

Rebuilding the capability system for modern mining



The minerals industry is facing a capability challenge that will not be solved by producing more graduates. The complexity of modern mining is now outpacing the systems that are being relied on to develop the professionals who must lead, operate, and improve it.

Over the past month, through engagements with universities, mine managers, industry leaders, regulators, professional bodies, and the SAIMM Council, one message has been consistent: The industry is becoming more complex at the same time as the systems that historically developed experienced professionals are becoming weaker. If the challenge is diagnosed only as a shortage of people, the wrong solutions will continue to be designed. The more important question is whether talent is being converted into experienced, professionally accountable capability at the rate and depth required by the future industry.

This contradiction came into sharp focus during a recent two-day workshop hosted by the University of Limpopo to design a new mining engineering degree aligned to future industry requirements. Representatives from universities, the Mining Qualifications Authority, local government, mining companies, and other stakeholders participated in the discussions. One theme stood out: In some cases, mining engineering graduates struggle to secure structured workplace opportunities, while mine leaders identify capability and skills constraints as one of the major operational risks facing their operations.

That tension exposes a deeper system failure.

The industry is not struggling to produce graduates. It is struggling to systematically produce capability. Producing graduates and producing industry-capable professionals are not the same outcome. The real constraint sits within the conversion system itself: workplace exposure, mentoring, structured development, operational experience, professional formation, leadership development, and long-term progression.

This challenge did not emerge overnight. Historically, many of South Africa's large mining houses played a decisive role in developing technical and leadership capability through formal graduate programmes, structured development pathways, mentorship systems, and long-term operational exposure. Companies such as Anglo American became powerful capability-development engines for the broader industry, launching the careers of many of today's senior engineering and mining leaders.

As the industry evolved through restructuring, divestment, decentralisation, outsourcing, and changing operating models, many of these large-scale development pathways were gradually dismantled or fragmented. The institutional memory and structure that underpinned systematic capability development dwindled, even as the complexity of modern mining operations continued to increase.

The industry is now living with the long-term consequences of that widening gap.

Mining leaders participating in the Limpopo workshop greatly reinforced this. Technical competence remains essential but, increasingly, it is not sufficient. Future mining professionals will operate in environments where operational performance, safety, ESG obligations, automation, energy, geotechnical risk, digital systems, AI, productivity pressure, communities, and regulatory requirements are tightly interconnected. The challenge is no longer only depth within a discipline. It is the ability to make sound decisions across an interconnected socio-technical system.

At the same time, the industry must be careful not to over-correct the diagnosis. What is missing is not only systems capability, but also deep technical capability across core mining and engineering disciplines. The future industry will require professionals who can think across systems, but it will also require strong technical specialists, artisans, and supervisors with the depth to operate, maintain, and improve increasingly complex operations.

This has important implications for the broader development pipeline. If the industry is serious about rebuilding capability, it must also help to rebuild and strengthen the technical and vocational base that historically supported mining performance. That includes renewed attention to technical schools, artisan pathways, and especially the role of TVET colleges, in rebuilding the pipeline of practically trained, industry-relevant capability on which the sector depends.

The strongest missing capability repeatedly identified during discussions was the ability to understand interactions across the broader mining system rather than only within narrow technical silos. The same concern emerged around safety behaviour, ESG understanding, and professional accountability. These capabilities cannot simply be added once graduates enter the workplace. They must begin forming during university and continue developing intentionally throughout professional progression.

A similar pattern emerged during the recent SAIMM Reimagining Diversity and Inclusion showcase. In several mining-related university programmes, female representation now exceeds 50% in the first year, but declines materially across graduation, professional membership, and leadership levels. This is not just a diversity statistic. It is evidence of a pipeline conversion failure: The system is attracting talent into the front end of the pipeline but is not consistently converting and progressing that talent across the full professional journey.

President's Corner (continued)

At its core, this is also a responsibility to the next generation of professionals entering an increasingly demanding industry.

The operational implications of this capability gap were reinforced again during Mine Managers' Day at the University of Pretoria. Listening to mine general managers, AMMSA representatives, and other industry leaders, the message was direct: Capability constraints are increasingly becoming operational constraints. Mine leaders are dealing with rising operational complexity while simultaneously experiencing a thinning layer of experienced technical and operational capability. The requirement is no longer simply more people. It is professionals capable of operating, leading, and making decisions within complex, high-consequence environments.

The capability gap is no longer theoretical. It is affecting operational resilience, decision quality, safety performance, and long-term sustainability. Too often, capability development is still approached through fragmented recruitment schemes, bursary offerings, and short training interventions, rather than as an integrated, long-term capability-development system.

Encouragingly, there are signs of a different approach emerging. One example discussed during recent engagements is the ten-year initiative recently established by Gold Fields under the leadership of Benford Mokoatle, EVP South Africa. The Group Legacy Programme reflects the type of long-term capability-system thinking the industry increasingly requires: structured development pathways, cross-operation and cross-industry exposure, and a deliberate focus on building future leaders over time rather than relying on isolated short-term interventions.

Similarly, discussions with Mzila Mthenjane, CEO of the Minerals Council South Africa, and a recent podcast conversation with Julie Courtnage of the Mandela Mining Precinct reinforced that genuine collaboration across the mining ecosystem will be essential if the industry is serious about rebuilding long-term capability. No single company, university, or professional body can rebuild this system alone.

These pressures also force an important question for SAIMM.

If the industry challenge is evolving, SAIMM must evolve with it.

At this month's Council meeting, SAIMM resolved to implement significant changes to the organisational structure and operating model of the Institute. This is an important milestone in its evolution from a predominantly administratively-focused body towards a more industry-facing organisation that strengthens execution capability and supports the future professional requirements of the minerals industry. This is not restructuring for its own sake. It is a deliberate shift to position SAIMM as a stewardship and integration platform for the professional capability pipeline.

If SAIMM is to play a meaningful stewardship role within the evolving capability system, then the Institute itself must be fit for that responsibility. In practical terms, this means sharpening its work around the full professional pipeline: how it is architected, how professionals are formed, how standards are signalled, and how performance is understood over time. The intent is not to duplicate what companies, universities, or regulators already do, but to help connect those efforts into a more coherent system and to keep the long-term capability question on the industry's strategic agenda.

Strategy without execution capability does not change a system. SAIMM's own evolution must therefore be judged not only by new structures, but by whether it helps the industry move from fragmented initiatives to integrated, long-term development pathways. That will require discipline over several years, not a single-year programme.

The next important step in this journey will take place on 3 June, when SAIMM hosts an industry engagement breakfast bringing together mining leaders, institutions, and key stakeholders in the capability ecosystem. The purpose is not for SAIMM to present all the answers. It is to create a platform for the industry to engage honestly with the growing gap between mining complexity and capability development, and to begin aligning around the coordinated actions required to address it.

What the past month has reinforced very clearly is that this challenge is no longer seen as an isolated HR issue, a university issue, or a professional registration issue. It is increasingly recognised as a strategic constraint on the future competitiveness and resilience of the minerals industry.

Unless the industry becomes far more deliberate and integrated in how it develops professionals across the full pipeline, the gap between mining complexity and available capability will continue to widen. The challenge is no longer to understand the problem. The challenge now is whether, together, the capability-development system required for the future of modern mining can be rebuilt, and whether that work will be treated as a core strategic priority rather than a peripheral support function.

Around every mining operation, significant investment is made in the resource endowment itself, and in the equipment, infrastructure, technology, and systems required to extract and process it. Skills and professional capability need to be treated as a third pillar of that investment — as important to long-term performance as the orebody and the physical and digital asset base. If the industry is prepared to invest heavily in capital and technology, it must be equally deliberate in investing in its capability endowment, because without that, neither the resource nor the equipment can be turned into sustainable value.

This is not SAIMM's project alone. It is an industry project that SAIMM is choosing to help steward. As president of the SAIMM, my view is simple: the industry cannot afford not to.

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