The Era of Fourth Industrial Revolution: Challenges and Opportunities for the Public Service

1 July 2019

The Spectre of Fourth Industrial Revolution is Upon Us

Patterns of global production, trade, employment and consumption are changing at the rapid pace. The future is unlike today, yet some of the changes that are associated with the notion of Fourth Industrial Revolution (4IR) are already among us. Major innovations in artificial intelligence (AI) or machine learning, robotics, the internet of things, autonomous vehicles, 3D printing, nanotechnology, and quantum computing are no longer futuristic technologies but a reality that we exist with today. There is also increasing talk about the emergent era of e-government, which is about using information and communications technologies to bring efficiencies to government.

The growing use of cloud computing and automation of back-office processes is but one part of this development. Beyond improving government processes, it is also about using technologies to improve ease of connection between government and the citizens, as well as to improve overall public services. Scientific breakthrough and human ingenuity over the decades have cumulatively produced the knowledge that drives much of what we referred to as the Fourth Industrial Revolution. The impetus has been to generate more value using limited resources, or at least less labour in the production processes, as well as to create more conveniences in our consumption patterns, for example autonomous vehicles or speech recognition applications that are self-learning and serve as assistants that can handle many functions at a speed; or algorithm-driven sensors or GPS.

While many of these technologies are dazzling, including those that can assess insurance claims, evaluate mortgage applications, execute sophisticated accounting functions, and mass produce items that were once manufactured by labour, they have implications for both blue-collar and white-collar jobs. When the structure of production changes dramatically, and when productivity and growth rise without any noticeable improvement in the welfare of workers, policy has an important role to play in normative and preference signalling.

What is the Fourth Industrial Revolution?

We have gone beyond contemplating whether the Fourth Industrial Revolution is a myth or reality. It is part of our lives, and has been with us now for some time. Every country is putting in place processes and measures to harness the positive effects of 4IR while countering its adverse effects especially on blue-collar workers and vulnerable groups. There is a broad consensus that the 4IR is a reality and increasingly an integral feature of capitalism in the 21st Century.

What has not been fully appreciated is how this development creates winners and losers. There is not much that is said about what will happen to all those workers that may likely lose their jobs as a result of structural change created by new technologies in the economy.

There have not been much research or insights on the precise effects of this change on public sector workers. There are reports and studies that are beginning to emerge on how these new trends are impacting upon blue-collar and white-collar workers. We live to see the evidence of labour saving technologies introduced in agriculture, industry, and services sectors. We are interested in gaining a better understanding of the impact especially on public sector workers so that we can think of best policy tools and strategies that can be put to effect to cushion these workers and prepare them for a changing structure of government.

Before we take a look at distributive effects of 4IR – that is the distribution of gains and losses – it is important to provide some definition and characterisation of this development. The trend referred to as 4IR is in simple terms the fourth phase or era of industrial development since the initial industrial revolution of the 18th Century. The first industrial revolution was marked by the use of water and steam to power production. This took place around 1765. It was soon followed by the second industrial revolution which took place around 1870, and saw rapid development of oil and gas extraction, railroads, and steel industry. In the case of South Africa the rapid progression from the discovery of gold in Johannesburg in the late 19th Century to the formation of Eskom in 1922, followed by the formation of the state-owned steel giant Iscor in 1928, and later the energy and chemical company in 1950 marked the short distance between the First and Second Industrial Revolution. This era was characterised by use of electric energy to power mass production. This was in a sense epitomised in the extractive character of production and the use of primary resources to generate energy and power production processes – or what came to be known as manufacturing, which was underpinned by steel production.

The evolution of industrial production since this period led to gradual displacement of agriculture by industry as a major force for developing productive capabilities in society. Change in the industrial structure of society also affected how industries were organised, consumption patterns, and how government organised itself to levy taxes, relate with the new industrial structure, and consider ways to effectively regulate it.

The Third Industrial Revolution is traced to the second half of the 20th Century, and it is mostly associated with breakthroughs in the discovery of nuclear energy; as well as the emergence of the era of electronics (transistors and microprocessors) and advances in telecommunications. Biotechnology and automation of work processes reflected the height of this industrial phase. It is important to note that there are no sharp breaks between the various industrial development phases, but new continuities and gradual discontinuities.

The different shapes in which forms of production assumed through the various phases – from First to Third Industrial Revolution – affected the organisation of government, the priorities of government, and the preferred policy tools to regulate commerce. For example, government's industrial policies would either be aimed at creating import replacement industries to develop industrial capabilities domestically – depending on the stage of development – or be directed at supporting farming activities on a large scale. The character of the export sector, whether it is agriculture-based, extractive, or manufacturing-based, reflected government's policy priorities and incentives.

The dominant sectors in the economic base would also constitute the corporate tax base of the country. These would also be the sectors in which the bulk of the country's human capital is absorbed in the economy. In turn, this would be the source of the income tax of the country. The functioning of government and how it defines its priorities has, to a considerable degree, reflected the structure of production, which also shapes how society is organised and where its members are employed.

The Fourth Industrial Revolution has features that are vastly different from what we have seen over the centuries of the development of capitalism. While the First to the Third Industrial Revolutions were characterised by labour-intensive processes, with automation emerging as a feature of the Third Industrial Revolution, the Fourth Industrial Revolution places greater emphasis on the substitution of technology for human labour. Whereas in the previous era the major contention of labour was about exploitation – that working conditions and wages were perceived as insufficient for enabling sustainable livelihood – in the Fourth Industrial Revolution, labour displacement is an effect of the introduction of new technologies or robots.

Even the mega-rich such as Microsoft founder Bill Gates and the serial entrepreneur Elon Musk have warned of the adverse effects of new technologies if they are not tamed either through public policy instruments or some ethical framework. Gates have argued for a tax on the robots, a proposition that has gained widespread popularity. The effect of new technologies is that the enable massive growth in the capital base without redistribution of gains to labour. All the value that is generated by new efficiencies is channelled to the super-elite or the companies that already dominate the tech-revolution.

This creates a tension within the capitalist mode of production: the concentration of capital gains in the elite, and mass unemployment created by labour-saving technologies, drains the economic system of the consumers who are responsible for sustaining it. The products that are churned out by automation or robots that are employed to replace labour create an inventory glut as the elite class in society cannot possibly purchase and consume all the products that are produced through automated processes.

It was not conceivable in the old era to experience economic growth without increased employment, in the Fourth Industrial Revolution there is de-coupling of growth from employment. Growth is increasingly less a function of exploitation of labour, and more a result of technology utilisation across domains of production. In advanced industrial economies, the growth in the overall pie of the economy is not accompanied by growth in demand for labour. The reverse is the case. It is not the first time that technology displaces labour; automation in the previous era has performed a similar function, but not in the scale and depth at which technologies today displaces human labour.

The Fourth Industrial Revolution can thus be viewed as a fundamental shift in the way production is organised, how production is defined and its rationale, and how society consumes what is produced. The current trend does not just witness the displacement of blue-collar workers by automation or robots on the manufacturing platforms but also white-collar workers.

The banking sector in South Africa is witnessing a significant change as back-office staff and tellers are increasingly replaced by artificial-intelligence (AI) based automation processes. Actuarial scientists, accountants, and para-legal professions are some of the functions that are also increasingly displaced by AI algorithms. There is growing intensity of automation in the mining sector. Manufacturing is shifting in the direction of greater use of robotics in the place of labour.

The food retail sector is also gradually automating in ways that limit the use of labour. In short, the Fourth Industrial Revolution has brought broad-based and deep disruptions to all facets of the political economy. These developments have winners and losers. Without a doubt, it is blue collar workers that bear much of the brunt.

All these changes and technological innovations have left the regulators way behind. Industries and countries are faced with tough political and moral choices. Significantly, the prevailing technological disruptions have also relocated the tax jurisdictions, so many nations find their tax base diluted and their fiscal revenues reduced. This too has serious socio-political ramifications. The public sector needs to think through its policy choices on how to regulate in the era of 4IR, how to manage the speed at which digital transformation is happening, and how best to use fiscal instruments to increase tax rate on the types of innovation that displaces labour while also compensating the losers. There are clear implications for government, and possibly questions to ponder for the potential effects of these developments on the public servants that might be in future affected by shift to innovative technologies associated with 4IR.

Digitisation and Implications for Public Servants

Some of the developments related to digitisation stand astride the eras of third industrial and the fourth industrial revolutions. The South African government already has a draft national e-Government Strategy that was released in 2017, and whose objective is to digitise government services. As stated in the draft document, 'The strategy aims to optimise service delivery that provides universal access to government information and services anytime and anywhere.'[i] An example of what a digital government will look like in the future is Estonia, where 99% of the public services are available online 24/7, an achievement that has been made possible through high-speed data connectivity.

In Estonia, health care registry and pretty much everything else that concerns the data of patients or citizens is run on a blockchain, which gives power to citizens to own their data wherever they are in the world. Blockchain is an encrypted platform or distributed ledger that captures transactions and records of proofs of ownership, and is managed by a peer-to-per network. It is also the technology that underpins cryptocurrency or bitcoin, although as a distributed ledger it has a life of its own outside of bitcoin, and can be used to store certificates, title deeds, medical records etc.[ii]

The only aspects of the public services that are outside e-government in Estonia and require physical interface are those to do with marriages, divorces and real estate transactions, but everything is nearly digitised. This is also an example of how new technologies that are associated with the Fourth Industrial Revolution in the domain of government services facilitate greater transparency. This can also strengthen democratic processes, including through e-voting and facilitating ease of communication between citizens and government in ways that improve trust. Given that much of the platform that enables digital transformation is developed and anchored by the private sector (Cybernetica, Dell, Ericsson, OpenNode, and Talia in the case of Estonia), this raises important questions about the ownership and uses of data outside its original purpose.

There are also crucial questions the digitisation trends in government raises about the future employment outlook in the public sector. There is no doubt that this this generates value in reducing bureaucratisation. Reducing bureaucracy should not always be associated with downsizing in the private sector, rather it should be seen as important for simplifying processes, create efficiencies, and empower public sector workers to achieve more with the aid of technologies.

Looking forward

In practical terms, technological disruptions mean growing automation, especially for the full range of entry level occupations in almost all industries. As a result, a number of unintended, yet critical, consequences are likely to emerge. The most important of these are:

I. A disturbing skills gap between what the labour force has and what a technologically-driven and competitive economy requires. How such an economy will be regulated is an important question that needs to be answered.
II. Unemployment and unemployability can become a serious social phenomenon.
III. To a large extent, it has also contributed to the loss of productivity and effectiveness within the public sector. In general, the more labour intensive a sector or an industry is, the more it can suffer from relative productivity loss.
IV. It is possible that the public sector could procure equipment that could make employees in the back office redundant or supernumeraries, for example, those that are working on human resource processes, transcription, accounting, and a range of clerical jobs at the low-end of the professional services.

If the Fourth Industrial Revolution leads to processes that displace labour in the public sector, this could mean sudden increase in demand for pension pay out, in ways that could pose risk to the sustainability of the public sector pension fund. The types of technologies that government chooses to use is a policy choice rather than a given. At the core, the public sector is about delivering public services to society and in ways that places people at the centre. It requires both excellent judgement and empathy – critical attributes that artificial intelligence does not possess.

The design of the public sector for the age of the Fourth Industrial Revolution should show greater sensitivity to the labour factor, the social utility of the public service, and the need to preserve jobs in the public sector as a national imperative. This therefore means that introduction of machine learning processes should be designed in a way that preserve greater utilisation – rather than displacement – of labour. There are both opportunities and risks in the Fourth Industrial Revolution. It is important that we harness the opportunities for skills and capability upgrade, and create an environment where machines work alongside human beings to enhance efficiencies and overall wellbeing rather than to achieve a zero-sum game. Proposals about the Universal Basic Income (UBI) should be taken seriously.

The universal basic income differs from the means-tested welfare grant in that it is given equitably to every member of society, whether they are working or not, as a minimum base. Countries such as Norway are currently experimenting with the universal basic income, and results so far suggests that it does not discourage people from looking for jobs. It is meant as a basic cushion against deprivation. The source of such an income could be higher rates of taxation on labour-saving technologies – or at least – those companies that deploy such technologies. Companies that make greater utilisation of labour could receive greater incentives in the form of tax credits. The public sector has far more important role to play in the uncertain future of the Fourth Industrial Revolution as a source of employment as well as to deliver public services, especially in view of the rising demand as a result of rising joblessness that might be induced by new technologies.

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[i] *National e-Government Strategy: Digitising Government Services, 10 November 2017*
[ii] *For an illuminating discussion on the blockchain and its origins, Tapscott, Don and Alex Tapscott, Blockchain Revolution, New York: Portfolio, 2016.*