

Why T-shaped Engineers in the Mining Sector are Vital for Progress

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Abstract. The importance of minerals and metals in the development of technologies vital for modern society to function and for increasing clean energy needs, cannot be understated. However, what is the level of knowledge of people working in this field, and how can we be sure that these people also update their knowledge continuously? There is a growing need for educated employees and engineers with a knowledge of wider issues associated with the mining sector. To align the competence of university graduates and employees with what is required in the labour market, it is necessary to develop a vocational system that identifies the competence of these mining-related occupations and incorporate new systems and ways of thinking, particularly in sustainability issues. Professional standards create opportunities for assessing competence. An occupational qualification standard describes the relevant occupational activity and competence necessary for practicing an occupation, i.e., skills, knowledge, and attitudes. When challenging work needs to be done, engineers with a deeper knowledge are needed, this is where the T-shaped professional comes in. The requirement for flexible and adaptable current and future employees is vital for the extractive sector and all the downstream industries that rely on raw materials to produce the goods and services that keep society moving. This article examines the importance of the T-shaped professional in the mining industry.

Keywords: engineers, mining, T-shaped.

INTRODUCTION

What and who are T-shaped engineers? The concept of T-shaped skills was first introduced in the 1980s, but its importance to both individuals and organizations has continued to rise. T-shaped engineers are skilled in their core field but also have a good working knowledge of other related subjects. A T-shaped engineer has a

particular specialization, but, at the same time, they are able to work with others in teams associated with their core responsibilities due to the fact they can speak and understand each other's working language.

T-SHAPED PROFESSIONAL

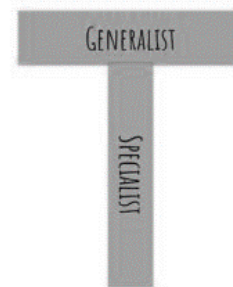


Fig. 1. The visualisation of the T-shaped professional.

The letter T represents the combination of hard and soft skills that are an increasing requirement of many employers today. The vertical represents the core training of the individual. The horizontal is the ability to collaborate in other areas and apply knowledge in areas of expertise other than core competencies. From a mining perspective, the individual's core training or expertise is that of a mining professional, however, this, coupled with knowledge of mining impacts on biodiversity, local and wider communities, etc. can create a better environment for innovation, creativity and productivity. It can also contribute to the enhancement of the company's reputation within society and make it more attractive as an employer.

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METHODS

At universities, there are still ongoing questions on how to transform engineering education to better prepare students for future employers' needs [1]. In a rapidly changing world, graduate engineering students face increasingly complex problems and challenges upon entering the industry [2].

Climate change is the biggest challenge we face today. Europe aims to be the first climate-neutral continent in the world by the year 2050. However, this future relies on minerals and metals sourced responsibly and managed sustainably along the full value chain. In addition, mineral exploration and mining face significant challenges around establishing a social license to operate (SLO). If the mining engineer constantly improves their knowledge and are aware of the changes taking place, particularly in policies or legislation, then it builds greater empathy, trust and transparency when engaging with stakeholders.

A sustainable raw materials sector requires digital transformation, but there is much competition to attract suitable employees [3] [4]. Such a transformation acts as a natural connector among all segments of the raw materials value chain and can help to gain a more holistic understanding of processes and life cycles to boost efficiency and safety in exploration, mining and processing while reducing the environmental footprint and progressing more to a circular economy business model.

Definitely, a well-managed, motivated, and trained workforce has been a core driver for productivity and safety in mining [5]. Hiring and developing a diverse workforce is increasingly crucial for mining companies. Once a new engineer has been employed by a company, additional pain points may often include uninspiring capability development, below-standard occupational training, limited career progression pathways and insufficient inclusion. To lose talented employees due to such reasons is detrimental to performance and reputation.

Well-trained employees can be a true value driver for the company because their skills and knowledge can have a significant impact on a company's performance relatively quickly. Well trained T-shaped engineers may help deliver on the company's production targets and strategic objectives faster. There can also be an increase in de-siloing and a positive change in the working environment and company culture.



Fig. 2. New T-shaped engineers on site.

Upon examining the mining sector, we can see that there is a growing need for specialized and well-trained engineers. For example, over 90% of rare earth metals for clean technologies in Europe are imported from China. Swedish company LKAB is making a game-changing step towards Europe's resilience and resource security, becoming the main owner of REEtec, a young innovative rare earth separation company that based in Norway [6]. Europe is witnessing a disruptive transformation of the domestic raw materials sector, establishing a strong Nordic value chain and securing a sustainable supply of rare earth elements (REEs). But, it also needs to attract and retain the T-shaped talent to ensure a secure and sustainable supply of raw materials along the whole value chain.

Projects such as TIMREX, an EIT RawMaterials labelled Master's programme, initiated and funded by the EIT (European Institute of Innovation and Technology), a body of the European Union, is a step in providing the next generation of T-shaped professionals [7]. Graduates will have a strong entrepreneurial mindset and combine an in-depth knowledge of their own discipline with a sound understanding of the challenges appearing along the whole raw materials value chain. Complexity of the resources sector and mineral exploration work needs this mindset which is opened not only to other disciplines but also towards social and civic issues.

Tallin University of Technology (TalTech), is currently running the course CircPro for Masters [8]. The core idea of the course "Circular economy for Materials Processing" is to give an overview of raw materials processing, i.e from exploration, mining, processing, and manufacturing until material recycling and re-use thru the lens of resource efficiency and circular economy.

However, formal education credentials are not the only way to recognize a good engineer. Nowadays organizations should see lifelong learning as a core component in their employee's development, where employees can engage in training in order to be adaptable and flexible for the organization to stay competitive and relevant. Also, it increases the value and reputation of the company if they are offering the resources and training needed to foster their workforce.

Every company needs the best employees to achieve their goals, therefore lifelong learning plays an important role in an engineers' everyday work. Lifelong learning is a form of self-initiated education that is focused on personal development. Lifelong learning recognizes that not all of our learning comes from a classroom. Individuals must be encouraged and supported to develop their expertise and enhance their skills throughout their careers as part of their continuous professional development in the life-long learning process. New knowledge and skills development may include problem-solving, critical thinking, leadership, adaptability and much more that benefits the employee and the employer.

In today's economic situation, companies have to do everything to survive in highly competitive markets. Those who have qualified employees that have the skills and ability to increase the company's productivity remain competitive. Such a working environment increases the opportunities for innovation, entrepreneurship and intrapreneurship and skills and talent retention.

In Estonia (Fig. 3), there is a system of professional standards with 4 different type of Occupational Qualification for mining engineers [9]:

- Mining Technician, Level 5.
- Mining engineer, level 6.
- Diploma mining engineer, level 7.
- Chartered mining engineer, level 8.

The professional standards outline the skills and knowledge that an engineer has acquired. An occupational qualification standard is a document describing the relevant occupational activity and competence necessary for practicing an occupation, i.e., skills, knowledge, and attitudes necessary to work successfully. The skills can be soft skills (mainly cross-discipline expertise) and hard skills (skills that you need at your occupational level in the sector). Occupational Qualification is given out when the competence for the profession meets the competence requirements set out in the professional standards.



Fig. 3. Occupational Qualification for company employees.

CONCLUSIONS

The mining sector faces challenges on many fronts. Depleting ore grades, mining at greater depths, water, energy and waste management are just some of the operational challenges that are encountered by the industry. However, talent is increasingly being elevated from a simple enabler to a true value driver, but this talent is proving difficult to attain and retain within the sector. The competition for T-shaped professionals is intense and the mining sector is one of the least attractive industry out there. Nevertheless, the industry, in cooperation with academia, organisations such as EIT and regulatory bodies are investing resources now to ensure the sector can surmount such challenges for the future of society. If mining companies cannot keep supplying the raw materials in a more sustainable way due to lack of talented employees, then, every single one of us will be affected, as will future generations.

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