The mining industry is confronted with challenges such as low commodity prices, the increasing cost of electricity and production, and pressures from non-governmental organisations to provide fast and useful monitoring data. These issues are driving the mining sector to Industry 4.0, which leads to industrial transformation. However, the implementation of digital technologies drives an increase in skills demand — resulting in high-quality job creation. As much as these technologies will not change basic mining principles, using electricity and mechanics, mine workers and their equipment will communicate through the internet of things (IoT).

Mine water treatment plants must start embracing the advantages that come with Industry 4.0. Digital technologies will enable ‘smooth’ reactions to changing water quality or quantity conditions in the mine. For example, a mine will know whether a pump has stopped and why. This means that the pump, as well as its control systems and motor, will be connected to a network that will allow for an operator to know everything. The SARCHI Chair for mine water management at Tshwane University of Technology (TUT) will prove that upgrading mines to Industry 4.0 will result in the creation of new jobs that require a higher level of qualifications and better education. New skills will be needed to configure wireless devices and set up networks or knowledge on internet protocols.

These technological advancements will benefit the mining sector — increasing the safety and security on the mine site, enabling the mines to reach higher production levels and optimising mine water management. With a data lake in the picture, communication between all the mine departments that deal with water becomes faster, easier and more reliable (Figure 1).

### Methodologies

Current technologies in mine water treatment are controlled by the composition and volume of water entering the plant at any given time (left-hand side of Figure 2). Often, this requires the plant to react instantly on volume or chemistry changes, as there is no foresighted interaction between monitoring data and operational parameters. Data includes precipitation, water inflow into the mine, technological changes within the mine, water analyses of the plant, and the outflow of the treated water.

TUT’s research will ensure that the mine’s technology will be improved, and all aspects needed for mine water management are considered adequately. These include sampling and monitoring data to develop intelligent mine water management (iMineWa) (right-hand side of Figure 2).

### Internet of mine water

IoT is a system of sensors, electronics and software that allows for the overall communication and information exchange of all connected devices. It is all things that are tangible that could be reached by an internet address. Internet of mine water (IoMW) (Figure 3) is derived from the idea of IoT. IoMW refers to more than things. It also includes data and the results of data processing coming from common statistical procedures or the procedures involved to analyse big data.