

Research Bulletin 18/7 | Automation NI – The Future of Work

Richard Johnston and Marguerite McPeake, Ulster University Economic Policy Centre

September 2018

Summary

Society is on the cusp of a technological disruption with advancements in automation such as big data, block chain and the Internet of Things becoming ever more intertwined in our everyday personal and working lives. This new era of automation divides opinion between those who are hopeful and those who are fearful of what it might bring. A review of the literature identifies a wide range of potential labour market outcomes across society.

Applying these findings to Northern Ireland (NI) suggests that the local economy is more vulnerable to the potential impact of automation (relative to the UK average) due to the sectoral and occupational composition of the economy. The literature also suggests that a range of jobs will be created as a result of automation and that many of these jobs do not yet exist. It is comforting to note though, that historically, automation has created more jobs than it replaced and helped to increase standards of living.

Automation represents both a challenge and opportunity for NI, it is happening, whatever decisions we take locally. Historically, automation and technological progress has been good for society, but there must also be measures in place to help those whose skills may no longer be in demand. Whether automation turns out to be an opportunity or a challenge is very much dependent on the decisions that are taken now. Therefore, we must build the evidence base, develop policies and practices and invest in our people and enterprises to prepare for the future of a more automated society today.

Introduction

Economists, policy makers and politicians have been concerned about the societal implications of automation and technological progress for over four centuries. Many feared that automation would reduce the demand for labour by replacing employees with machines and subsequently creating mass technological unemployment. However, whilst automation replaced many jobs and tasks, it also created many more, increased production possibilities and reduced prices, helping to increase demand. The current view is that whilst automation may replace some jobs and tasks, it will also present opportunities in the form of highly paid jobs, more efficient processes and products, reduced risk and increased accuracy.

This article discusses the implications of automation from a historical perspective, reviews published academic literature on the impact of automation over the next two decades and applies the findings to the NI economy to

estimate the range of potential outcomes for NI. It then discusses some of the steps that are required to prepare for the future of work in a more automated society.

A Historical Perspective

In the 1500's William Lee was refused a patent by Queen Elizabeth for his stock frame knitting machine for fear that his invention would leave the hand knitters unemployed. In 1821 David Ricardo was concerned that the introduction of technology in the Industrial Revolution would reduce wages and create mass unemployment. These views proved to be unfounded in a macroeconomic context as employment and output continued to grow and products became more affordable, new jobs and occupations were created and standards of living increased. In a micro context however, those whose skills were in lower demand and as a result lost their jobs or had to endure lower wages were understandably unenthusiastic about the benefits of automation to society.

By the 1930's the perspective on automation had become more optimistic, with John Maynard Keynes predicting a 15-hour working week and standards of living four to six times higher by the 2030's as technology boosted productivity. Unfortunately, his prediction about the 15-hour working week was woefully inaccurate, but US living standards (as measured by GVA per capita) are already six times higher in 2018.

The historical perspective on automation teaches us that technological progress and automation have;

- Helped to make products and processes more efficient, lowering prices and increasing general standards of living as consumers can afford to purchase more;
- Created a range of products that make everyday life easier – some examples include smartphones, internet finance and the array of automotive sensors that enable us to operate vehicles; and
- Shaped the foundations for future developments in big data, blockchain and Internet of Things.

As a result, technological progress has created a huge range of jobs and tasks – many in ICT and engineering, but across other sectors such as agriculture, the public sector and manufacturing. It has replaced other jobs and tasks, such as warehouse staff, bank clerks, assembly line workers and phone operators. History shows that rather than creating mass unemployment as was feared by Ricardo, or reducing the working week as Keynes suggested, there has always been more for employees to do. The focus shifted to other higher order tasks, which added more value to the business and improved productivity - if employees were able to adapt to a more automated working environment and had the relevant skills. Unfortunately, those who could not adapt, or whose skills sets became entirely redundant, faced tougher economic circumstances, illustrating how important workforce skills and readiness is for adapting to a more automated workplace. The historical perspective suggests that in general, technological progress and automation has been good for society and most citizens, but there are those who lose out too.

The Future of Automation and Work in NI

UUEPC research carried out for Catalyst Inc. reviewed the published academic literature and found a range of estimates for jobs that could be impacted (which includes whole jobs and tasks or parts of jobs) by automation over the next two decades. These estimates range from 10% to 50% for jobs or tasks at risk and from 5% to 70% for jobs that could be created over the next two decades. This illustrates the differing perspectives on how automation might impact the economy.

Applying these ranges to NI suggests that the net impact of automation could range from minus 40,000 to plus 170,000 jobs over the next two decades. Naturally, based on the published research, these ranges are large. However, they serve to illustrate both the potential opportunity and the downside risk for NI. These figures underline how important it will be for society to make the best policy choices and encourage employees to be adaptable and invest in their future.

Table 1: Jobs at Risk and Jobs Created from Automation

	%	Number
Jobs at risk	10% to 50%	85,000 to 424,000
Jobs that might be created	5% to 70%	43,000 to 595,000
Balance	-5% to +20%	-42,000 to +171,000

Source: Various and UUEPC analysis

The literature suggests that those jobs and tasks that are most at risk from automation are in routine and non-cognitive occupations that can be easily replaced. However, the capabilities of machine learning and robotics means that some non-routine and cognitive jobs can also be carried out by robots and these capabilities are continually developing. Some examples include dispensing pharmaceuticals, providing medical diagnoses, analysis of risks in company accounts, picking fruit and vegetables and processing meat.

It is relatively easy to identify those occupations that are at risk, but much more challenging to identify the occupations that might be created as they do not exist now. In 1998, who could have predicted that “app developer” would be an occupation? Yet two decades later there are more than 750,000 app developers in employment in the US.

Research carried out by PwCⁱ entitled “Will the robots steal our jobs” considered the potential for jobs to be highly impacted by automation (either whole jobs or parts of jobs). This research found that 30% of UK jobs were at high risk of being impacted by automation over the next decade. Transposing those sectoral estimates onto the NI economy suggests that 31.1% of NI employment is at risk of automation, with the relatively higher figure driven by NI’s sectoral composition (relatively more retail jobs, for example).

Table 2: Jobs at High Risk of Impact by Automation, UK & NI by Sector

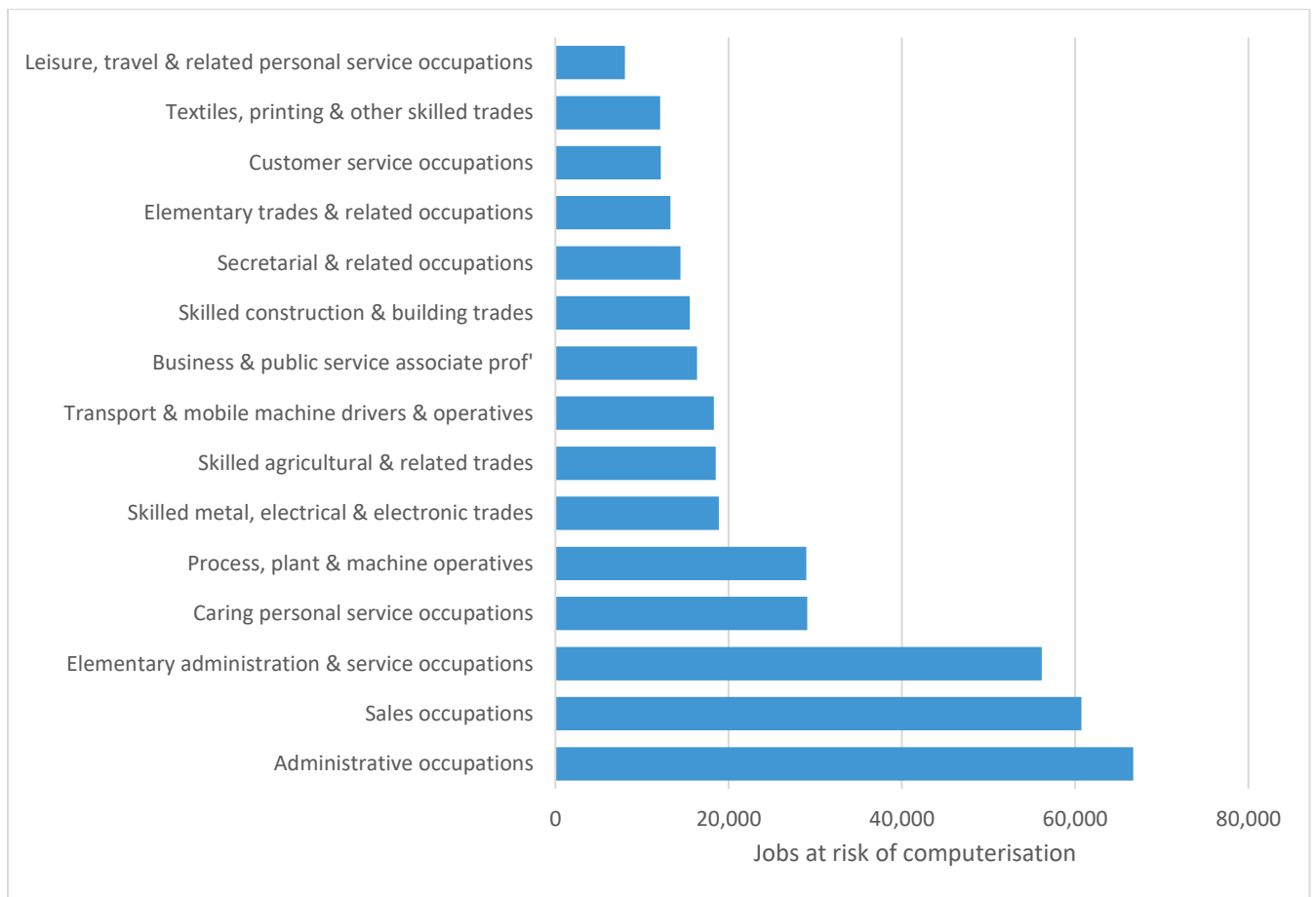
Sectors	% of UK jobs at potential high risk	% of jobs in this sector in NI	% of NI jobs at potential high risk	Number of jobs at potential high risk
Wholesale & retail	44%	15%	7%	57,400
Manufacturing	46%	11%	5%	43,400
Restaurants and hotels	26%	14%	4%	31,500
Transport & storage	56%	4%	3%	21,500
Public admin & defence	32%	6%	2%	17,300
Admin' & support services	37%	5%	2%	15,500
Construction	24%	6%	2%	13,100
Professional & scientific	26%	5%	1%	11,500
Health & social work	17%	6%	1%	8,500
Finance & insurance	32%	3%	1%	8,200
ICT	27%	3%	1%	6,600
Other service activities	19%	4%	1%	6,500
Education	9%	9%	1%	6,200
Water supply & waste	63%	1%	0%	4,200
Elect' & gas	32%	1%	0%	4,000
Arts & entertainment	22%	2%	0%	3,500
Agriculture	19%	2%	0%	3,300
Real estate	28%	1%	0%	1,700
Mining	23%	0%	0%	500
Employed by households	8%	0%	0%	-
Total	30%	100%	31%	264,600

Source: PwC & UUEPC analysis

Note: Estimates are rounded to the nearest 100

Research by Osborne and Frey, based in Oxford University, approached the issue from an occupational rather than sectoral perspective. Their research suggests that the occupations which are likely to see most impact from automation includes administration, sales, personal services and plant and process operatives. In the UK, they estimate that 46% of jobs might be impacted by automation over the next decade (whole jobs or parts). Transposing the Osborne and Frey occupational estimates onto the NI economy occupational structure again reveals that NI is relatively more vulnerable to the impact of automation, with 50% of jobs in occupations that are identified by Osborne and Frey as potentially impacted by automation.

Figure 1: Jobs at Risk of Automation by Occupation (Top 15, 3-digit) by 2030, NI



Source: Oxford University & UUEPC analysis

Applying the research to the NI economy reveals that the sectoral and occupational employment structure is slightly more skewed towards those that are more likely to be automated in the future, such as retail and manufacturing and administration and sales. Therefore, NI is marginally more vulnerable to the potential impacts of automation than the UK.

Grasping Opportunities and Addressing Challenges

The fourth industrial revolution is well underway, and technology is becoming ever more intertwined in our everyday life and work. Progress is inevitable, and the structure of the NI economy is such that it is likely to be more vulnerable to the impacts of automation in the future.

Society must make the most of the opportunities that may be presented in order to grow sectors that are internationally competitive and can generate employment and wages for the NI economy in the future. The key enablers it would seem are skills and education. In the words of Benjamin Franklin, it is *“an investment in knowledge that pays the best interest”*. Preparing our children, employees and those with aspirations to work for the labour market of the future is key. Literacy, numeracy and the ability to use technology are part of the baseline requirement for many jobs. Nurturing the education system and developing the curricula that creates and develops traditional literacy, numeracy and IT skills and deepens skills that are more *“human”* and less easily replaced are key, especially for jobs in the knowledge and export-oriented sectors. Deloitteⁱⁱ research reveals that oral comprehension, problem sensitivity, expression, reasoning, critical thinking and flexibility are now essential skills for working in a machine age. These are more *“human”* skills and are therefore less easily replaced.

As the workplace becomes more automated, it is essential that the education system focusses on developing these skills in the workforce of the future.

Conclusion

Automation is happening, whatever decisions we take in NI. Historically, automation and technological progress has been good for society, but there must also be measures in place to help those whose skills may no longer be in demand. Whether automation turns out to be a friend or a foe is very much dependent on the decisions that are taken now. Therefore, we must build the evidence base, develop policies and practices and invest in our people and enterprises to prepare for the future of a more automated society today.

Richard Johnston & Marguerite McPeake

For further information or queries please contact richard.johnston@ulster.ac.uk on m.mcpeake@ulster.ac.uk

ⁱ <https://www.pwc.co.uk/economic-services/ukey/pwcukey-section-4-automation-march-2017-v2.pdf>

ⁱⁱ <https://www2.deloitte.com/uk/en/pages/growth/articles/essential-skills-for-working-in-machine-age.html>