

SATCAP WP 2: SKILLS

PROGRAMME	Successful Application of Technology Centred Around People (SATCAP)	WORK PACKAGE	Skills needs matrix for 3 designations
SUMMARY			
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1. BACKGROUND

SATCAP WP 2.2. of 2019/20 titled *Full Modernisation Impact Assessment* (Stanz *et al.*, 2020) served as a foundation to the study. The outcomes of the SATCAP 2019 study indicated the need for investigation into specific impacts of modernisation, with a clear need to consider mining modernisation skills needs. The envisaged changes in organisational structures have further brought about the need to identify the changes within the current skills frameworks.

2. AIM OF THE PROJECT

The SATCAP 2020 project focusses on the identification of skills needs, applicable for mining modernisation, for rock drill operators (RDOs), winch operators and shaft timber-persons. As new skills, upskilling and reskilling will be needed for mining modernisation, this study aimed to conduct a skills needs study, which allows for identifying potential skills needs for the 3 designations. Through this study investigation into 4.0 skills needs, recommendations for curricular changes for the Mining Qualifications Authority (MQA) skills programmes also become evident, for the three designations. The MQA was thus a key collaboration partner in this study.

3. PROJECT OBJECTIVE

The identified objectives of the research, as listed in the project proposal, include the following:

- Objectives included:
- Conduct a skills needs study, for mining modernisation, specifically with regard to three key effected designations, namely; rock drill operator (RDO), winch operator and shaft timber-person.
- Develop a skills needs matrix, with technical and leadership skills needs for the three designations.

4. METHODOLOGY

The research was informed by a literature review, online questionnaires, and case study analysis. Report inputs from the MQA contributed to project outputs. Job profiles from mine operations and desktop reviews of profiles served as inputs to the development of a skills needs framework.

Stakeholder engagement remains vital to project success and hence mine operations, industry experts and labour representatives' inputs were included through stakeholder sessions and online questionnaire distribution.

5. LIMITATIONS

Limitations of this research included difficulties in gaining access to study sites and participants, due to impacts of the current COVID-19 pandemic, and administrative processes led to project delays. Online interactions were used for the study and assisted with the gathering of data. Stakeholder interaction was often found difficult due to the additional pressure COVID-19 has put on stakeholders and their operations.

6. FINDINGS AND RECOMMENDATIONS

It was evident that there will be impacts on the skills requirements for the future of the designations investigated. However, these impacts might not be as dramatic as expected due to the small increments in changes already taking place in mining companies. Increased alignment between educational institutions and operations may ensure that the skills requirements are addressed timeously to support mining modernisation skills needs.

The following are the findings and recommendations from the study:

- It was evident that there will be impacts on the skills requirements for the future of the designations investigated. However, these impacts might not be as dramatic as expected due to the small increments in changes already taking place in mining companies.
- Increased alignment between educational institutions and operations may ensure that the skills requirements are addressed timeously to support mining modernisation skills needs.
- Educational frameworks in terms of qualification and skills programme approvals need to be revisited and aligned to speed of change within the sector. It was apparent that the rate of change in sector and educational structures are not aligned.
- The skills and levels in qualifications for the 3 designations will change as mining modernises. An example being that the need for Onsetters Certification for the Shaft timber-person to support skills-mix needs.
- Upskilling, re-skilling will be needed for the designations to support new technologies, systems and processes.
- New skills may be required to support transfer and redeployment within and outside the sector.
- The designations will require higher basic literacy levels.
- The inclusion of digital skills into the skills matrix per designation is needed for mining modernisation, as designations will move away from the face, and with using of modern technologies, some basic digital skills will be needed.
- The designations may need to cope with basic data analysis, interpretation and dissemination.
- The designations may have the potential to be future multi-skilled designations – implying that possibly the Shaft timber-person may need skills to support new roles/jobs in the future.
- Additional qualifications may be needed to support skills needs. This may include health and safety trade certification to support equipment maintenance, which correlates strongly to findings from previous studies conducted (SATCAP WP 2.2. 2019/20).
- For any change, including skills or roles change, it may be suggested that a change management model be utilised. The draft change management guideline developed in SATCAP WP2.1 (2019/20) (Stanz *et al.*, 2020) may be used to enable change management or a simple ADKAR process may be used.
- For the Shaft timber-person an Onsetter Certification could become part of the future qualification requirements. This links in with the aspect of multitasking as has been identified as a future jobs impact. Further to this there is also the possibility of the position requiring higher education levels, with aligned digital skills. The job may require new skills.

- There remains a disconnect between the needs of operations and education institutions, in part due to the slow response by institutions to the technology changes in industry - towards supporting of mining companies for upskilling, reskilling and new skills needs.
- The MQA will also need to consider skills needs for the effected designations, through mining modernisation and review their curriculum accordingly.
- It is recommended that a study be conducted into the specific technology changes for the various designations which will inform modernisation 'real' skills needs.
- Additionally, role profiles, remuneration and organisational structures may be impacted by mining modernisation, as employees are up-skilled/reskilled or obtain new skills – this may need deeper understanding.

Recommended Skills Matrix per designation to support mining modernisation

The following tables are the developed and validated skills matrices for the three designations:

Title of Position	Rock Drill Operator (RDO)			
Description of Position	A RDO handles rock-drilling machinery for the primary role of rock excavation. They drill specifically explosive charge holes in order to facilitate blasting operations for the removal of rock. Further to this the RDO is also responsible to ensure effective functioning, storage, transport and maintenance of his/her equipment.			
Qualification Requirements	AET Level 4 (Literacy and Numeracy) (Current DMRE requirement is AET3 for blasting certificate) Competent Person - B (Skills Programme Certificate MQA) Basic Health and Safety Practice (recommended for safety trade certificate) Generic Mine Stope and Development Safe Operating methods, procedures and skills Generic Mine Policies and Procedures Blasting Assistant Certificate Rock Drill Operator Certificate Certificate of Fitness First Aid Safety Trade Certificate			
Skills Categories	Skills Description	Proficient	Not Proficient	Methodology to address gap
Technical Knowledge, Skills and Abilities	Mechanised drill operating			Formal courses (classroom, digital) Induction VR training AR training Simulations Gaming Team-based training On-job practical application Experiential learning Exposure Job shadowing Coaching
	Mechanical knowledge, including design, uses, repair and maintenance			
	Drilling and installing roof bolts			
	Drilling and charging up shot holes			
	Assisting with the construction of temporary supports			
	Compliance and adherence to regulations			
	Regulating and monitoring equipment			
	Assistance with face preparation			
	Storage, maintenance, repair and transport of equipment			
	Deliver safe production			
	Deliver on target: safety, cost, production and grade			
	Knowledge on explosives and charging up operations			
	Fatal risk protocol implementation and adherence			
Implement the operating model				
Leadership Knowledge, Skills and Abilities	Communication – includes various mediums and levels of communication			Formal courses (classroom, digital)

	Problem solving and solution engineering			Team-based training On-job practical application Experiential learning Job shadowing Coaching and mentoring
	Consequential thinking and consequential management			
	Adaptability / flexibility			
	Reporting through various mediums and levels – targets, service records, concerns, areas of impact			
	Monitoring of environment			
	Hazard awareness, risk identification, assessment and management			
	Collaboration and teamwork			
	Resource, materials and equipment management			
	Live the organisation culture and values			
	Demonstrate digital transformation basics			
	Support company strategies (including mining modernisation)			
Digital Knowledge, Skills and Abilities	Basic digital literacy – Using devices and technologies, handling information and data			OEM and digital use training Policy and procedural in-house training Coaching for use of data and information On-the-job training and application
	Basic data and information management – interface with data, communicating information, analysing data, ethical usage of data and information			
	Basic data analytics – understanding, condensing and distribution of the correct data			
	Basic digital skills - Use applicable job-related software programmes to operate rock drill machines/technologies			
	Basics around virtual collaboration, virtual teaming			

Title of Position	Winch Operator			
Description of Position	A winch operator removes broken rock by means of a scraper winch in an underground workplace as part of the mining process. The position also entails pre- and post-removal activities (i.e., storage of tools and equipment, submission of reports, liaising with engineering personnel for maintenance, repair and function outputs)			
Qualification Requirements	Grade 12 / NQF Level 4 (Current DMRE requirement is AET3 for blasting certificate) Competent Person - B (Skills Programme Certificate MQA) Basic Health and Safety Practice (recommended for safety trade certificate) Generic Mine Policies and Procedures Certificate of Fitness First Aid Safety Trade Certificate (US already available i.e., SAQA US ID 244360)			
Skills Categories	Skills Description	Proficient	Not Proficient	Methodology to address gap
Technical Knowledge, Skills and Abilities	Preparation of work area			Formal courses (classroom, digital) Induction VR training AR training Simulations Gaming Team-based training On-job practical application Experiential learning Job shadowing
	Mechanical knowledge, including design, uses, repair and maintenance			
	Equipment Maintenance - Performing routine maintenance on equipment and determining when and what kind of maintenance is required			
	Fault finding – troubleshooting and determining the causes of operating errors			
	Utilising automated/mechanised equipment			
	Compliance and adherence to regulations			
	Regulating and monitoring equipment			

	Transportation - Knowledge of principles and methods for moving goods			Coaching
	Understanding scraper paths and proximity influences			
	Fatal risk protocol implementation and adherence			
	Deliver safe production			
	Deliver on target: safety, cost, production and grade			
	Implement the operating model			
Leadership Knowledge, Skills and Abilities	Communication – includes various mediums and levels of communication			Formal courses (classroom, digital) Team-based training On-job practical application Experiential learning Job shadowing Coaching and mentoring
	Problem solving and solution engineering – including mathematics			
	Consequential thinking and consequential management			
	Adaptability / flexibility			
	Reporting through various mediums and levels – targets, service records, concerns, areas of impact			
	Monitoring of environment			
	Hazard awareness, risk identification, assessment and management			
	Service orientation – delivers on outputs and understands impact of not delivering on time			
	Resource, materials and equipment management			
	Monitoring - assessing performance of self, other individuals, or teams to make improvements or take corrective action			
	Live the organisation culture and values			
	Demonstrate digital transformation basics			
	Support company strategies (including mining modernisation)			
Digital Knowledge, Skills and Abilities	Basic digital literacy – Using devices and technologies, handling information and data			OEM and digital use training Policy and procedural in-house training Coaching for use of data and information On-the-job training and application VR and simulations
	Basic data and information management – interface with data, communicating information, analysing data, ethical usage of data and information			
	Basic data analytics – understanding, condensing and distribution of the correct data			
	Basic digital skills - Use applicable job-related software programmes to operate scraper winch machines/technologies			
	Basic interface usage for monitoring – watching gauges, dials, or other indicators to make sure a machine is working properly			
	Basics around virtual collaboration and virtual teaming			

Title of Position	Shaft Timber-person
Description of Position	A shaft timber-person examines the roof and side walls of haulage ways, air passages, shafts, galleries etc. inside the mines and erects timber or steel props, frames etc. Carries out basic construction and maintenance work at the shaft and on shaft stations, conduct inspections and maintenance work within the shaft barrel, including steelworks, supports and brackets. To control explosives for blasting purposes in accordance with safety procedures and standards. <i>(Taken from NSDC India Qualification pack as example of occupational standards)</i>

Qualification Requirements	AET Level 4 (Literacy and Numeracy)/Grade 12 Grade 12 Certificate (Matric) Certificate of Competency (shaft timber-person: Competent person - B) Assistant Blasting Certificate Must have valid Certificate of fitness (Red Ticket) Safety Trade Certificate (Onsetter Certificate- future skills mix)			
Skills Categories	Skills Description	Proficient	Not Proficient	Methodology to address gap
Technical Knowledge, Skills and Abilities	Preparation of work area			Formal courses (classroom, digital) Induction VR training AR training Team-based training On-job practical application Experiential learning Job shadowing Coaching
	Perform shaft maintenance			
	Equipment Maintenance - Performing routine maintenance on equipment and determining when and what kind of maintenance is required			
	Use radar and evaluation equipment for track laying, construction and blasting			
	Handle, receive, store and issue explosives			
	Compliance and adherence to regulations			
	Maintain clear blockages and repairs to shafts			
	Conduct shaft examinations and repairs			
	Utilise remote operating systems			
	Use technology to measure floor to roof for height of support requirements			
	Install, support and recommend roof bolt installation			
	Inspect shaft barrel on a weekly basis to ensure construction is safe by checking the shaft barrel concrete, bunting boxes, buntings and guides, and assist Artisans when required			
	Deliver safe production			
	Deliver on target: safety, cost, production and grade			
Implement the operating model				
Leadership Knowledge, Skills and Abilities	Communication – includes various mediums and levels of communication			Formal courses (classroom, digital) Team-based training On-job practical application Experiential learning Job shadowing Coaching and mentoring
	Problem solving and solution engineering – including mathematics			
	Consequential thinking and consequence management			
	Adaptability / flexibility			
	Reporting through various mediums and levels – targets, service records, concerns, areas of impact			
	Monitoring of environment			
	Hazard awareness, risk identification, assessment and management			
	Service orientation – delivers on outputs and understands impact of not delivering on time			
	Resource, materials and equipment management			
	Monitoring - assessing performance of self, other individuals, or teams to make improvements or take corrective action			
	Live the organisation culture and values			
Demonstrate digital transformation basics				

	Support company strategies (including mining modernisation)			
Digital Knowledge, Skills and Abilities	Basic digital literacy – Using devices and technologies, handling information and data			OEM and digital use training Policy and procedural in-house training Coaching for use of data and information On-the-job training and application VR and simulations
	Basic data and information management – interface with data, communicating information, analysing data, ethical usage of data and information			
	Basic data analytics – understanding, condensing and distribution of the correct data			
	Use radar and evaluation equipment for placements and evaluations			
	Measurement tools used and remote reporting			
	Basic virtual collaboration, virtual teaming			

- **Change Management**

It is recommended that a change management guideline be utilised for the adoption of the skills matrices. The draft change guideline in SATCAP WP2.1 (2019/20) (Stanz *et al.*, 2020) may support change management needs, or a simple change process such as ADKAR may be considered.

7. VALUE OF THE STUDY TO THE INDUSTRY

The matrix, per designation, may be used, customised or adapted to fit the modernisation business strategy of the company. It needs to be noted that the matrix per designation supports current and forward looking skills needs.

8. ACKNOWLEDGEMENTS

- The CSIR collaboration team for their inputs into the research, stakeholder engagements and reports.
- The key stakeholders who participated in the research, through the various on-line platforms.
- Mining companies and MQA for inputs into this study.

9. PROGRAMME MANAGER COMMENTS

Skills needs for mining modernisation for 3 designations were investigated. It is evident that skills will be impacted through mining modernisation, and for the 3 designations, the impact will mean:

- Upskilling, re-skilling will be needed for the designations to support new technologies, systems and processes;
- New skills may be required to support transfer and redeployment within and outside the sector;
- A need for higher literacy and numeracy levels;
- Additional qualifications needs to support modernisation technologies, systems and processes;
- Development in basic digital skills;
- Enhanced technical and leadership skills;
- Training for skills- mix;
- MQA curriculum revised to support new skills needs, upskilling and reskilling needs; and

- Inclusion in change management processes.

In support of the above, the study has recommended a skills needs matrix, per designation. The recommended skills matrix, per designation, may serve as guidance to the mines of potential new skills, upskilling and reskilling needs, and also assist in informing development plans, profiles and organisational structures. Mines may use, customise or adapt the matrix as per the mine's modernisation journey, to support skills development for the identified designations.