

We have not achieved much. It's a big lesson; we have to learn from that. The principle of the charter was to try to deracialise the mining industry, which has not been achieved'.

Minister of Mineral Resources, Susan Shabangu, talking in New York, explaining why the Mining Charter has to be revised—March 2010

It has been a firm tradition that one of the annual issues of the SAIMM Journal be devoted to publication of papers derived from undergraduate projects in the mining and metallurgical faculties. I am sure this prestigious selection will be of interest to those involved in the various topics but also more generally for the current quality of such student work.

We support this activity, not to inspire embryonic Nobel prize winners, but because it is our belief that an essential part of university training is to imbue students with the ability to solve problems, to undertake experimental work, to search the literature for ready-made solutions, and to record and transfer the outcomes of such 'research' to the population of their future profession. I have put the word 'research' in inverted commas because not all the undergraduate students have the ambition to go into postgraduate research for masters and doctoral degrees. The majority wish to be trained to have the expertise to get a professional job and to start climbing the ladder to a successful career in their chosen industry. However, I submit that for such students this introduction of problem solving project work is as important as in all the other well established fundamentals of engineering expertise, which makes up an accredited graduate training programme.

It is the common perception that research institutes and postgraduate departments are the major generators of innovation. Many authorities associate this magic word 'research' with the main gateway to the promotion of a national entrepreneurial ability and culture which is, almost universally, rated the essential ingredient for new prosperity and job creation.

I should like to submit that the professional training of an engineer is, by definition, a much more reliable recipe for the training for an 'entrepreneur'.

'Necessity is the mother of invention' is as true today as was the case when first propounded by Plato.

While I do not deny the possibility of an immaculate conception of many inventions, in my 50 years of research experience, the vast number of the successful innovations has arisen in the normal course of the evolution of the applied sciences, e.g. engineering. Only a small proportion of innovations was derived from the fundamental research at the boundaries of knowledge. The majority was recognized from existing experience and a scientific culture bred into engineers and indeed many other professional applied scientific activities.

In mining and metallurgical enterprises the opportunities abound and indeed the industrial might of this country is, to a considerable extent, due to the entrepreneurs of the last century. The natural instinct of a good engineer is to do things more efficiently at lower cost and of higher quality. Creative suggestions abound but entrepreneurial activities must be distinguished from wishful thinking or dubious speculation. Chance taking in any of the engineering industries can result in disastrous consequences. This is particularly the case in mining engineering. Sound

disciplined decision-making is vital in a field where probability evaluation of random orebodies and rock structures is a vital element of their training.

I am not proposing that the research institutes and the research activities of the universities close down. What I am proposing is that there must be a high level of interaction between research and the faculties of the applied sciences and industry and it is the latter two components that will provide the bulk of the entrepreneurs to create the innovations leading to new prosperity and jobs.

This somewhat unconventional view leads me to reinforce even more that the sooner this is realized by students, staff, industrial employers, and government the greater will be the entrepreneurial output.

In this latter regard, two quotations came my way while writing this comment. The first is the quotation heading this comment from the Minister of Mineral Resources announcing internationally that all is not well with the South African mining industry. The second is as follows:

'Speaking at a media briefing in Johannesburg, Landelahni CEO Sandra Burmeister said that the country produced 304 mining engineers according to 'Landelahni Mining Survey 2010', compared with Australia's 130, Canada's 127 and the US's 35.' The author, from a black empowerment recruiting agency, goes on to suggest that South Africa is supplying the bulk of the mining engineers in the English speaking western world. So in terms of personnel, our industry is achieving something good.

The figures are so astoundingly good that I felt I should double-check them. With the amalgamation of the technikons with universities there exist several categories of 'mining engineers' confusing the survey company.

I have been able to obtain figures from the three main schools of mining engineering, and the formal professional four-year engineering graduates appear to be of the order of ca. 180 in 2009, still above those of the other countries such as Australia and Canada. I must say that this appears to me to be a phenomenal achievement over 15 years. There is no shortage of first-year candidates and although the failure rate is high as a result of poor maths and science teaching at schools, this serious situation is not in the camp of the mining industry as such.

In the case of metallurgists and mineral processing qualifications, the situation is more complex due to the amalgamation of chemical engineering, metallurgy, and materials engineering into one department. I am not aware of any equivalent survey to provide figures. But my impression is that the conclusion about the mining fraternity applies equally to the number of entrepreneurially trained metallurgists and mineral processors constituting the mining and metallurgical industry as a whole.

I am not in any way suggesting that all mining engineers and metallurgists will become entrepreneurs. We will be lucky if one in 50 has the ambition, acumen, tenacity and lucky breaks to make a fortune and become a leader in the industry. There can be no doubt that the

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country has already an extensive pool of qualified young people to create the teams with a potential of creating the innovative new ventures we need so badly.

On the project side, the opportunities and challenges are legion. Apart from tourism, our economy revolves around an ever expanding demand for mineral resources. For cement, steel, chemicals, and decorative materials for housing and fertilizers for agriculture, to name but a few examples, this implies ever increasing challenges and opportunities, and the ever present possibility of the trillion dollar jackpot exploiting the immense ultra deep gold resource. With such challenges, am I wrong in believing that there is no difficulty in utilizing our engineering graduate potential to the full?

It is tragic to think we are losing mining engineers to Australia and Canada. It is even more worrying that the Minister of Mineral Resources considers the Mining Charter to be a failure in deracialization, to use her own wording. This is a new challenge to find a solution to this problem. Fortunately I am confident that in the context of the professional goodwill that exists I can see a realistic and simple way forward for an industry with the predication for accident-free operation, which implies zero tolerance towards lack of competence or inexperience in key operational management.

Professional pride and goodwill start at undergraduate levels and the interaction with the members of their profession.

For this reason the Institute must on all accounts continue and expand its interaction with undergraduates and with the collaborative student projects. It is the groundwork for educating entrepreneurs.