South Africa needs new mineral technology initiatives for the 4th industrial revolution

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South Africa's mining policy has undergone a revolution in the past two or three decades (albeit a regulatory revolution), but the country will now need to get on board the fast-moving train that is the 4th industrial revolution (4IR).

This sentiment was echoed recently by Mineral Resources Minister Gwede Mantashe, as reported in Creamer's Mining Weekly on 30 April 2019, in which:

"he warned that the South African mining industry must carry out skills development to prepare itself and its employees for the Fourth Industrial Revolution (4IR). Automated mining activities were no longer scarce, he pointed out; the 4IR was coming. He highlighted that, while the 4IR was destroying old jobs, it was also creating new jobs. The country's mines had to develop new skills as a result."

He then devoted the rest of his speech to stressing the need for technology to improve mine safety and some further comments on transformation in the sector and the mining charter.

It is interesting to note that these comments were made in the keynote address to a colloquium hosted by the

University of Pretoria, in partnership with the Minerals Technology and Beneficiation Science Council (Mintek). Mintek is a partially state-funded institution, which also does research for many private sector-funded initiatives. Currently, it is divided into several technical divisions, including:

- Advanced Materials
- Analytical Services
- Biotechnology
- Hydrometallurgy
- Measurement and Control Solutions
- Mineral Economics & Strategy
- Minerals Processing
- Mineralogy
- Pyrometallurgy
- Small Scale Mining & Beneficiation

Institutions such as Mintek could potentially become vehicles for funding and developing initiatives that could lead the minerals industry in South Africa to become a leader in 4IR innovation.

Another state funded institution, the Council for Scientific and Industrial research (CSIR) is already showing the way in this area, and this is illustrated in a recent article authored by Daniel

Visser that appeared in a special report in the Mail and Guardian towards the end of last year. In the article, titled "Fourth Industrial Revolution is upon us - is South Africa ready?" Visser lists some initiatives that the CSIR is pursuing in this area, which include the following:

- interoperability
- information transparency and accessibility
- big data analytics
- decentralised decision-making

He further observes that:

"The next big component of the FIR is advanced manufacturing. A number of these technologies, for example, 3D printing, laser welding and advanced joining, are already well established in this space, but it is predicted that they will become increasingly more pervasive in manufacturing and also more integrated in products of the future. Insofar as the mining industry and innovation and beneficiation is concerned, he has also said that the CSIR has just started a nano-micro manufacturing initiative that researches the integration of multiple technologies and defines whether new product types can be manufactured with them. South Africa is currently the leader on the continent in terms of national readiness to adopt and implement these technologies and these could, in turn, have a significant impact on national competitiveness, export potential, job creation and economic transformation."

He also cites an example of this in their additive manufacturing platform, being the development of Aeroswift, an example of industrial-scale additive manufacturing using metal 3D printing and laser welding. He states that the machine is currently the largest of its kind globally and is designed to be scalable, and that the development has mostly been with titanium alloys to enable additive manufacturing for lightweight aerospace components.

It may also be worth reflecting on a recent initiative by the West Australian government in this field where they recently announced a public private partnership to develop a battery manufacturing industry in West Australia.

The following salient points were reported in ABC news article on 10 April 2019 on the subject:

The $135 million centre, announced today, will operate out of Curtin University in Perth and will look at how to better source minerals and process them into chemicals that are used to develop batteries.

The research centre will be jointly funded by the Federal Government, the State Government and industry to the tune of $53 million.

It will also receive $82 million of in-kind support from the sector.

Federal Minister for Industry Science and Technology, Karen Andrews, said the cooperative research centre was about lifting Australia's role in the battery value chain.

"We are clearly not just digging these minerals out of the earth," she said.

"We will be extracting, processing and looking at the technology to develop the components."

Government should be spearheading initiatives like this for the minerals industry, both at the CSIR and at Mintek as these two excellent state-funded institutions are well placed to develop collaborative models with the private sector.

Hopefully the government will use its influence and funding to promote initiatives in the minerals sector that will give impetus to projects that can capitalise on the new technologies of the 4IR.

Perhaps the Minister's recent speech quoted above was a missed opportunity to announce that that some projects are underway, or will be considered?