South Africa's 4th Industrial Revolution belongs to the youth

"Data is the new gold, the new oil of the 21st century". So pronounced Vladimír Šucha, Director-General of the European Commission's Joint Research Centre at the SA-EU Strategic Partnership Dialogue Conference on disruptive technologies and public policy last month. Policies need to equip youth with technological skills and opportunities if South Africa is to extract and reap, equitably, the benefits of big data, our most valuable future resource.

The importance of placing youth at the center of South Africa's response to big data, the Internet of Things (IoT), biotechnology, Artificial Intelligence (AI) and other elements of the fourth industrial revolution (FIR) was one of the key points to emerge from the conference. Bringing together various interests and industries, the dialogue aimed to uncover mutually beneficial ways for South Africa and Europe to ride (and help to create) the converging waves of technology that are transforming the way we live.

The European Union hopes to positions itself as a future leader of the 4th industrial revolution, viewing rapid advancements and convergences across the digital, biological and physical spheres as opportunities for growth. Cross-country collaboration is central to this vision, with international partners providing new, valuable sources of data and access to new markets.

"What is important to understand, is that that one country-- if you forget for a moment, the big countries like China, US, we're talking about Arabic countries and also about African countries-- is not going to survive for this race on its own," Sucha said. "So there must be cooperation between countries."

South Africa, too, stands to benefit from innovations through partnerships and collaboration. One area of opportunity is mobile connectivity: South Africa and other African countries have huge mobile penetration, which means large and growing data reserves (particularly with the advent of 5G) that could, for example, drive precision agriculture.

But, as history has many times borne out, where there is opportunity, there is also opportunity for exploitation. South Africa's focus therefore is on realizing the benefits of the FIR through inclusive policy while mitigating potential harm through regulations.

Concerns about data security were underscored by Gareth Priede, the Managing Director of Implicit Design, with the hypothetical example of Moozle, a cow recognition software using AI to recognise and evaluate cows. Such an innovation offers obvious

benefits to farmers. But it could also be used in ways that don't benefit the farmers, or have unexpected outcomes: farmers' data could conceivably be given away or sold to breeders, buyers, or other interested parties. In other words, the greatest value created would not benefit the users.

"Think for example about social networks like Facebook." Priede said. "The moment you share something on Facebook, sure, you get... a like or something, but you lose that information. That data is then used by Mark Zuckerburg to make billions."

In addition to protecting users through guidelines and regulations, how can South Africa foster its own innovation and support potential entrepreneurs?

As Chief Director of Future Production Technologies at the Department of Trade and Industry Ise Karg noted, fifty percent of South Africa's population is under the age of 30, which means, in theory at least, that we're well suited for a digitally-driven economy. Yet, in the absence of opportunities, a significant portion of youth is in danger of being left behind. Almost 40 percent of youth are unemployed and lack the skills to participate in an increasingly technological society.

"We need to empower young people to disrupt us," Rev Frank Chikane, chairperson of Kagiso Trust, argued. Technologies of the FIR – for example remote learning – could empower youth to close this gap and to meaningfully participate in the mainstream economy.

."An ordinary child in rural province with no support… can perform the same as a privileged child in a private school [if you give them the opportunity]," Chikane said.

Thus one of the core focal points of the conference was about how to structure policy to reach the youth, support needs-based innovation and to equip workers to be able to constantly evolve, up-skill and broaden their expertise.

One suggestion was a network of tech training outreach centres to reach marginalized youth and provide support to turn innovative ideas into profitable products. Leaders in the educational and automation sectors agreed that policies should also allow for adaptable, flexible curriculums in higher education institutions, as well as learning models not restricted to universities.

Annemarie van Coller, president of SAIMC named the National Tooling Initiative Programme (NTIP) programme as an alternative learning model better suited to an age of relentless technological change. The NTIP is a modular training program that workers

can undertake in increments, while working, and which allow for upward mobility from wherever they left off. (Contrast this to the need for an artisan worker to return to university and complete an engineering degree from the beginning if she wishes to become an engineer, and the fact that, in tech particularly, by the time a student enters the workforce, part of what she learnt at college will already be obsolete.)

Vice Chancellor Tshilidzi Maewala argued that broader skill sets were increasingly critical as divisions between sectors and associated skill-bases blur. Health workers need to become data scientists, he argued, and, quoting Michael Jordaan "Bankers of the future will need more engineers and less economics".

To equip students with broader skill-sets, the University of Johannesburg is introducing a compulsory multidisciplinary undergraduate curriculum, called 'African Insights'. "This looks at the political economy of Africa," Maewala said. "And how it can be tackled from all angles: from the legal side, climate mindset and so on."

A second key point to emerge from the conference was the potential role of tax incentives that encourage investment in SMEs and innovation in South Africa's FIR strategy. Dr. Roberto Volpe from Queen Mary University of London detailed Italy's experience with policy geared towards the 4th industrial revolution, such Italy's Start-up Act, aimed at facilitating the creation and the growth of new hi-tech companies.

"Since 2012, whoever invests in the equity of an innovative startup benefits from a considerable income tax break." Volpe explained. Such empirical evidence from Europe and elsewhere could help to inform South African policy.

 There's also opportunity for cross-country collaboration based on the EU's twinning model, a part of the Horizon 2020 project. In this model, cities with similar problems but different technological capacities are paired, to work on joint solutions for localised problems. This is particularly pertinent for the South African context because it allows for innovation that responds to localised needs.

The depth and scope of big data and its possible applications, and implications, are difficult to grasp. [Ninety percent of the world's data was created in the last two years](), and currently, only around 0.5% of all data is analysed. The data explosion is so huge and so sudden that, on the graph below, the data produced in 2007 doesn't even feature. Some of this data is personal data collected by players like Facebook and Google and Amazon. And increasingly, a significant proportion of it is going to be genomic data, as the cost of mapping the human genome drops and precision medicine becomes widespread.

As molecular biologist Musa Mhlanga of the University of Cape Town put it, "Biology is where the silicon revolution was in the 1970's but evolving much faster."
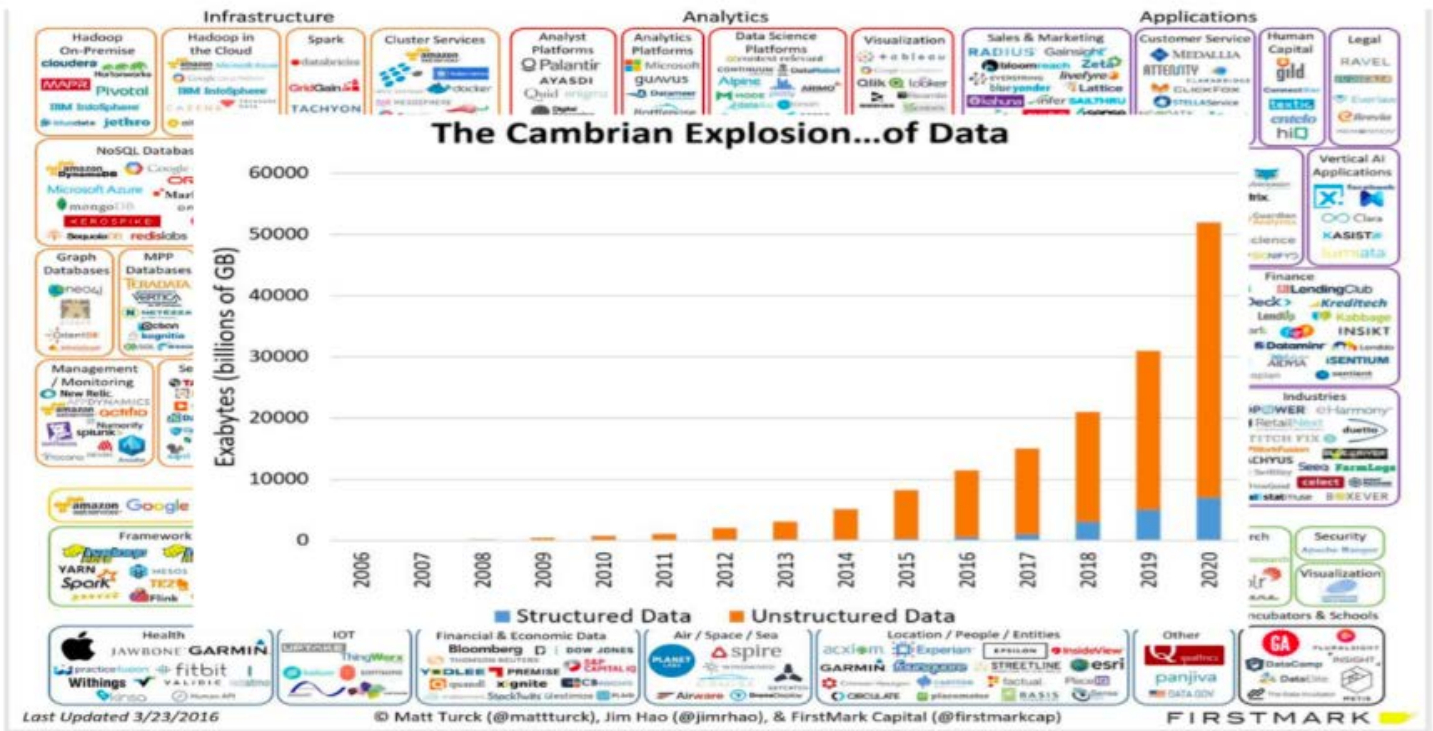
The cost of missing the next wave of genomic advancement might be the health of the continent, Mhlanga argued. Because the risk profiles for different diseases -- including various cancers -- differs for different population groups, the fact that most of our genomic data comes from Europe means that we might be missing valuable insight into how to treat patients in Africa and other parts of the world.

"Our inability to have large datasets-- in places like Africa-- of these cancers… makes it very difficult for us to be able to pick up key variants driving this disease," Mhlanga said.

Once again, policy imperative is to build capacity – particularly among youth – to collect and analyse big data. If the heart of the 4th industrial revolution is data, then it is education that will make it beat for us.