Adapting Our Education to the Demands of the Fourth Industrial Revolution:
Challenges for the Future
31 January 2020
----

1. Catching Up with the Pace of Change

The world is changing at a very fast pace. Our education system is lagging behind. From the primary level to higher education, our education system is churning out students who are either ill-prepared for advanced learning or not equipped enough to participate meaningfully in a dynamic economy. Our education system is plagued by problems related to access, equity, and quality. Our industrial structure as well exhibit many defects in its resource intensity and lack of innovation.

As a result, South Africa has a two-tiered system: one delivers a private education for the upper middle classes and the elite strata of society; and the other offers substandard outcomes for children of middle classes on the lower end, the working class, and the poor. These two systems determine who participate in the economy in future. The tiny layer that receives relatively good quality education will likely rule those who are at the bottom. One system is well-resourced and privately-funded; the other system is publicly funded and largely dysfunctional.

This two-tier system reproduces inequalities in society. The elite-driven privately-owned system cannot on its own produce a human capital that can respond to the demands of a changing economy. Those who come from this system are likely to find a place at a university in South Africa (or abroad) than those who come out of the public schooling system who are likely to be trapped in joblessness. As commentators have pointed out, 3% of South African high schools produce more distinctions in mathematics the remaining 97%.[i] This tells a disturbing story about the country's level of preparedness to compete in the future, since the 3% cannot drive economic renewal.

Building a high performing and competitive economy requires an educational system that is accessible, equitable, and delivers quality outcomes. This is not what we have in South Africa.

As it is, South African schools are lagging in mathematics according to the Trends in International Mathematics and Science Study. Good quality education is a prerequisite for national competitiveness. According to the National School Effectiveness Study in 2018, which tests numeracy and literacy, 'show that South Africa's mean scores for literacy in grade three and grade four were 19% and 27% respectively. The means score for numeracy in these grades in other countries were 28% and 35% respectively.'[ii]

2. The Blight of Illiteracy

South African school-going children who attended schools for six years cannot read or write compared with their counterparts in Tanzania and Zimbabwe. In these circumstances, it is not realistic to make a leap to the Fourth Industrial Age. That is not to say South Africa will not get there, for such developments are part of the country's economy. What this means rather is that our technological change is externally-driven, and South Africa will bear their effects without the capacity to respond or to meaningfully participate in ways that generate shared economic benefits.

If we are to take advantage of these shifts we would need to first agree that our education system is in a state of emergency and that it requires extra-ordinary effort to turn it around, including building capacities among educators, improving infrastructure, stemming fiscal leakage to corrupt activities, have stringent system for monitoring performance with clear incentives and disciplinary measures, and adhering to a high normative framework. We may also need to take a closer look at the schools' curriculum and methods of teaching with to align aspects of this to the demands of the economy.

3. Trends in Fourth Industrial Revolution and their Impact

As we enter the second decade of the 21st Century, it is clear that much has changed in industrial structure of the economy. These shifts are not abstract but real. We see this in growing automation in agriculture, mining, and manufacturing as well as lay-off of workers in these sectors. This is also true within the financial services sector with growing digitalisation. The old industrial sectors are still with us but are increasingly driven by service-intensity and automation. Various industries of the future are emerging as either stand-alone or as part of the old industrial economy to redefine production processes in ways that displace labour. Industries of the future include internet of things, robotics, advanced life sciences, code-ification of money, cybersecurity, and big data. It is worth taking a look at a few of these industries and understand the underlying processes and applications that define these.

Internet of things work through sensors and networks that create interconnection between various devices who can communicate with one another.

An example here would be a refrigerator that is able to sense when specific food items are about to be exhausted and communicates the requirement for inventory replenishment to a grocery store. Internet of things are essentially connected devices that are able to communicate with one another using sensors. These can be used in medical fields, home security, smart-grid, and tracking of shopping habits.

Robotics is another area slated for major development. Many assembly lines in China rely on robotics to produce apparel and other widgets as a way to sidestep criticism about exploitation of labour in tough working conditions. There are public policy questions about the type of robotics activities that countries should adopt, with emerging views that stress the need to show preference for robots that work alongside human beings than displace labour. In other countries the field of robotics is not limited just to industrial production but create non-human assistance for leisure and home care.

Countries such as Japan, China, the US, South Korea, and Germany are leading in this respect. Digital manufacturing and infinite computing will also be a game changer in democratising and localising manufacturing through 3-D printing technologies. Big data and cloud computing have been popularised by the big tech companies such as Microsoft, Amazon, and Google. These companies deal with massive trove of user data that reveal social preferences and norms of users and allow tech companies to use such data to track or influence consumer choice. Many companies no longer rely on massive physical storage infrastructure to store their data but rely on cloud storage provided by companies such as Amazon Web Services and various other smaller competitors that offer such services.

Apart from these listed above, there are many other artificial intelligence-driven processes in medical fields and education that are changing how these services are conceived and delivered. Other relate to the growing field of digital business and fintech which is gradually upending the traditional banking sector. Take, for example, a company like MTN. It is not just a mobile telephone platform that competes with other mobile telephony company but has leveraged its infrastructure to create financial services as part of its digital offerings. New banks such as Tyme, which is a spin-off from African Rainbow Capital, are competing with traditional banks for the previously unbanked consumers at the low end, and who struggle to access financial services through traditional channels.

There are various other processes that are moving apace in creating new digital products or showing inclination towards artificial-intelligence or robotics processes in the industrial and services sectors. What all these shifts mean is that if we do not fix the challenges in our education system with urgency and upgrade our human capital we may find ourselves in a worst state than we currently are in economically. The education system should think beyond just vocational and academic training and move from a new starting point: how do our institutions develop the kind of human capital required to grow the economy.

4. Conclusion: Planning for the Industries of the Future

The areas that are well-documented to show talent scarcity are big data and analytics (or data scientists), Artificial Intelligence skills, and machine learning engineers. These are critical competencies needed to build a globally competitive economy.

It is essential that students are equipped with mathematics to be able to participate fully in this changing economy. There is a second set of competencies that are less to do with technological shift but are essential services and careers in society that cannot be replaced by robots. These include social work, home care, psychologists, counselling, coaching, and leadership. Those who are going into these professions need to have a general awareness, if not grasp, of skills that are essential for building a globally competitive economy. What is important is to develop a human capital that is flexible and adaptive. This should be the focus of our education system from primary to higher education.

---

[i] Spaull, Nic, SA's schooling system not making the grade', Financial Times 4 October 2019. https://www.businesslive.co.za/fm/features/2019-10-24-sas-schooling-system-not-making-the-grade/

[ii] Mntatato, Sabelo, 'Basic education is failing the economy'. Mail & Guardian, 23 November 2018.