Engineers dividend and the African mine of the future

The mining industry has experienced massive metamorphic and irreversible structural changes in the recent past. In addition to the recent unpredictable geopolitical conditions, the major challenges affecting the actors in the mining industry are intricately shaped by structural constraints such as geological, technological, and market conditions. Complexity in the geometallurgical properties of the individual ore bodies, for example, is irreversibly shaped by the geological conditions that existed billions of years ago. The grade and mineralisation properties of the ore bodies also have a significant impact on the choice of mining and processing technologies adopted, the economics of production, and the location of the mining operations. In addition, the mining industry also continues to face operational pressures to cut costs and increase productivity, while simultaneously navigating other challenges such as competition for high end skills, and meeting increasingly strict governance requirements and stakeholder expectations.

Due to the nature of mining as a business, it is clear that these inherent challenges are here to stay, and thus, the future of the industry depends on the ability to learn and adapt. The first, and perhaps most important priority for any mining operation, would be to strengthen its operational and cashflow resilience to enable it to weather the obvious challenges, such as geopolitical disruptions and cyclical downturns. Second to strengthening the economic position, the focus of a future looking mining operation would be to elevate its social licence to operate, achieved mostly through long term investments in human capital and environmental, social, governance, and sustainability KPIs. In fact, investing in talent and leadership has been considered a key variable to building a sustainable mining operation, as the mine of the future will be highly automated and will require highly skilled personnel capable of operating sophisticated systems and technologies. Establishing and strengthening economic linkages with other sectors of the economy is also critical to building value chain resilience and mitigating against the cyclical impact of the commodity markets.

In my October 2024 article, I introduced a controversial and yet highly ambitious proposition that critical minerals can result in sustained technological and economic catch-up. My hypothesis still remains unchanged, and I am convinced that it is possible to utilise the vast experience in complex mining systems and technologies on the African continent to build a vibrant manufacturing economy capable of providing value-added products and services to the rest of the world. I also highlighted that the ability to catch up is driven by deliberate efforts to build value-add competencies. Traditionally, the number of science, technology, engineering, and mathematics (STEM) skills active in the economy was used as a proxy measure of technological capabilities, however more recently, interesting terms such as 'engineer dividend' are being introduced to broadly describe the nature and quantum of STEM skills that are required to drive and sustain technological innovation.

President's Corner *(continued)*

Borrowing from investment economics, the term 'engineer dividend' was introduced in a recent Bloomberg article to refer to a phenomenon whereby countries with a large and diverse skilled engineering workforce naturally develop competitive advantage in areas leading to technological advancement and industrial development (Bloomberg, available at https://www.bloomberg.com/opinion/articles/2025-03-24/china-s-engineer-dividend-is-paying-off-big-time). Case in mind is China, which, according to Bloomberg, invested intensely in STEM education and managed to increase its number of engineers by close to 12 million in the period between 2000 and 2020. In this context, engineer dividend was described as an internal rate of return on investment in engineering competencies to create a concentrated community of experts and strong network of engineering skills capable of driving innovation in multiple fields. Although dependent on other factors to succeed, the high concentration of multidisciplinary and specialised engineering expertise fosters both competition and collaboration, leading to improved sector productivity and industrial competitiveness.

In conclusion, there is no doubt that resource-rich countries on the continent can leverage on the extensive experience in designing and operating complex mining systems and operations to build a robust manufacturing and value-added services economy. With all conditions remaining the same, would it be plausible to consider the 'engineer dividend' concept as a viable skills investment concept to derisk the future of African mining industry and, if so, which areas should we focus on?

E. Matinde
President, SAIMM