

# HARNESSING TECHNOLOGY

SETTING THE SCENE | WHAT DRIVES US | LEADERSHIP | DELIVERING ON OUR STRATEGY AND OUTLOOK | ANCILLARY INFORMATION



## HOW WE DID IN 2019

### SUCCESSES

#### Safety

Enabled significant risk reduction and safety improvements through the use of data and analytics

#### Innovation culture/ culture

Developed an end-to-end idea and innovation management framework to enable a culture of innovation

#### Intelligence

Delivered bottom line value through various aggregation, visualisation and intelligence platforms

### CHALLENGES

#### Adoption

Experienced low levels of adoption for abstract or complicated technology themes

#### Measurement

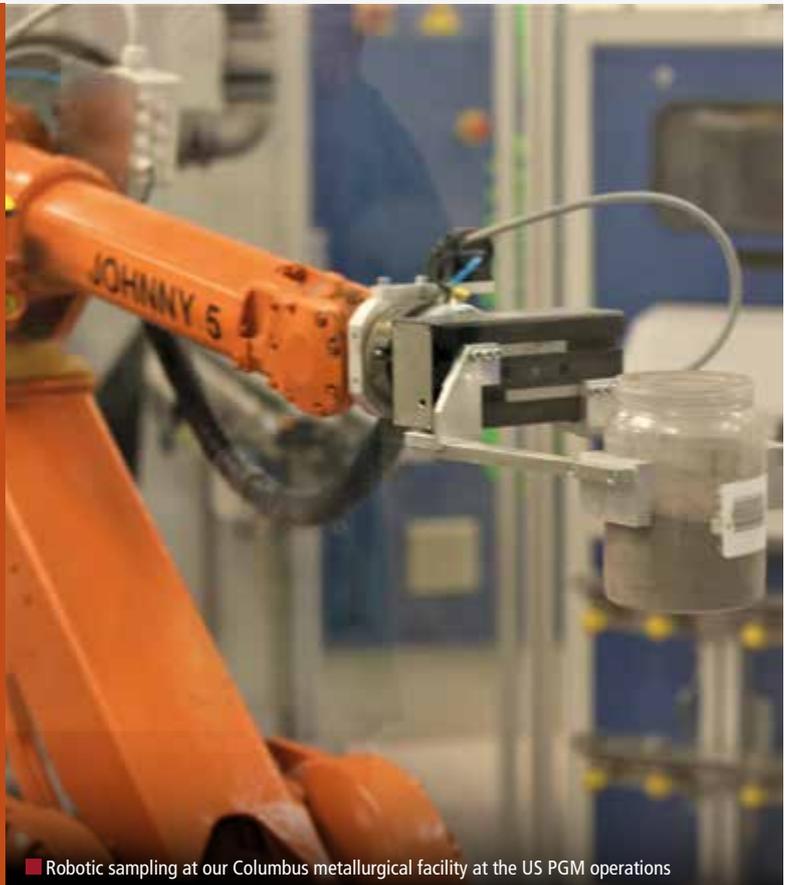
Difficulty in understanding true bottom line benefit associated with technology and innovation initiatives

#### Capability

Identified skills and capability building requirements to enable rapid adoption of technology

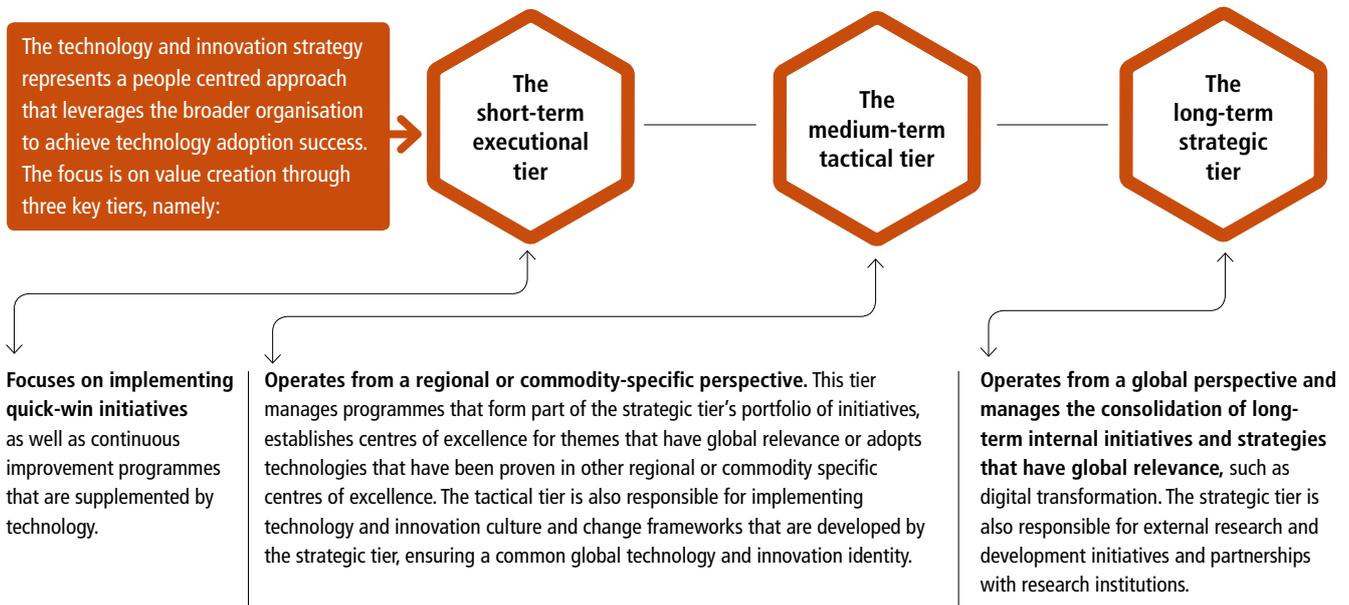
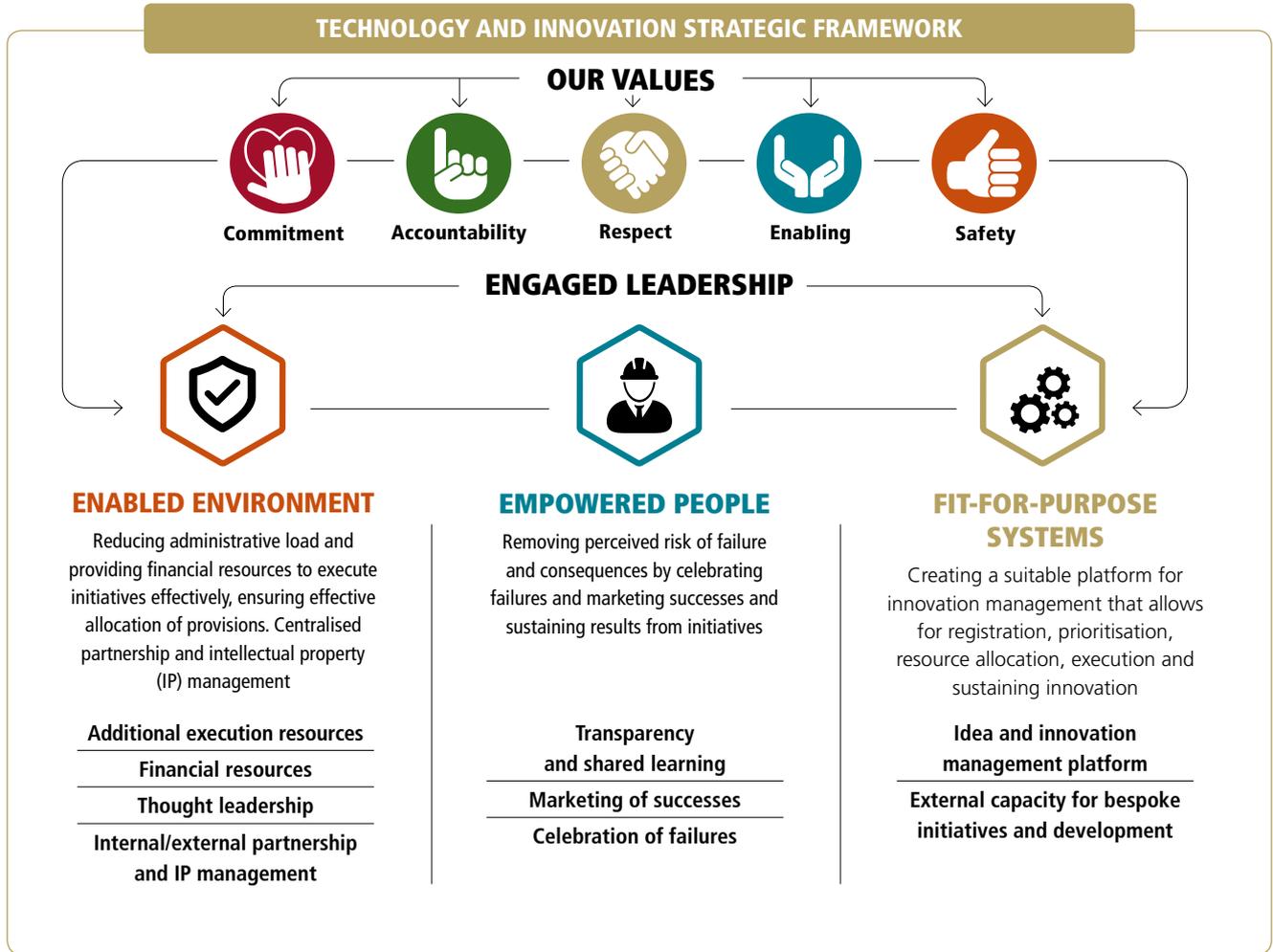
Technology adoption and innovation in mining is an important aspect of our drive to deliver value by improving efficiencies and productivity within our organisation.

Sibanye-Stillwater has transformed its research and development focus, corporate and regional strategies and internal and external initiatives, to keep pace with the growth and transformation of the Group. Technology and innovation is contained within the Group Technical function and is responsible for implementing a comprehensive and cohesive global technology and innovation strategy.



Robotic sampling at our Columbus metallurgical facility at the US PGM operations

The technology and innovation strategy has been fully aligned with the safe production strategy:



## HARNESSING TECHNOLOGY CONTINUED

### DIGITAL TRANSFORMATION

The vision of Sibanye-Stillwater's digital transformation initiative is to enhance value creation through digitalisation to create a prescriptive data-driven organisation, effective in the safe, sustainable and responsible extraction and beneficiation of our resources.



Digital transformation is a unique and key strategic technology pillar that is applicable to all aspects of the Group. As such, a dedicated functional and governing executive sub-committee, comprised of relevant representation from Group technical, shared services, the SA and US operations, was established. The digital transformation executive-committee supports the digital transformation initiative and is resourced with an agile, multi-disciplinary team, sponsored by the Group executive committee, that focuses on value realisation across the mining value chain and ancillary support functions.

During the establishment of the digital transformation initiative, it became apparent that there was significant value in leveraging external expertise to fast track ideation and prioritisation of key strategic aspects of the initiative. Consequently, Sibanye-Stillwater established an advisory panel of globally renowned disruptors from various industries and institutions. The value contribution of the advisory committee was immediate, with members accelerating our internal understanding.

Key to our digital transformation strategy, and in preparation for the fourth industrial revolution, we are investing significantly in establishing a suitable base with which to leverage the concept of big data, as well as integrate the various technologies associated with the revolution.

To understand and demonstrate the achievable value creation through digital transformation, we have partnered with South African company, DataProphet, to implement an artificial intelligence (AI) powered plant optimisation system. AI is used to extract value from historical data and optimise manufacturing and mineral processing plants. On processing the data, the solution creates a learnt digital twin of the plant and can deduce the entire process from the equivalent of

hundreds of years' worth of institutional knowledge embedded in the data. Optimum operating patterns are identified from the historical data and used to prescribe actions based on the current operating characteristics of the plant. These prescriptions are provided within the context of a systemwide view which takes into consideration upstream and downstream processes. The result is a reduction in variation and improved plant metrics through optimised and unified operations. Preliminary indications suggest that, when applied, a potential recovery change of between 1.5% and 3% is achievable with no significant amendments to other quality parameters. This translates to a commensurate improvement of ounces produced through treatment of the same volume of mined ore.

### INNOVATION CULTURE FRAMEWORK

Concurrently with, and partly as an enabler to, our technology and innovation strategy, we are building an innovation culture framework, supported by an idea and innovation management process, with the aim of establishing a way for people's ideas to be heard, enhanced through collaboration with the broader organisation, elevated and funded and thus benefit the business. These ideas are not limited to technology and digitalisation but can also be general innovation and new ways of working.

The framework's idea and innovation management process is designed to be a collaborative and democratic process that empowers and enables the broader organisation through the use of fit-for-purpose systems. Implementation of the idea and innovation management platform began in early 2020, starting with integrated shared services, to be followed by the operations. The process is designed to encapsulate both bottom-up innovation as well as top-down direction in the form of innovation challenges which are designed by various levels of management, aligned with key challenges and strategic goals and posed to the broader organisation.

Combined cultural and technological experiments have been conducted to see if, once the barriers to entry into the technological arena have been removed, particularly costs and administration, teams would take up the innovation challenge. Outcomes of the experiments have been positive, with large interdisciplinary teams working together and implementing concepts that are valuable to the company.

### KEY TECHNOLOGY INITIATIVES

As part of the digital transformation initiative, the team identified significant opportunity in increasing overall equipment effectiveness (OEE) by using information that resides on numerous digital systems installed on fixed and mobile machinery. Machine telemetry and qualitative data are gathered and routed to a central database where this is aggregated and analysed. Through various forms of analysis and modelling, the effectiveness and associated productivity of a specific, or sets of, machinery, can be determined and potential improvement opportunities identified. In the case of fixed plant machinery, new operating and maintenance paradigms can be established that improve performance and reduce cost. In the mining environment, the analysis can be used to optimise extraction methodologies and processes, optimise logistics, increase asset utilisation, reduce cost and improve production. In both instances, potential changes can be assessed prior to implementation with a relatively high level of confidence, reducing the risk that significant changes may impose on an otherwise stable process.

Three separate initiatives were implemented in 2019, the primary objectives of which were to understand and demonstrate the practicality, applicability and potential value of the concept and enabling technology. The intended focus areas and initiatives are as follows:



■ At the SA gold's Kloof operation

### 1. OVERALL EQUIPMENT EFFECTIVENESS:

Visualising key productivity and telemetry data in order to enable improved utilisation and effectiveness of trackless mobile machinery and production improvements in a mechanised mining environment.

### 2. LOGISTICAL OPTIMISATION:

Using telemetry and behavioural data to optimise the use and improve the safety of locomotives within the gold segment.

### 3. OPTIMISED METALLURGICAL PROCESSING:

In partnership with the aforementioned, DataProphet, improving plant production and quality through the use of historical data and deep learning to extrapolate revised operating recipes and models based on historical positively anomalous performance.



■ At the SA gold Driefontein operation

All three initiatives were successfully implemented, yielding extremely positive results and initial analysis respectively:

1. Potential machine use and associated production improvement potential of 8%-10% through the aggregation and visualisation of telemetry and production data on mechanised mining machinery.
2. Behavioural interventions resulted in further reductions in locomotive related injuries (about 70% fewer in 2018 and a further 25% fewer in 2019) as well as a sustained locomotive related fatality free period of two years, building on past enabling interventions that were implemented in 2018. Vehicle telemetry data aggregation established and stabilised enabling further analysis into fleet and maintenance optimisation.
3. Potential concentration recovery improvement of 1.5%-3% without compromising grade in a 4E PGM concentrator.

## RESEARCH AND DEVELOPMENT PARTNERSHIPS

### Mandela Mining Precinct

The Mandela Mining Precinct (MMP), an outcome of the government-supported Mining Phakisa process, and previously referred to as the Mining Precinct's Innovation Hub, was opened in September 2018. The MMP creates a space for researchers from various institutions and organisations to collaborate and work together. The function of the precinct is to co-ordinate research activities towards the revitalisation of South Africa's mining operations through the development of next-generation mining systems.

Sibanye-Stillwater participates in the MMP's six steering committees, which meet quarterly and the innovation team, which meets three times a year.

### Sibanye-Stillwater Digital Mining Laboratory

The Sibanye-Stillwater and the University of the Witwatersrand (Wits) Mining Institute's (WMI) Digital Mining Laboratory (DigiMine) was launched in 2018. DigiMine is a 21st century state-of-the-art mining laboratory and post graduate research entity. The aim of the laboratory is to make mining safer and more sustainable using digital technologies.

The DigiMine collaborative effort between the Wits Mining Institute and Sibanye-Stillwater is funded under two separate agreements of R12.5 million (2015 – 2017) and R15 million (2018 – 2020) respectively. The funding supports fundamental and applied research efforts within DigiMine and provides for student support and infrastructure upgrades in the Wits Mining Institute.

To date, the WMI has given vacation work opportunities to 37 undergraduate students, 13 postgraduate students graduated with a Master's degree, and five PhD candidates graduated with a doctorate. In addition, 32 journal and conference research articles were published – many of which are international. Due to this high impact, WMI staff and students receive regular invitations to speak and share ideas on leading practices for 21st-century mining. This is more than a significant contribution to Professor Habib's objective to increase the University's research output and would not have been possible without the support of Sibanye-Stillwater.

Sibanye-Stillwater is providing DigiMine with an additional R10 million in funding annually from 2019 to 2021, over and above an original commitment to the project.

# HARNESSING TECHNOLOGY CONTINUED

Annual funding under this agreement is being directed to five core focus areas, progress in which is described below:

DigiMine core focus areas	Progress in 2019
Fast-tracking of WMI-initiated technologies and prototypes through DigiMine, in partnership with the Wits Siemens Solutions Laboratory	Identified, scoped and workshoped three specific projects, which focus on applying digital technology and analytics to conventional problems like rock mass management, ventilation, tailings. A review of a further three projects is ongoing.
Fast-tracking of mine seismicity research	Integration has taken place with the school of geo-science (Wits). We are establishing a database of all seismic events over an extended period. Deep learning will be applied to that information to see if any patterns can be identified.
Enhancing the sustainability of the WMI and DigiMine	A fund has been established into which R1 million is deposited per annum.
Enhancing the delivery structure for the research and development agenda	A head of DigiMine has been appointed, and administrative help engaged.
The creation of the Sibanye-Stillwater Health and Safety DNA project	Planning was completed and a pilot site identified. Deployment commenced in the last quarter of 2019. Different methods of onboarding have been examined, with the aim of embedding safety from the day of engagement. The development of phone applications is taking place as part of investigations into how best to deliver safety training material.

## Establishing training facilities at University of Johannesburg

Sibanye-Stillwater has also made the same two investments into the University of Johannesburg's mining engineering faculty, which is being used to establish complimentary infrastructure that supports Sibanye-Stillwater's long-term research and development strategy. A virtual reality training simulator is being built that will support the development of 21st century mining graduates by giving them a real-world experience without the need to go to a mine.

## OUTLOOK AND FUTURE FOCUS FOR TECHNOLOGY

Sibanye-Stillwater's key focus in the near term will be the following:

1. Implement, embed and sustain the innovation culture framework and supporting infrastructure in order to enhance organisational ability to adapt to, and, adopt disruptive and value enhancing technology at scale as well as capitalise on the collective intelligence of the organisation.
2. Embed, sustain and expand on initiatives that demonstrated value during 2019.
3. Continue research and development in order to understand emerging technology themes and trends and pursue new opportunities.
4. Continue to support partner entities and institutions and develop new relationships and partnerships.

Our medium term focus will be on further developing our technology and innovation strategy to include new research, development and implementation models that enhance the sustainability of the initiative as well as the broader organisation.

## INFORMATION AND COMMUNICATION TECHNOLOGY

The governance and management of information and related communication technologies (ICT) have become increasingly critical as our dependence on the use of technology to share and collect information has increased. [+](#) See *Corporate governance* page 78 for more information on the governance and management of ICT.

In 2019, the integration of the US operations ICT infrastructure into the corporate ICT architecture was completed and we are now operating as one Group function. The ICT Group structure was redefined to prioritise core focus on digital enablement. ICT established the Digital Innovation Hub, that aims to align technology with our business goals, enabling a contribution to Sibanye-Stillwater's strategic objectives.



■ At the DigiMine laboratory at Wits in Johannesburg

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We established the Sibanye-Stillwater: Marikana integration programme to execute identified synergies and opportunities, with integration of the Marikana ICT landscape prioritised for completion by the end of 2020.

The Group strategy to help standardise operations and financials within Sibanye-Stillwater was developed during 2019, and the Marikana SAP integration strategy approved by the Integration Steering Committee. The strategic aim of the ERP project is to combine our current SAP platforms into one integrated system. As an existing SAP customer, we will leverage our investment and produce a consolidated SAP environment for the SA operations by July 2020. The process to gain insight into the US operations ERP platform was initiated and an analysis of the JD Edwards software platform was performed. ERP platform alignment with the aim of creating one integrated business platform is set to start in June 2020.

Sibanye-Stillwater has adopted a hybrid cloud model which is best suited to our operating model. The ICT infrastructure migration to a centrally hosted data centre facility is set for completion by July 2020. This central facility will host the core of the Sibanye-Stillwater business systems and will enable Sibanye-Stillwater to benefit from increased bandwidth and availability and place it in a position to optimally support all central services to the SA and US operations.

The project to review the storage and keeping of information and records in line with the Protection of Personal Information Act (POPI) continued and is being aligned with the European Union's General Data Protection Regulations (GDPR).

### CYBER SECURITY

Security of our ICT systems, network and information, which apply innovative technology to enhance operational and knowledge performance, is essential. We developed a cybersecurity framework to govern the security regulations as required.

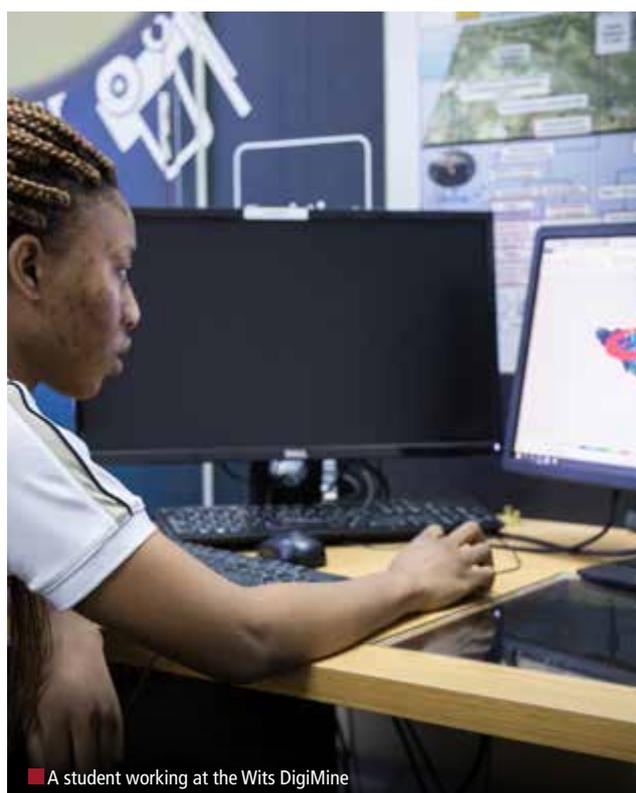
Our service efficiency centre established to monitor and respond to threats to the Group's ICT system on a 24/7 basis continued this role during 2019. We successfully prevented major security threats and assisted with the investigation where attempts were made.

Internal and external vulnerability tests provide feedback on our ability to prevent and remedy hacking attacks, and in 2019 showed that we maintain a high level of cyber security. We initiated the cyber security training and awareness platform, which has been very successful in educating our user community and thus minimising cyber attacks.

The disaster recovery testing for critical and core business applications is performed on an annual basis, and application recovery plans are then documented. This process is then followed by a business impact assessment of the Group's essential information assets necessitating protection, which includes reviews of recovery procedures and security controls. Plans are in place to replicate applications with critical and high availability requirements at alternative data centres throughout the Group.

### Outlook and plans for technology, innovation and ICT for 2020

- As part of the development of our Fourth Industrial Revolution roadmap, we will be investigating ways to improve the velocity and veracity of our data, using, for instance, Kiosk data collection. This will also complement the idea management process and enable the use of currently unused data in pursuit of accessing leading indicators
- Increased focus on the integration activities with our Marikana operations will remain a key area for 2020
- The execution of our ERP One project is key to the business and needs to be executed successfully
- ICT footprint reduction at our PGM operations in the North West will receive priority
- The execution of our SAP project for the group. This includes the implementation of a single SAP instance for our SA operations which is set for completion in July 2020
- The successful implementation and conversion of our Marikana operations HR payroll is in progress and set for completion at the end of February 2020
- Automation opportunities will receive priority. We have restructured the operating model with key focus around digital innovation. ICT will drive continuous improvement and create exciting change in the way we traditionally performed business functions. New tech trends, like IoT, IIoT, edge computing and automation will be introduced



A student working at the Wits DigiMine