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The Digital Revolution and its impact on jobs and skills

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This article discusses the effects of the Digital Revolution on jobs and skills from the perspective of economic sociology. On the basis of selected sources in English and German languages the aim of this article is to show both the positive and side effects of the progressing automation of production and digitalisation of the economy, which puts millions of jobs in jeopardy. Both those phenomena are not necessarily associated with improving methods of work and intellectual potential of workers. There is the so called de-skilling effect of automation, which was confirmed by some research-studies not only with regards to the impact of software over manual skills. The biggest challenge is to invent the appropriate institutions which could handle all social and economic upheavals resulting from contemporary technological change.

Keywords: Economic sociology, digital revolution, automation, robots, jobs, skills, de-skilling

The so-called information technology revolution began in the 1970s. From the beginning of that revolution there have been many academic and business-oriented studies which contained rather alarmist forecasts of the loss of work skills and jobs. Some of the studies published in the 1980s had two common attributes: an employer-based research method and a pre-occupation with technology's impact on skills and jobs (Taylor & Wealthy 1985). A good example illustrating such an approach was 'New Technology and Demand for Skills' published in 1984 by the Manpower Services Commission in Sheffield, where the skills requirements of technology in two small but expanding labour markets – Newbury and Milton Keynes – were assessed by the research workers (not disclosed) of the above mentioned Commission. The companies participating in this research had all adopted information technology in one of three activities: manufacturing, assembly and services. Skill requirements for four occupations were examined: technologists and engineers; technicians; craftsmen; and operators. It was found that the requirements had changed for the first and to a lesser extent, the second occupation. And the technology induced skill shortages of craftsmen and operators – the last two of the four occupations- were at that time highly exaggerated.

Another observation from the numerous studies prepared by the researchers from the Institute of Manpower Studies is the view that information technology has one deterministic impact: multi-skilling. In the IMS study from 1985 covering eight occupations in 20 industries, it was found that the impact varied enormously. Multi-skilling had occurred in only 20% of the participant companies. Amongst the rest, there had been either no impact or deskilling. Examples were encountered where microprocessor-based instrumentation had simplified and downgraded the maintenance work. In others, it had upgraded it or weakened the divide between production and maintenance. In the final analysis, the outcome owed less to the inherent nature of the technology, and more to

the manner in which it was planned and implemented (Rajan 1985: 559). This is not to deny that technology does not create demand for multiple skills. It does. But its scale needs to be put in perspective.

The same observation applies to the scale of use of the technology as well as to the product and process innovations. With regards to those last two aspects, product innovation comprises microprocessor based components equipment used in the production process. For both types of innovation, the United States, Germany, Japan and the Great Britain have the highest adopting rate. As for jobs it is very difficult to calculate how many jobs in the above mentioned countries were lost due to the introduction of both the newest, advanced technology comprising product and process innovations, and how many of such vanished jobs were lost due to globalisation? The same holds true to the question of how many new jobs have been created in those and other highly developed countries due to continuing product and process innovations?

Traditional explanations

These problems can be likened to the ones posed by classical economists in the 19th century: to what extent is the displacement of labour in production by machinery compensated by employment created by making the machines, and by increasing production brought about by decreasing cost/increasing quality as a result of using the machines? As Heertje points out, in the 19th century the introduction of one of the most radical labour-displacing machines (the mechanical loom) in fact led to a net increase in employment because of demand-inducing effects of decreased prices resulting from its introduction (Heertje 1978: 41). Unfortunately the same did not happened in the same scale in the second half of the 20th century and in the first two decades of the 21st century. The main reason has not only been the different nature of the contemporary technological change based upon the Digital Revolution and automation of production, but the lack of appropriate institutions which could handle all social and economic upheavals resulting from that change.

Side effects of the Digital Revolution

The contemporary Digital Revolution puts millions of jobs in jeopardy. It has been growing in its transformative influence for decades, in the process undermining the economic power and to some extent, the very purpose of much of the workforce. Technology has allowed companies to move jobs to countries where wages and labour rules are more favourable, to automate away jobs altogether or to change the structure of markets in ways that reduce labourers, autonomy and power. As some authors point out, workers' economic circumstances change, they have little choice but to try to get by – to compete against machines and against other similarly vulnerable workers – in an attempt to maintain a tenuous grip on the employment ladder. The intensity of this competition has held down wages. Stagnant rates of pay have in turn hobbled the economy, by making it harder for governments to manage the business cycle and by reducing the incentive within firms to invest in labour-saving, productivity-enhancing equipment (Ryan 2016: 27; Rifkin 2011: 16). However, the present situation is substantially different from that resulting from the Industrial Revolution. That revolution had also fundamentally altered the role of industrial workers in society, which, in turn, led to decades of social and political mobilisation and conflict. However the Digital Revolution is not only going to continue to change the economy, but also to cause it to work in ways quite different from what we have become accustomed to. If, in the next decade or two, driverless cars become common on our city streets and the grab-and-go retail models of Amazon Go takes over our shopping centres, these two changes alone will put millions of jobs at risk, jobs typically filled by people without much education or training. And as those changes are occurring machines are becoming ever better at understanding human speech and at performing human sorts of reasoning. They will find applications across the economy and fill roles now occupied by people of all educational backgrounds and skills levels. It can be concluded that the prospects for many not multi-skilled workers are bleak.

If workers are going to thrive in the contemporary

world, we will have to change the definition of work, change the way we think about preparing people to work and change the level and type of support people can expect to receive from society. There is no other way of resolving these issues except through the political system. Resolving them through the political system means the emergence of new political movements that should not only battle over the merits of their particular proposals but have to fight to obtain the leverage to implement their particular vision for society. The problem is that there are not so many of such political movements promoting the particular and first of all realistic vision for society.

The fact is that in the 1990s and in the first decade of the 21st century a big factor fuelling economic growth in the majority of Western countries was technology. In the period from 1995 to 2005, large companies invested in technology that increased efficiency and productivity, eventually creating entirely new areas of business and boosting employment growth. The fact that American companies invested more than, for example, European ones is a key reason explaining why many U.S. multinationals increased revenue and market share during that time. At the same time there had been changes in the labour market structure in all highly developed countries with mid-skilled jobs disappearing, many of them becoming automated, at the same pace where the numbers of low- and high-skill jobs have expanded. While globalisation and technological progress have brought overall benefits, the gains have been unequal: some communities and workers have lost more than they have gained.

The findings of JP Morgan Chase's experts confirm that this trend is not going to continue in the next several years. The first reason is the declining prices for IT equipment such as computers and networking technology. That is an important factor for companies producing both hard- and software and other IT equipment because a lower price for technology implies lower gains for companies producing it. However computer "power" has increased dramatically over time. As the power of new devices increases, prices of old ones fall. The fact that they are not falling so quickly now means that technology is not increasing at the same pace it once did. The same slower pace unfortunately holds true also for which new workplaces are created, which is not good news for many workers who are afraid of losing their jobs. This can be partly explained by the low-risk attitude of many contemporary major businesses and their desire for more safe profits instead of risk. Increasingly, labour and investment are employed directly and indirectly and finally a mainstream exponential growth is achieved as the application and evolution of technology move towards commercial maturity. It should also be mentioned that competition from multiple suppliers commoditises technology and service. Additionally, labour employment is maximised. Thus, in the near future, modest evolution is and will be the growth path rather than radical innovation.

Slower pace of innovation and new types of jobs

Some economists argue that in the second decade of the 21st century, we are entering into an even longer period of slow tech gains and slow growth. Robert Gordon from Northwestern University argues that the productivity gains of the decade beginning in 1995 were nothing compared with earlier, arguably more cataclysmic tech shifts like the advent of the combustion engine and electricity in indoor plumbing (Time 2013: 9). In his opinion, even if innovation were to continue into the future at its pre-2500 rate, the U.S. faces new serious problems connected with an aging population, environmental challenges, inequality and lower levels of education relative to international standards – that will hinder growth more than in the past. One of the biggest problem in the United States has been, however, "men without work". This problem is a consequence of structural changes in the U.S. economy: the decline of manufacturing; the rise of outsourcing and automation; slow growth; and the advances of new technology due to the progressing Digital Revolution (Eberstadt 2016: 12).

Similar problems are arising in other Western countries, where the impact of technology has, to date, been highly unequal. The fact is that innovation

is the start of the wealth creation process, but initially it benefits few, and many who contribute and are key to that success go relatively unrewarded. It can therefore be assumed that further technology advancement will still be for a certain period of time a key driver of higher unemployment and inequality, as less educated workers lose their jobs to machines. However fears which abound that robots will cause mass unemployment are not justified (Ford 2014: 35). Rather, automation will still be pushing people from routine jobs, such as factory work, into non-routine ones, particularly those that require cognitive and social skills. There is not doubt that further technological progress will bring about a shift in the nature of jobs available and the skills they require. It is, however, very hard to imagine what kinds of completely new types of jobs may emerge in the near future. One seems to be certain that even more jobs will become automated thanks to self-driven technology, where the next class of jobs likely to disappear will include taxi drivers, road hauliers and couriers. However some jobs – those that require uniquely human skills such as empathy – will remain impossible to automate in the foreseeable future. Alongside technology, engineering and science, these will be the growth professions of the future. But these are jobs currently found at the bottom of the hierarchy: low-skill, low-status and low-paid feminised work such as care and retail.

There is no reason to fear that computers are also likely to take away all the jobs done by talented, creative people. On the other hand not all young people will become top scientists and engineers. Both politicians and businessmen should not only think of how to create more elite jobs in science and technology but how to turn occupations such as care into destinations of choice rather than jobs that are deemed as the last resort. The same holds true for other occupations threatened by computers which are taking over the kinds of knowledge work long considered the preserve of well-educated and well-trained professionals. It can be seen in many spheres of our life how computers are changing the way work gets done. And evidence is mounting so much so that the same de-skilling effect that ate into the talents of factory workers in the last century is starting to gnaw away at professional skills, even highly specialised ones. Yesterday's machine operators are today's computer operators but no one can predict for sure what types of new jobs will be created in the future due to technological progress. Also the manufacture workers who fiercely protested in the 19th century against the mechanisation of weaving could not have imagined that new fields such as railways, telegraphy and electrification opened up plenty of new jobs.

At present the new technologies have not created entirely new large-scale industries which would increase employment and income levels, as was the case with many 19th century inventions. Innovation has frequently entailed replacing labour with capital, reducing skill requirements, employment and wages. This can be illustrated through the example of the United States where technology remains small (less that 10 per cent) in terms of its share of gross value added of total output of US private enterprises and share of total private employment. IBM and Dell employ over 400,000 and 100,000 people respectively compared to around 10,000 for Facebook and around 50,000 for Google. Only around 0.5 per cent of the US labour force is employed in industries that did not exist in 2000. Even in Silicon Valley, only 1.8 per cent of workers are employed in the innovation-intensive businesses. Thus an idea promoted by many policy makers that innovation is associated with strong economic growth and creation of employment, especially well-paid work, has not been proven in all situations. It can be said that the connection between new inventions or innovation and growing employment, improved living standards and cleaner environment is tenuous at best.

De-skilling effect of automation

Innovation is not necessarily associated with improving both methods of work and intellectual potential of workers. In 2004 information Scientists from Utrecht University conducted a study aimed at finding out whether software improves or not, people who possessed the technological know-how. They had a group of people carrying out complicated analytical and planning tasks using either rudimentary software

that provided no assistance or sophisticated software that offered a great deal of aid. The researchers found that those who used the simple software developed better strategies, made fewer mistakes and developed a deeper attitude for the work. The people using the more advanced software, meanwhile, would often 'aimlessly click around' when confronted with a tricky problem. The supposedly helpful software actually short-circuited their thinking and learning (Carr 2014: 11). This is called a de-skilling effect of digitalisation and automation. It should be noted that even creative trades are increasingly suffering from the de-skilling effects of automation. Computer-aided design has helped architects to construct buildings with unusual shapes and materials, but only when computers are used, so they can deaden the aesthetic sensitivity and conceptual insight that come from sketching and model-building. As some studies have confirmed, working by hand is better for unlocking a designer's originality, expanding their working memory and strengthening their tactile sense. So, when software takes over, manual skills wane.

The overreliance on computers makes it harder for designers to appreciate the subtlest, most human qualities of their buildings. Not only architects, designer and many other professionals do not need to resign from software based work. Thus, automation need not remove challenges from our work and diminish our skills. Those losses stem from what ergonomists and other scholars call 'technology-centred automation', a design philosophy that has come to dominate the thinking of programmers and engineers. In order to avoid all traps caused by automation which is isolating various groups of more or less creative workers from hard work and in this way is depriving them of their skills, the inventors (innovation makers) should not emphasise the needs of technology over those of humans. In other words in 'human-centred automation' the talents of people should be given precedence. Pushing automation in a more humane direction does not require any technical breakthroughs. It requires a shift in priorities and a renewed focus on human strengths and weaknesses. This does not mean that we should limit our enthusiasm to computers and the smartest software. However we should be aware of the fact that even the smartest software lacks the common sense, ingenuity and verve of the well educated and multi-skilled professional. All workers should therefore not underestimate their own talents and should not rely only on computers or on automation because this makes them less capable, less resilient and more subservient to machines.

Concluding remarks

Much of the current debate about the future of work, new types of jobs and new skills should be focused on the realistic vision of creating a better world of work. And this seems to be impossible without both the 'human-centred automation' and more importantly, appropriate government policy. The recent, somewhat shocking results of parliamentary and presidential elections in the individual countries confirm the view of many sociologists, economists and political scientists that political systems built in the past are not capable to meet the demands and challenges of the present era of digital economy. In the opinion of Riccardo Campa it is some kind of paradox that 'sentient' human beings 'capable of inventing quantum computers and creating artificial lice fail to come up with a new system of production and consumption in which these and other innovations, if they cannot be beneficial to all individuals at the same extent, at least are not detrimental to the majority' (Campa 2017: 14). In my opinion the efforts directed at the creation of more or less 'new' production and consumption system, alternative to capitalism, are headed for failure. Thus the question is not to look for another, more or less efficient and at the same time 'fair' (just) economic and political system, beneficial to the widest strata of the society, but to find a realistic way of reforming the existing system in order to transform the world and make it more friendly for humans than for robots.

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