The ESG impacts lens dashboard: an integration of socio-economic transformation, automation and change impact dashboards

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Mines need to understand the impacts of modernisation on people. Research has been commissioned by the Successful Application of Technologies Centred Around People (SATCAP) programme of the Mandela Mining Precinct to understand the effects of mining modernisation on people in the minerals sector, in support of the Environmental, Social and Governance (ESG) agenda.

An ESG Impacts Lens Dashboard was developed to assist mines to understand the impacts of socio-economic transformation interventions, automation, and the efficacy of change management processes in the adoption of new technologies. The ESG Impacts Lens Dashboard comprises of three underlying impact evaluation (IE) dashboards (the Socio-Economic Transformation IE Dashboard, the Automation IE Dashboard, and the Change IE Dashboard), with 19 individual sub-dashboards, and over 81 specific indicators. The dashboard was developed using a design thinking and co-creative approach and integrates into a Power BI platform. The dashboard, user-guideline, and supporting videos are available on the Mandela Mining Precinct's website. Dissemination to industry has been through various seminars, conferences and presentations at industry forums.

Key words: Business priorities, Community engagement, Digital tools, Modernisation

INTRODUCTION

South African mines are modernising to enable improved safety, production, and sustainability. Mines need to get an understanding of the impacts of modernisation on people in mining, including the aspects of socio-economic transformation interventions, automation, and the efficacy of change management processes in the adoption of new technologies. An Environmental, Social and Governance (ESG) Impacts Lens Dashboard was developed to assist mines to understand modernisation impacts, as related to people. The development and features of this dashboard are detailed in this paper, along with preliminary findings from a case study conducted at a zinc mine.

This paper is based on work conducted for the Successful Application of Technologies Centred Around People (SATCAP) programme of the Mandela Mining Precinct. SATCAP aims to understand the effects of mining modernisation on people in the minerals sector, and lends support to the ESG agenda, with a focus on the social aspect.

The ESG Impacts Lens Dashboard is based on work conducted in three SATCAP projects in 2023, which provided insight into:

- The impact of socio-economic transformation interventions in mine host communities (Mahadeo *et al*., 2024a; 2024c)
- The impact of automation on jobs within the mining workforce (Mahadeo *et al*., 2024b); and
- The effectiveness of change management in the adoption of modern technologies (Botha *et al.*, 2024).

The project is built on and progresses the research conducted in the programme in the previous year (2022), which related to the development of data collection tools for mines' informed decision making. These tools included the following:

- Training Needs Assessment Tool
- Community Social Needs Assessment Tool
- Small, Medium and Micro Enterprises (SMME) Communications and Engagement Tool
- Digital Leadership Competency Gap Assessment Tool; and
- Change Management Blueprint.

The data gathering tools, as above, inform the key impact indicators in the ESG Impacts Lens Dashboard. The 2023 projects aimed to verify these tools with industry and interlink them to impact evaluation (IE) dashboards. The three related IE dashboards are integrated into the ESG Impacts Lens Dashboard to enable mines to gauge impacts around social, automation and change aspects.

REVIEW OF LITERATURE

The South African mining sector contributes 7-8% to the nation's gross domestic product (GDP) and sustains over 475 000 livelihoods, with each mine worker employed supporting approximately ten additional dependents (Minerals Council South Africa, 2023). However, the mining sector faces many challenges, such as fluctuating commodity prices, labour unrest, environmental degradation, and social conflicts (Ngobese, 2015). According to a report by McKinsey and Company (2019), the global mining industry has been under pressure due to falling commodity prices, maturing mines, declining ore grades, and increasing new-mine-development times. Modernisation becomes necessary for industry sustainability and worker safety in line with the mining industry's 'zero-harm' goal. Modernisation is a transformative pursuit with profound goals: extending mine life, generating employment, boosting exports, catalysing socio-economic development, and fostering a more sustainable and environmentally responsible mining sector (Minerals Council South Africa, 2022).

Literature suggests that the impact of modernisation on local mine communities may be evaluated according to five key drivers, as follows:

- **Economic development:** The process by which communities with a low standard of living work towards sustainable development, involving qualitative and quantitative improvements in various aspects of the economy, such as technology, productivity, and infrastructure (Market Business News, 2023).
- **Social development:** Change in the social structures and processes of a society or a group. It involves the acquisition of skills, attitudes, relationships, and behaviours that enable individuals to interact with others and function as members of society (Parke, 2020).
- **Diversity, equity, and inclusion:** A conceptual framework that promotes the fair treatment and full participation of all people, especially in the workplace or community, including populations who have historically been under-represented or subject to discrimination because of their background or identity (McKinsey and Company, 2022).
- **Good governance and best practices:** Concepts that aim to improve the quality, efficiency, and effectiveness of an organisation or a process. They involve following ethical principles,

complying with relevant laws and regulations, ensuring accountability and transparency, and engaging with stakeholders and beneficiaries (McKinsey and Company, 2022).

- **Environmental security and safety:** A concept that refers to the protection of natural resources and ecosystems from human-induced threats, such as pollution, climate change, deforestation, and overexploitation (UNEP, 2019). Environmental security and safety also imply the prevention of environmental degradation that could lead to social conflicts, violence, or instability.

The South African mining sector is undergoing a profound digital transformation, aligning with the broader global trend towards modernisation. Energy and mining companies are experiencing a paradigm shift where growth, sustainability, and technology intersect (Bain and Company, 2022). The industry recognises that increased digitisation and the swift adoption of cutting-edge technologies are pivotal for its future success. Notably, digital transformation is a driver of efficiency and a potential source of significant employment opportunities. According to projections, digitisation could lead to a net gain of more than one million jobs by 2030 (McKinsey and Company, 2018), demonstrating the transformative impact of technology on labour markets within the mining sector. This shift towards digitalisation is not merely a technological upgrade but a strategic move towards a more sustainable and prosperous economic future for South Africa (McKinsey and Company, 2018). As the mining industry embraces advanced digital technologies, it positions itself for enhanced productivity and resource efficiency and as a key player in the country's economic growth trajectory. In this context, the confluence of growth, sustainability, and technology in energy and mining companies signals a forward-looking approach that acknowledges the potential of increased digitisation to be a driving force behind South Africa's future economic prosperity. The industry's commitment to leveraging technology underscores a vision where digital transformation becomes a cornerstone for sustainable development, economic inclusivity, and job creation in the evolving landscape of South African mining.

The literature review, furthermore, informed the development of the ESG Impacts Lens Dashboard, with consideration to relevant and applicable indicators for gauging of socio-economic transformation, automation and change.

METHODS

An exploratory design process informed the development of the integrated IE dashboard. Figure 1 depicts the process that was followed.

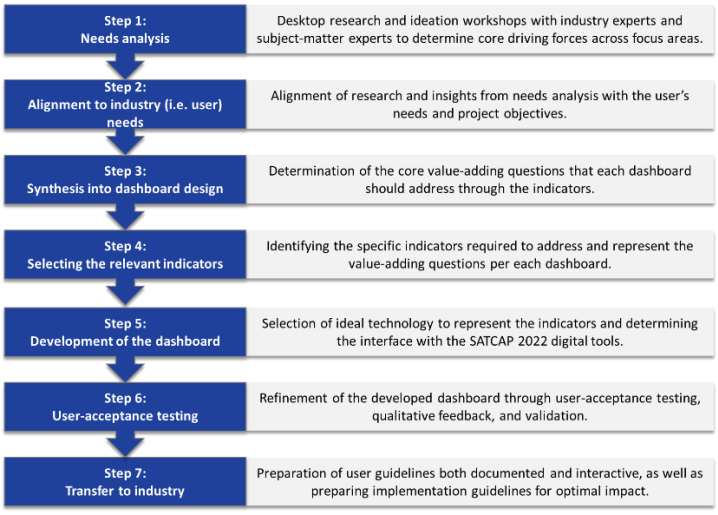

Figure 1. Design and development methodology.

Desktop research and stakeholder engagements were conducted to gain insights relating to dashboards applied in mining and other sectors, and a background understanding relating to each of the three domain-related dashboards and indicators to consider. The Stanford Design Thinking process was used to understand and synthesise data collected. The insights from the research informed the ideation and analysis of necessary functional properties of the ESG Impacts Lens Dashboard. The dashboard draws data from the 2022 digital tools, with the SATCAP 2022 data gathering tools forming the dashboards base key indicators, which then integrates with the Microsoft Power BI Platform. The 2022 data-gathering tools provided some of the key indicators for understanding of people impacts, but this baseline was extended further. A prototype was designed and developed according to the insights, which was tested according to the needs of the mines through several validation and feedback engagements. Several iterations and refinements occurred to end up with an accepted product.

Further, to enable industry transfer, several guideline documents were developed, along with supporting videos, to ease the adoption of the ESG Impacts Lens Dashboard.

OUTPUTS

The ESG Impacts Lens Dashboard comprises three integrated domain-specific IE dashboards, with 19 individual sub-dashboards and over 81 specific indicators. The ESG Impacts Lens Dashboard indicators align with business priorities of cost, safety, people, and productivity. The ESG Impacts Lens Dashboard takes an integrated approach, collecting data through purpose-built digital tools linked with the Power BI dashboard.

The three integrated dashboards are the following:

- **Socio-Economic Transformation Impact Evaluation (SETIE) Dashboard:** Reflects the change and impact that socio-economic transformation interventions have had in mining communities through social performance indicators. It considers the impacts of social change directly attributable to mining modernisation, possible closure of mines, and support and preparation of the local communities regarding engaging in alternative economies, such as training in entrepreneurship, and the development of asset bases in communities.
- **Impact of Automation (IoA) Dashboard:** Reflects the change and impact of automation and digitalisation on the workforce within the mining operation. This dashboard considers the impacts of change directly attributable to initiatives of mines in terms of automation and digital transformation, namely the introduction of new technologies and processes, the implementation of skills and training, and changes in skills profiles and employee levels.
- **Change Impact Evaluation (CIE) Dashboard:** Reflects the effectiveness of change management practices relating to technology adoption. The CIE Dashboard specifically aims to understand the changes and impacts around people, technology, organisation, change adoption and projects, including critical success factors that should be taken into consideration when introducing new technologies for mining modernisation. This dashboard was informed by a Change Management Blueprint, which was based on Minerals Council South Africa's Mining Industry Occupational Safety and Health (MOSH) Leading Practice Adoption System (Malatji & Stewart, n.d.) and linked to Awareness, Desire, Knowledge, Ability and Reinforcement (ADKAR) principles (Prosci, n.d.).

The ESG Impacts Lens Dashboard has the following features:

- The landing page, which provides a brief explanation of the purpose of the dashboard, and links to the integrated dashboards (Figure 2)
- Instructions on how to use the dashboard (Figure 3)
- A summary of key business drivers, namely safety, cost, production and people (Figure 4)

- Summaries for the SEITI, IoA, and CIE dashboards (Figure 5 to 7)
- The SEITI Dashboard, which comprises seven sub-dashboards with 46 indicators
- The IoA Dashboard, which has three sub-dashboards with 18 indicators, and
- The CIE Dashboard, with five sub-dashboards and 17 indicators.

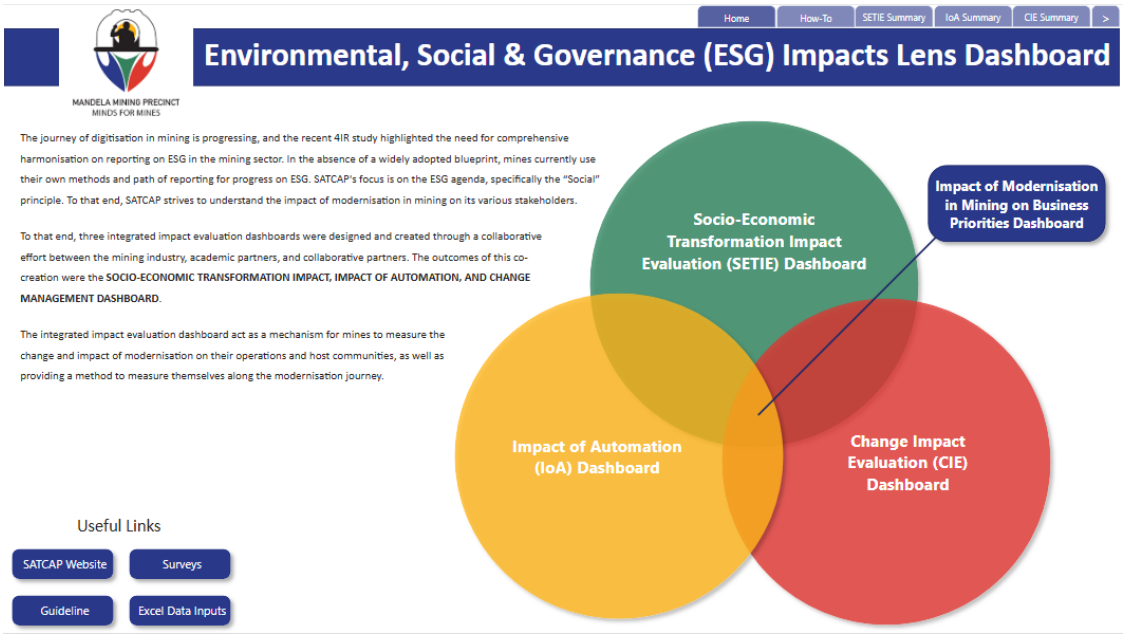

Figure 2. ESG Impacts Lens Dashboard landing page.

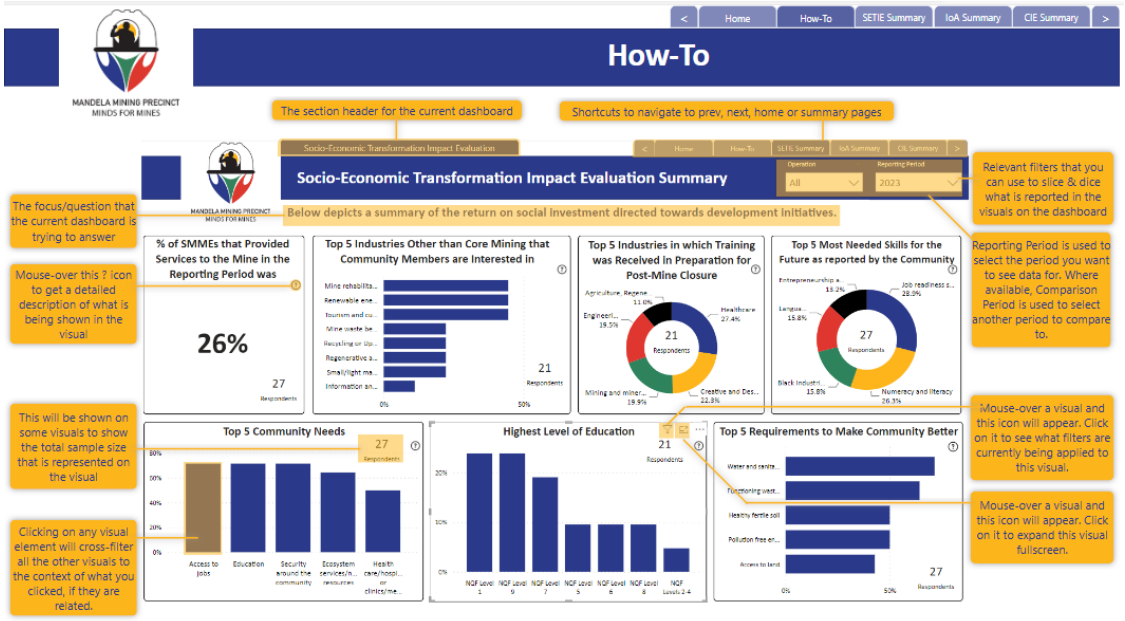

Figure 3. How-to page.

The Business Priorities Impacts summary (Figure 4) is a representation of summary data from the three domain-specific dashboards to specifically reference the impact of introducing a technology into a specific context against the following:

- **Cost**: Cost associated with technology and of training people.

- **Internal workforce** (People): Number of people in training to use the new technology, changes in employment and gender distribution, change in training methods, and the digital capability of the workforce.
- **Safety:** Number of employees removed from dangerous context, occupational health and safety (OHS) impacts due to the technology introduced (lost days, fatalities, injuries and fatigue), and the risk levels relating to the adoption of different technology projects.
- **External stakeholders** (Communities): Distribution of skills in alternate economy sectors, top five skills identified by communities for sustainable economies (post-mining), changes in the total number of community members' participation in skills-related training programmes.
- **Production:** Changes in organisation business processes to implement new technology, changes in number of automated processes in context, changes in number of projects implemented efficiently due to new technology adoption, and change in number of technology projects with change management implemented.

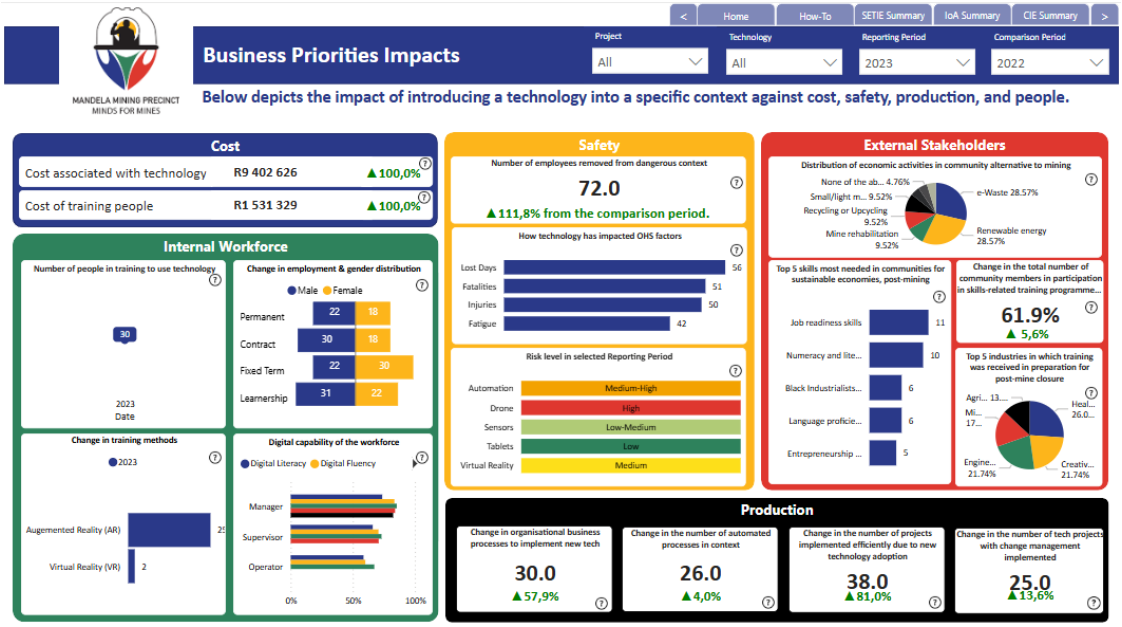

Figure 4. Business Priorities Impacts summary page.

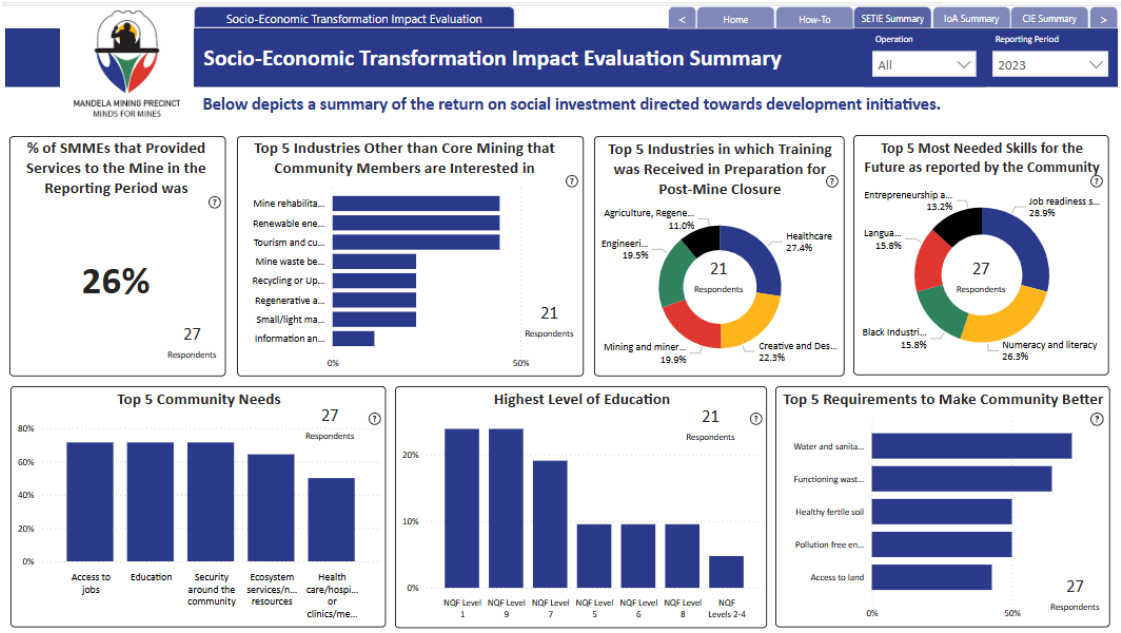

Figure 5. The SEITI summary page.

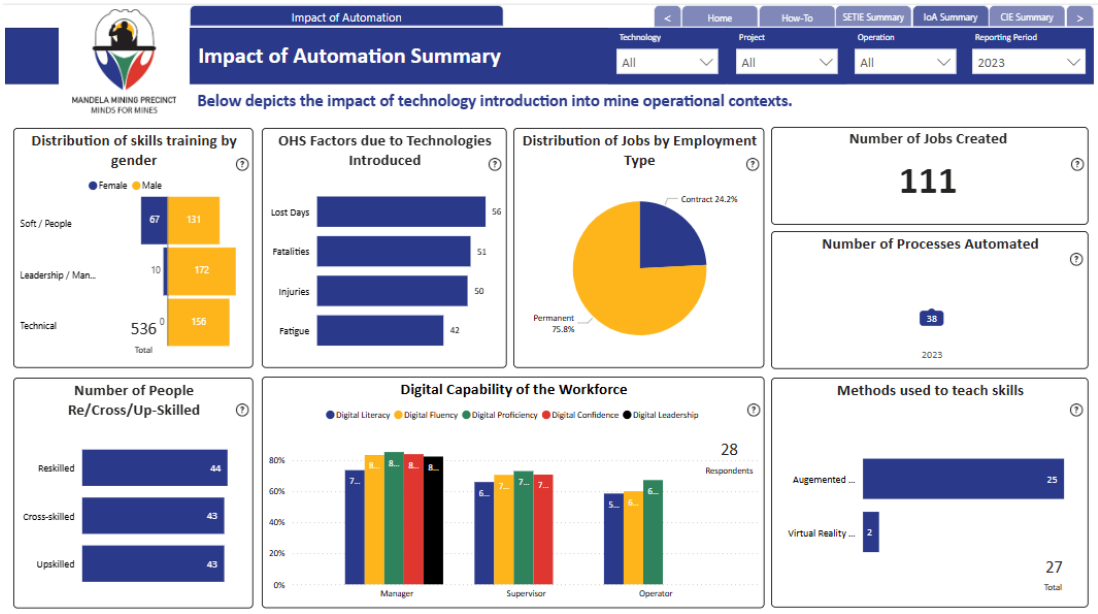

Figure 6. The IoA summary page.

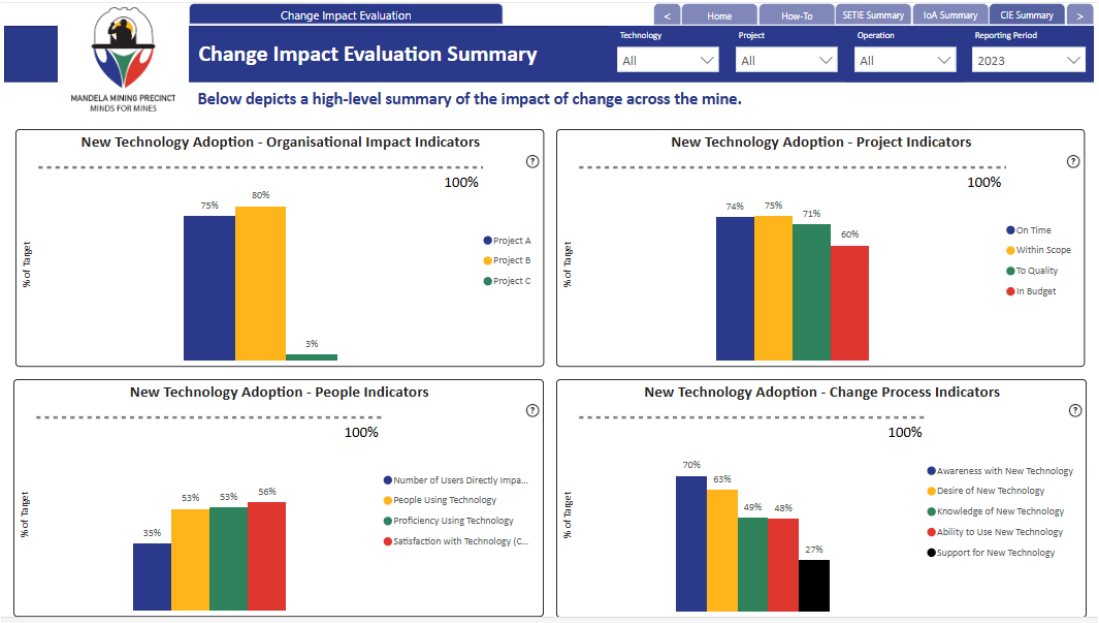

Figure 7. The CIE summary page.

The lists of indicators included in each domain-specific dashboard are shown in Tables 1 to 3. The SETIE Dashboard consists of seven sub-dashboards representing different areas including Community Skills, Community Current Needs, Community Future Needs, Community Jobs, SMME Skills and Training, SMME Information, and SMME Stakeholder Engagement (Table 1). The IoA Dashboard includes pages for the Impact on Skills and Training, Impact on jobs, and Impact on Health and Safety (Table 2). The CIE Dashboard has sub-dashboards including Organisation Impact, People and Change Adoption Impact, and Project Indicators (Table 3).

Table 1. SETI Dashboard indicators

Sub-dashboard	Indicators
Community Skills	• Highest level of education • Computer literacy • Top five skills most needed in the community • Top five skills in which training was received • Top five skills that the community is most interested in • Top five industries in which training was received in preparation for post-mine closure • Skills-related training participation in the reporting period
Community Current Needs	• Top five community needs • Top five issues affecting post-mine growth • Living conditions • Level of security • Access to education • Access to housing • Access to healthcare • Access to water • Access to food • Access to internet
Community Future Needs	• Top five most needed skills for future as reported by community • Top five businesses desired in future • Top five requirements to make the community better • Top five skills considered most important to access other job opportunities if the mine were to close • Top five skills considered most important to start your own business if the mine were to close
Community Jobs	• Of those employed, what was their employment status • Of those employed, how many work for the mine • Gender disparity in employment status • Top five alternative economy sectors in which people have skills • Top five alternative industries that people are interested in
SMME Skills and Training	• Top five skills in which SMMEs offer on-the-job training • Top five skills of importance to SMMEs • Top five industries in which SMMEs received training • Awareness of the Black Industrialist Scheme • Top five skills most needed by SMMEs for future local economies • Top five services provided by SMMEs in the community
SMME Information	• Percentage of SMMEs that provided services to the mine in reporting period • Assistance from the organisations received to grow the business • Percentage SMMEs that had easy access to loans in the reporting period • Assistance from organisations needed to grow the business post-mining • Percentage of SMMEs that have participated in related training
SMME Stakeholder Engagement	• Types of companies applying • Top five product or service offerings of companies applying • BBBEE level of companies applying • Percentage who found the application process user-friendly • Awareness of the pre-application checklist • Actively monitoring application status • Pre-application survey responses • Post-application survey responses

Table 2. IoA Dashboard indicators.

Sub-dashboard	Indicators
Employee Skills and Training	• Digital literacy score • Digital fluency score • Digital proficiency score • Digital confidence score • Digital leadership score • Number of people re/cross/upskilled • Distribution of skills training by position • Distribution of skills training by gender • Methods used to teach skills
Employee Jobs	• Total employees in the reporting period • Number of processes automated • Distribution of employees by occupation level • Distribution of jobs by employment type • Job adjustments between levels
Employee Health and Safety	• OHS factors due to technologies introduced • Number of employees removed from dangerous contexts • Change in risk level • Total reported cases of ergonomic and musculoskeletal injuries

Table 3. CIE Dashboard indicators

Sub-dashboard	Indicators
Organisation Impact	• Business process (hours saved) • Safety (lost time) • Financial results (Rands saved)
People and Change Adoption Impact	**Technology Indicators:** • Leadership readiness • Organisational readiness • Technology readiness • (Organisational) policies, procedures and process readiness **Change Management Process Indicators:** • People's awareness of the new technology • People's desire for the new technology • People's knowledge of the new technology • People's ability to use the new technology • People's support for the new technology **People Indicators:** • Number of people using the technology • People's proficiency in using technology • People's satisfaction with new technology
Project Indicators	• Project management (time, scope, quality, budget) • Prepare, Plan, Pilot, Roll-out and Support (3PRS) Change Management Blueprint step progression

The ESG Impacts Lens Dashboard is the visualisation output incorporating two separate data input sources. The first source is data from the digital survey tools, stored in a data Firebase project. The second source is the respective users' raw data captured and stored in an Excel workbook. Figure 8 depicts where and how to ensure success when implementing the dashboard. The effectiveness of the ESG Impacts Lens Dashboard requires synergy between four primary champions within each mine, including the Project Owner, Dashboard Administrator, Dashboard Manager, and Dashboard User. A

user-guideline document provides detailed instructions that teams must follow for the data collection tools and dashboard to be useful. The dashboard, user-guideline document, and supporting videos are available on the Mandela Mining Precinct website.

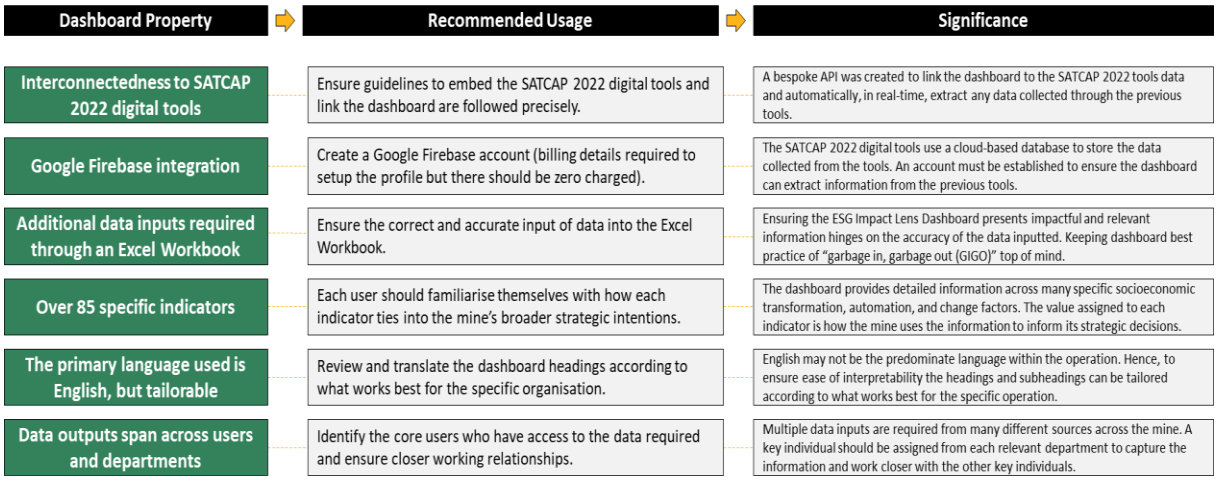

Figure 8. Success factors for implementation of the ESG Impacts Lens dashboard.

PRELIMINARY CASE STUDY FINDINGS

The SATCAP digital tools were applied in a zinc mining context, to serve as a means by which needs and data can be collected from mining communities for mines' analysis and decision-making. Data gathering and validation in the mining operation were done using the Community Liaison Office within the zinc mine host community. The digital tools were deployed within the zinc mine itself. Participants completed surveys of the data collection tools, namely the Training-Needs Survey (59 responses), Community Social-Needs Survey (33 responses), and the SMME Communications and Engagement Tool (28 responses). The data analysis and interpretation process is shown in Figure 9.

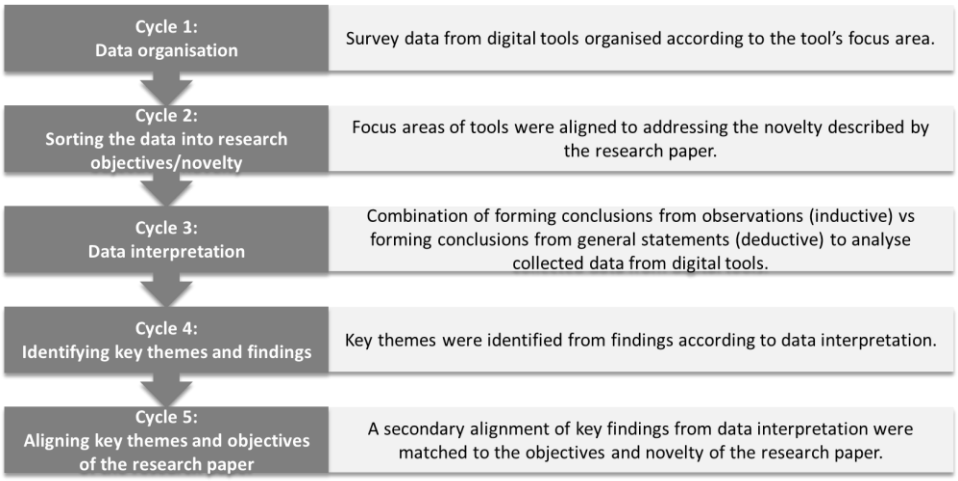

Figure 9. Data analysis and interpretation process.

Key themes from the study related to the following:

- SMMEs' present and perceived future needs
- The community's current and future social needs
- The community and SMMEs' training needs

- Alternative economists and industrialists that meet the Broad-Based Black Economic Empowerment (B-BBEE) criteria with the mine communities (i.e. Black Economic Industrialists); and
- The level of engagement between the SMMEs and the regional zinc mine.

The SATCAP digital tools provided a more detailed perspective of elements questioned within a mine's materiality assessment and may also enable more instantaneous and regular feedback with host communities. It was found that community involvement and understanding local dynamics was important when implementing digital ESG tools in the mining communities. Moreover, it was recommended that the digital tools be adapted according to the specific context and needs of a mine. Access to technological assets (e.g,. smart phones or computers), internet connection, and time required to complete the surveys are further practical considerations. Findings from this study are detailed in a paper by Mahadeo *et al.,* (2024d). A follow-up study is planned for the validation of the Change Management Blueprint and Digital Leadership Competencies Tool at a zinc mine.

CONCLUSION AND RECOMMENDATIONS

An ESG Impacts Lens Dashboard was developed to assist mines to understand the impacts of socio-economic transformation interventions, automation, and the efficacy of change management processes in the adoption of modern technologies. The dashboard comprises three integrated domain-specific dashboards with 19 individual sub-dashboards, and with over 81 specific indicators. It also includes a summary of business priorities impacts, which outlines the key business drivers of safety, cost, production and people. The three domain-specific dashboards are the SETIE, IoA, and CIE dashboards. The ESG Impacts Lens Dashboard was designed to integrate multiple sources of information and display it in an easy-to-interpret, comprehensive, and practical manner, to enable clear communication across various divisions within mines. The dashboard, a user-guideline document, and supporting videos are available on the Mandela Mining Precinct website.
In addition, dissemination to industry has been through various seminars, conferences and presentations at industry forums. For example, the Mining Indaba, WITS Mining Institute Annual Seminar, and SAIMM Conferences.

Recommendations for application of the ESG Impact Lens Dashboard include:

- Users should familiarise themselves with the embedding and usage guidelines of each of the tools.
- Create a Google Firebase account to ensure integration across SATCAP tools.
- Maintain database integrity by inputting the correct and accurate data into data capturing worksheets.
- Seek expert advice on how to read and understand each indicator.
- Obtain buy-in from leadership on the regular review and usage of the dashboard outputs.

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