation would free up the workforce to provide a more valuable and personalised citizen experience.¹⁶

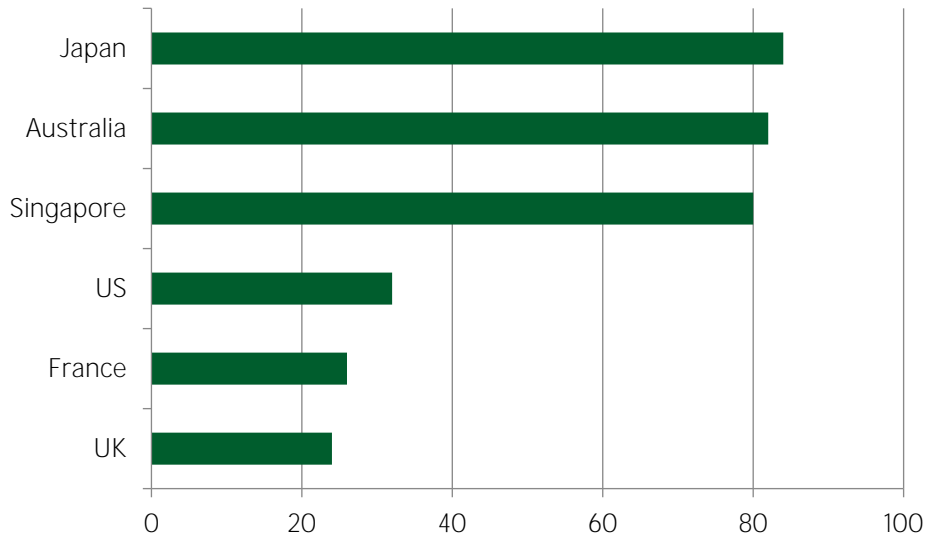
¹³ Eurostat, *Individuals who contacted or interacted with public authorities and services over the internet for private purposes in the last 12 months, 2013, 2013.*

¹⁴ Accenture, *Emerging Technologies Make Their Mark on Public Service*, 2017.

¹⁵ National Audit Office, *The digital skills gap in government*, December 2015.

¹⁶ Accenture, *Emerging Technologies Make Their Mark on Public Service*, 2017.

Chart 2: percentage of public sector workers who believe that automation will enable the workforce to offer a more valuable, more personalised citizen experience¹⁷



Although the evidence of the many benefits of automation are clear, the UK public sector lags behind other developed countries and the UK private sector in deploying the technologies available. A change in policy to pursue automated solutions wherever feasible would deliver substantial advances in the provision of public services in the UK.

¹⁷ Ibid.

The potential for automation in the public sector

Professors Frey and Osborne at the University of Oxford developed a methodology to estimate the probability of automation for hundreds of different roles.¹⁸ Working with Deloitte and applying this methodology, it was estimated that over 850,000 jobs in the UK public sector could be automated by 2030. This transformation could eventually yield staff cost savings of up to £17 billion annually in public sector staff costs when compared to 2015.¹⁹ This is after allowing for the cost of transitioning to the automated platforms to deliver the services.

The tasks automated particularly focus on administrative and operative roles, which are often desk-based or manual. However, frontline roles requiring considerable personal interaction, whilst not being fully replaced by automation, could also benefit from the support of technology in fulfilling some functions.²⁰

The type of roles most easily automated will often involve repetitive and uninteresting activities. Automating these roles opens the way to redeploying the staff released, with retraining, into more productive and rewarding jobs.²¹ The UK has proved very successful in recent years in creating these new roles which are normally more complex, social and creative.²² The very nature of these roles means they are less susceptible to future automation and therefore sustainable.

Table 1: tasks with a high potential for automation by employment area²³

Employment area	Tasks
Finance and accounting	<ul style="list-style-type: none"> ▪ Accounts payables ▪ Accounts receivables ▪ Reconciliations ▪ Fixed assets accounting
Procurement	<ul style="list-style-type: none"> ▪ Supplier setup and amends ▪ Purchase order management
Payroll management	<ul style="list-style-type: none"> ▪ Payroll accounting and processing ▪ Compliance ▪ Settlements
Human resources	<ul style="list-style-type: none"> ▪ Travel desk ▪ Attendance tracking ▪ Reporting ▪ Data processing
Information technology	<ul style="list-style-type: none"> ▪ IT helpdesk ▪ Data centre management ▪ Infrastructure management

In advanced economies such as the UK, the public sector can often crowd out the private sector. Therefore, as the public sector increases, the private sector decreases, and the converse of this is also true.²⁴ This growth in the private sector will create new jobs, which will be filled by the former public sector workers.

From a labour market perspective this is exactly what the UK economy needs to compete in the global market place: a higher skilled workforce. This also sees employees progress into more satisfying, sustainable and higher paid work. The transition to higher levels of automation benefits both the public service provider in improved efficiency and the workforce in enhanced roles or retrained and redeployed into new jobs in the private sector.

¹⁸ Frey, C., & Osborne, M., *The Future of Employment: How Susceptible are Jobs to Computerisation?*, September 2013.

¹⁹ Deloitte, *The State of the State 2016-17: Brexit and the business of government*, 2016.

²⁰ KPMG, *Accelerating Automation*, 2017.

²¹ McKinsey & Company, *A Future that Works: Automation, Employment, and Productivity*, 2017.

²² Deloitte, *From brawn to brains: The impact of technology on jobs in the UK*, 2015.

²³ KPMG, *Accelerating Automation*, 2017.

²⁴ Behar, A., & Mok, J., 'Does Public-Sector Employment Fully Crowd Out Private-Sector Employment?', *IMF*, June 2013.

The taxpayer also benefits from improved public services delivered on a timely and cost effective basis. In short, everybody benefits.

Case study 2

Many federal agencies in the United States have started to adopt automation. For example, NASA Shared Services Center automated its HR personnel action processes for new recruitment and position transfers in 2017.

A new personnel action requirement auto-generates an email. That email signals a Robotic Process Automation software robot to copy personnel data and then create a new case in the HR system. Finally, the bot starts off the appropriate process actions within the HR system to complete the new case.

Automation has dramatically improved the efficiency of the process. It has managed to reduce completion time from 24 hours to one hour or less.²⁵

Case study 3

New York City is planning to work with IBM's AI platform, Watson, to build a new customer management system to speed up the time and process of answering questions and complaints about city services. This is similar to work in British Columbia where IBM's Watson helped power an app to quickly answer citizen questions. The app is used to address 65 per cent of questions that already have answers on city websites. Watson, which learns over time, studied over 3,000 documents about 16 city services, and can answer 10,000 questions.²⁶

Case study 4

Norway's Welfare and Pensions Administration has automated 65 per cent of sickness benefit claims and payments processing, replacing a manual procedure involving thousands of paper forms.

The project has increased efficiency, agility, and accuracy, and had a positive impact on staff. 350 employees who previously handled the claims paperwork have been moved to the front office to help citizens face to face.²⁷

²⁵ Deckard, M., *Automation will shape a new, super-empowered US federal worker*, February 2018.

²⁶ Mehr, H., 'Artificial Intelligence for Citizens Services and Government', *Harvard Kennedy School*, August 2017.

²⁷ Norwegian Government, *Digitizing Public Sector Services: Norwegian eGovernment Program*, 2012.

Case study 5

Enfield Council adopted the AI, Amelia in 2016. Amelia is a learning system which means that it can digest information from natural language and then create answers from what it learns. It understands the meaning of questions and finds the answers from its base of knowledge. Amelia also understands context, applies logic, learns, resolves problems, and even senses emotions.

The council is facing increased demand. Its population is increasing by four to five thousand each year and has 100,000 visits to its website and 55,000 telephone calls every month.

Amelia has the capabilities to make it easier for residents to locate information and complete standard applications as well as simplify some of the council's internal processes. For example, the council is evaluating Amelia's inclusion on the website to help guide people quickly to the correct information, employing Amelia to provide self-certification for planning and making it possible to authenticate applications for permits and licences.²⁸

Productivity

Productivity growth in the UK, and particularly in the public sector, is lower than in other advanced economies.²⁹ Its importance is best summarised by the economist Paul Krugman who stated that “Productivity isn’t everything, but, in the long run, it is almost everything. A country’s ability to improve its standard of living over time depends almost entirely on its ability to raise its output per worker.”³⁰

Automation is a key driver of productivity growth. For example it is estimated that widespread adoption of automation using AI technologies has the potential to increase productivity in the UK by 25 per cent.³¹

Productivity can be a complex issue, and is often referred to as the ‘productivity puzzle’.³² There is disagreement among economists as to why productivity has stagnated globally, and why productivity in the UK is particularly low.³³ The cause is likely to be multifactorial with issues such as the restrictive planning system, high levels of taxation, and transport congestion all being contributing factors.³⁴

If automation is more rapidly applied in the public sector, then not only would productivity in the public sector increase, it would also contribute to an overall increase in productivity growth across the economy.

The drive to higher productivity growth by increased adoption of automated processes will lead to an increase in the demand for higher skills levels in the workforce. In order to take full advantage of all the many benefits of automation, it will be essential that both current and future workers receive the skills training needed to operate within a higher technology environment. The cost savings that are generated by increased automation of public services will fund a substantial improvement in both the quality and availability of vocational training. The education system should also reflect this step change. Students should be offered and counselled towards courses and training that reflect the changing skills needed in a more automated workplace.

The UK should look to examples of best practice from other countries with a proven record of productivity growth in order to offer the highest standard of skills development and vocational training.

There are numerous examples of automation improving productivity in both the private and public sectors. Below are two such cases that demonstrate this.

²⁸ IPsoft, *First public sector role for Amelia as Enfield Council deploys her to boost local services*, June 2016.

²⁹ ONS, *UK productivity introduction: July to September 2017*, January 2018.

³⁰ Colford, C., ‘Productivity for prosperity: In the long run, it is almost everything’, *World Bank*, 2016.

³¹ Purdy, M., & Daugherty, P., ‘Why Artificial Intelligence is the Future of Growth’, *Accenture*, 2016.

³² Schneider, P., ‘The UK’s productivity puzzle is in the top tail of the distribution’, *Bank of England*, 2018.

³³ Haldane, A., *Productivity puzzles*, March 2017.

³⁴ Meakin, R., *Productivity Dirty Dozen 12 Policy Failures*, April 2018.

Case study 6

Changing Precision Technology Company previously employed 650 people in its factory producing mobile phones. The factory now has 60 robot arms and only 60 members of staff. The robot arms work 24 hours a day across ten production lines. The members of staff check and monitor the production lines and also monitor the computer control systems.

As a result of automation, productivity has increased by 250 per cent. There has also been a 80 per cent decrease in defects.³⁵

Case study 7

In January 2017, a major manufacturing firm was found guilty of bribery as a result of the use of AI by the Serious Fraud Office. Automating the process enabled the Serious Fraud Office to sift, index, and summarise the 30 million documents it needed to work through as part of its investigation. Moreover, the software was able to learn on the job, deepening on its understanding of the case, and identify relevant material.

Manually identifying the relevant information can cost the Serious Fraud Office millions of pounds and is very labour intensive. The introduction of the Legal Professional Privilege Robot can cut the costs considerably and, in the manufacturing firm case, contributed to solving the case “exceptionally quicker” than if it had been investigated manually.^{36 37}

It is clear that automation will increase productivity in the public sector in the UK. Furthermore, the adoption of automation by both the public and private sectors in the UK has the potential to significantly increase productivity in the UK economy as a whole. As increased productivity contributes to economic growth, it will lead to an increased demand for higher skills in the workforce. Therefore, in order to take advantage of the opportunities offered by automation, it is essential that current and future workers are equipped with the skills which they need.

³⁵ Javelosa, J., 'Production Soared After This Factory Replaced 90% of Its Employees With Robots', *Futurism*, 9 February 2017.

³⁶ Flood, G., 'Is AI Starting to Help the UK Public Sector?', *Think Digital Partners*, 13 March 2017.

³⁷ Macaulay, T., 'Serious Fraud Office CTO Ben Denison reveals how AI is transforming legal work', *CIO*, 3 January 2018.

Impact on the labour market

When the prospect of automation is raised in any context, a normal first reaction is to consider the effect it will have on the workforce. This is entirely understandable, as the main purposes of automating any process is to make it more efficient and, almost without exception, less labour will be required as a result. Machines, devices, computers and software will undertake tasks that were previously performed by people. This, allied to increased output and improved quality, are the objectives of automation.

A pessimistic view is often taken by concentrating on the negative impact automation will have on the jobs displaced in isolation. Currently these include some prominent figures, with Bill Gates, calling for a tax on robots³⁸ and Elon Musk for a universal basic income to support a jobless population.³⁹ By contrast James Dyson's stated view on automation is that "I do understand the concern, but my own view is that it will merely increase employment."⁴⁰

History is littered with dire predictions of the effects of mechanisation and automation on the working population.

We even find such fears as far back in time as Ancient Greece. For example, Aristotle expressed his concerns about automation in the fourth century BC.⁴¹

Queen Elizabeth I, in response to William Lee's attempt to patent a stocking knitting frame, stated "Consider thou what the invention would do to my poor subjects. It would assuredly bring them ruin by depriving them of employment, thus making them beggars".⁴²

Perhaps the most well-known example is that of the Luddites who destroyed new machinery in 19th century textile mills, fearing that the machines would take away their livelihoods.⁴³

Even the renowned economist John Maynard Keynes, although optimistic on the future standard of living, raised concerns in the 1930s about what he called 'technological unemployment'.⁴⁴

These fears have persisted into recent history. The advent of personal computers in the 1980s led to a widespread phenomenon known as 'computerphobia', with people being concerned that computers would lead to mass unemployment.⁴⁵ Advances in new technology, and in particular the internet, led many in the 1990s to predict a world without work.⁴⁶

However, with the benefit of hindsight we can see that none of those predictions were borne out. This is because – as was pointed out by Joseph Schumpeter in *Capitalism, Socialism, and Democracy* – although jobs are destroyed by new technologies, they are replaced by new ones. It is this 'creative destruction' which disrupts industries and destroys jobs, but which ultimately creates new, better jobs, and grows the economy.⁴⁷

Recent history also demonstrates this very well. In the UK between 2001 and 2015, technology had displaced over 800,000 jobs in the UK, but it had also created approximately 3.5 million new ones.⁴⁸

³⁸ Waters, R., 'Bill Gates calls for income tax on robots', *Financial Times*, 19 February 2017.

³⁹ Weller, C., 'Elon Musk doubles down on universal basic income: "It's going to be necessary"', *Business Insider UK*, 13 February 2017.

⁴⁰ Williams, H., 'Automation will "improve our lives", says Dyson founder', *The Independent*, 1 March 2018.

⁴¹ Aristotle, *Politics*, (London: Penguin, 2000).

⁴² Frey, C., & Osborne, M., *The Future of Employment: How Susceptible are Jobs to Computerisation?*, September 2013.

⁴³ O'Rourke, K., Rahman, A., & Taylor, A., 'Luddites, the industrial revolution, and the demographic transition', *Journal of Economic Growth*, vol. 18, December 2013.

⁴⁴ Keynes, J.M., *Economic Possibilities for our Grandchildren*, 1930.

⁴⁵ Lafrance, A., 'When People Feared Computers', *The Atlantic*, 30 March 2015.

⁴⁶ Atkinson, R., "It's going to kill us!" And other myths about the future of artificial intelligence, June 2016.

⁴⁷ Schumpeter, J., *Capitalism, Socialism, and Democracy*, (Abingdon: Routledge, 1994).

⁴⁸ Deloitte, *From brawn to brains: The impact of technology on jobs in the UK*, 2015.

Overall between 2011 and 2016 the number of UK jobs grew by 2.5 million. Whilst 1.1 million jobs were lost (including 0.5 million to automation), 3.6 million were created (automation itself accounting for 330,000 of those).⁴⁹ It should be noted that the above source uses a narrower definition of automation and is over a shorter time period than that of the Deloitte study.

Looking specifically at the UK public sector, since the financial crash in 2008, over 600,000 jobs have been shed, yet far more have been created in the private sector to absorb those displaced.^{50 51}

Subsequently, a period of rapid technological advance and automation followed, and unemployment has fallen from 5.7 per cent to the current level of 4.2 per cent, its lowest since 1975.⁵²

The last four decades have arguably seen the greatest, and certainly, the fastest, technological advances ever experienced. Personal computers, the internet, mobile phones, manufacturing robotics have all come into everyday use during that time, yet unemployment has not increased as a result. In fact employment is at its highest level since records began in 1971.⁵³

So, whilst concerns about the changes that automation will bring are understandable, past experience shows that increased unemployment will not be the outcome.

We should therefore focus on the positive outcomes that greater automation of public services can deliver in the interests of society as a whole.

⁴⁹ Allum, A., 'Jobs for the Bots? How the UK Jobs Market is Responding to Automation', *L.E.K. Consulting*, February 2017.

⁵⁰ Sheffield Political Economy Research Institute, *Public and private sector employment across the UK since the financial crisis*, 2015.

⁵¹ Coulter, S., *The UK labour market and the 'great recession'*, 2016.

⁵² ONS, *Unemployment*, May 2018.

⁵³ Department for Work & Pensions, *Employment rate reaches joint record high*, 2018.

Conclusion

Automation has the potential to dramatically improve public service delivery in addition to achieving significant savings. As a result, taxpayers will benefit as they will receive higher quality public services in a more cost-effective manner. It is not only taxpayers who will benefit as a result of automation, public sector workers will be freed from undertaking monotonous and repetitive tasks and will find more rewarding work either elsewhere in the public sector or in the private sector.

This move from the public sector, coupled with the increased productivity flowing from the adoption of automation, will have a benefit on the wider economy. There is a skills shortage in the UK, and so the private sector will benefit from skilled former public sector workers. This will allow companies in the private sector to expand, which will continue to increase employment opportunities and also grow the economy.

Therefore, it is essential that those currently in the labour market, and those who are yet to enter it, receive the training which they need in order to take advantage of the many benefits which automation brings.

Many people have understandable concerns about the impact of automation on employment and are worried that it might lead to mass and long-term unemployment. However, these fears have always existed, and history shows us that although new technology does displace jobs, it also creates more jobs, which are more interesting and rewarding.

This paper is the first in a series looking at the potential of automation to improve the delivery of public services. Future papers will examine the potential for automation in delivering health and social care, and also the realisation of public sector assets as a result of automation.

References

- Accenture, *Emerging Technologies Make Their Mark on Public Service*, 2017.
- Accenture, *Getting Robots Right*, 2016.
- Allum, A., 'Jobs for the Bots? How the UK Jobs Market is Responding to Automation', *L.E.K. Consulting*, February 2017.
- Aristotle, *Politics*, (London: Penguin, 2000).
- Arvato, *Balancing budgets and priorities*, 2017.
- Atkinson, R., "It's going to kill us!" *And other myths about the future of artificial intelligence*, June 2016.
- Behar, A., & Mok, J., 'Does Public-Sector Employment Fully Crowd Out Private-Sector Employment?', *IMF*, June 2013.
- Colford, C., 'Productivity for prosperity: In the long run, it is almost everything', *World Bank*, 2016.
- Coulter, S., *The UK labour market and the 'great recession'*, 2016.
- Deckard, M., *Automation will shape a new, super-empowered US federal worker*, February 2018.
- Deloitte, *Automate This*, 2017.
- Deloitte, *From brawn to brains: The impact of technology on jobs in the UK*, 2015.
- Deloitte, *The State of the State 2016-17: Brexit and the business of government*, 2016.
- Department for Work & Pensions, *Employment rate reaches joint record high*, 2018.
- Eurostat, *Individuals who contacted or interacted with public authorities and services over the internet for private purposes in the last 12 months, 2013*, 2013.
- Flood, G., 'Is AI Starting to Help the UK Public Sector?', *Think Digital Partners*, 13 March 2017.
- Frey, C., & Osborne, M., *The Future of Employment: How Susceptible are Jobs to Computerisation?*, September 2013.
- Haldane, A., *Productivity puzzles*, March 2017.
- Hitchcock, A., Laycock, K., & Sundorph, E., *Work in Progress: Towards a leaner, smarter public-sector workforce*, February 2017.
- HR News, *Replace GP receptionists and Train Drivers with robots, say UK workers*, January 2017.
- International Parking Institute, *What's What in Parking Technology*, 2016.
- IPsoft, *First public sector role for Amelia as Enfield Council deploys her to boost local services*, June 2016.
- Javelosa, J., 'Production Soared After This Factory Replaced 90% of Its Employees With Robots', *Futurism*, 9 February 2017.
- Keynes, J.M., *Economic Possibilities for our Grandchildren*, 1930.
- KPMG, *Accelerating Automation*, 2017.

Lafrance, A., 'When People Feared Computers', *The Atlantic*, 30 March 2015.

Macaulay, T., 'Serious Fraud Office CTO Ben Denison reveals how AI is transforming legal work', *CIO*, 3 January 2018.

McKinsey & Company, *A Future that Works: Automation, Employment, and Productivity*, 2017.

Meakin, R., *Productivity Dirty Dozen 12 Policy Failures*, April 2018.

Mehr, H., 'Artificial Intelligence for Citizens Services and Government', *Harvard Kennedy School*, August 2017.

Microsoft, *Digital Transformation Skills for Government*, 2016.

National Audit Office, *The digital skills gap in government*, December 2015.

New Forest District Council, *A better way to pay*, 2017.

NHS England, *Dramatic annual surge in online GP services as patients sign up for convenience*, March 2018.

Norwegian Government, *Digitizing Public Sector Services: Norwegian eGovernment Program*, 2012.

ONS, *UK productivity introduction: July to September 2017*, January 2018.

ONS, *Unemployment*, May 2018.

O'Rourke, K., Rahman, A., & Taylor, A., 'Luddites, the industrial revolution, and the demographic transition', *Journal of Economic Growth*, vol. 18, December 2013.

Piette, J., Rosland, A., Striplin, D., Bernstein, S., & Silveira, M., 'Engagement with automate patient monitoring and self-management support calls: experience with a thousand chronically ill patients', *Med Care*, March 2013.

Purdy, M., & Daugherty, P., 'Why Artificial Intelligence is the Future of Growth', *Accenture*, 2016.

Schneider, P., 'The UK's productivity puzzle is in the top tail of the distribution', *Bank of England*, 2018.

Schumpeter, J., *Capitalism, Socialism, and Democracy*, (Abingdon: Routledge, 1994).

Sheffield Political Economy Research Institute, *Public and private sector employment across the UK since the financial crisis*, 2015.

Sillers, P., 'Customs Technology is Going to Make Security Queues a Thing of the Past', *The Independent*, 30 June 2017.

Waters, R., 'Bill Gates calls for income tax on robots', *Financial Times*, 19 February 2017.

Weller, C., 'Elon Musk doubles down on universal basic income: "It's going to be necessary"', *Business Insider UK*, 13 February 2017.

Williams, H., 'Automation will "improve our lives", says Dyson founder', *The Independent*, 1 March 2018.

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