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**“IS COVID-19 AN OPPORTUNITY TO ACCELERATE THE  
DIGITALISATION IN THE MINING SECTOR? LAW AND  
POLICY IMPLICATIONS”**

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## **Abstract**

During these unprecedented times of the COVID-19 pandemic, governments worldwide are imposing non-essential categories of business to be partially or fully closed. Although mining is declared an essential activity in many countries, working routines have been adapted to comply with safety and control measures. By trying to understand how and where the work should be carried out during the COVID-19 crisis, mining companies can anticipate the adoption of automation and digital capabilities. This essay discusses if this is an appropriate moment to accelerate the digital transformation of the mining sector. Some advances have already been made in implementing digital technologies to mining, and to some extent, partnerships have been implemented to support the transitions in demand for workforce skills, addressing its main disruptive effect: the replacement of workers by machines. Economic studies indicate that the digitalisation of the mining sector means less revenues and reductions in the national gross domestic product, with adverse consequences particularly for lower-middle-income countries. The digital processes, including remote working and the uses of machines instead of people, can probably ensure that the activities are carried out continuously during the COVID-19 crisis and beyond. However, governments should use this opportunity to make sure there are tangible benefits for the local communities, aligned with national interests, and to give traction to Sustainable Development Goals (SDGs) policies. Law and policy play an important and direct role to mitigate the adverse economic and social changes in the adoption of digital technologies.

## **Introduction**

In response to the COVID-19 pandemic worldwide, governments have imposed orders limiting or closing operations of non-essential categories of business in order to prevent the spread of the virus and protect the workforce. Mining activities have been affected by the restrictions to encourage social distancing, either by reducing operations or temporarily closing down mining-sites. Even in countries where mining was declared as an essential activity such as South Africa, the United States, Canada and Brazil, the continuation of operations has been subject to implementation of safety and control measures.

While mining companies are facing uncertainties, their immediate concerns involve non-performance of contractual obligations and failing of commodities prices, amongst others. However, this crisis can present a favourable moment for emerging digital trends in the

sector. By trying to understand how and where the work should be carried out during the COVID-19 crisis, mining companies can anticipate the adoption of automation and digital capabilities. Several questions surround the decision with respect to the digital transformation of the mining sector, such as:

- How is the mining sector adopting the use of digital technologies?
- What are the impacts of the introduction of automation and digital processes in the mining industry?
- How can the disruptions caused by the digitalisation be reduced in the mining sector?
- What type of policies can be considered for remediating the disruptions caused by the digitalisation of the mining industry?
- Finally, is the COVID-19 pandemic crisis an appropriate moment to accelerate the digital transformation of the mining sector?

## **1. Digitalisation in the mining sector: advances & disruptions**

Over the last few decades, digital technologies have been impacting economic sectors and society at large. Digitalisation means the adoption of processes that use digital or computer technologies (Gartner, 2016). When the digitalisation occurs in a far-reaching and cross-cutting way, changing an entire business model, it is referred to as a digital transformation (Bloomberg, 2018). Established industries such as high-tech services, retail, media, and finance have been transformed by digital solutions and processes (McKinsey Global Institute, 2019).

At a graduated pace, mining companies are increasingly incorporating digital technologies in their daily activities (WEF, 2017). Digital tools such as operational hardware and software, automation and robotics can be embedded in the performance of several mining activities. They can influence how jobs are performed, place of work, whether these jobs are performed by humans or machines, and whether these must be carried out *in situ* or remotely.

Some of the examples involve the use of digital technologies to ensure safety and efficiency of workers and equipment respectively. Since 2014, the Canadian company Goldcorp has been using smart sensors to control areas inside the mines. By providing a digital

format to collect physical, biological or chemical input data, such devices can make sure workers are out of danger during planned blasting work (WEF, 2017). The same company uses smart sensors to manage the air filtrating, by sending fresh air where needed (WEF, 2017). Besides, a group of companies in Australia, including Rio Tinto, Anglo American and New Crest Mining, are providing field workers with smart headwear that can measure fatigue levels by monitoring their brainwaves. Although the companies have declared intention to improve work routines and environments, some workers have raised concerns that the collected data could be used for disciplinary purposes (WEF, 2017).

Smart sensors are also used to reduce the environmental impacts of the mining industry, monitoring air, water and vegetation pollution sources (Li et al., 2015). Researchers are currently considering diversified functions for the smart helmet, such as detecting dust and gaseous pollutant in the air, amongst others (Berh et al., 2016). Despite concerns about privacy and potential job displacements, the real-time track of on-site workers can improve worker-safety in hazardous environment, save lives, and avoid injuries (WEF, 2017).

Furthermore, there are instances of automation in the mining sector that adopts robotics for tasks that is until now, carried out by workers. Automation can be an advantage when the machine operators command activities from screens and computers remotely, away from unsafe environments and exposures to dust, noise, and potential chemical hazards. Also, automated machines tend to consume less fuel than manual engines, which is expected to lower energy consumption and to reduce the CO<sub>2</sub> emissions (WEF, 2017).

As an example of autonomous machines, in 2019, Rio Tinto inaugurated the AutoHaul Project in Australia, a driverless train to transport iron ore to port facilities. According to the company's announcements, this is the part of a strategy to increase productivity and efficiency, by reducing the need for staff and the complex scheduling of train drivers (Wilson, 2016). This motivation reveals a typical tension between technology and employment based on the assumption that machines would replace jobs.

A significant number of studies are dedicated to answering the question about the employment disruption caused by technology. It is not the objective of this essay to examine this controversy, except to notice that the Organisation for Economic Co-operation and Development's (OECD) review on the subject indicates that technology is not the only factor shaping the future of the employment (OECD, 2019). While the OECD recognises the real risk of job automation, based on the fact that many adults lack the right skills for the new jobs, it

concludes that the future of work will largely depend on policy decisions contingent on the training of the workforce with new skills (OECD, 2019).

## **2. Digitalisation of the mining sector: law and policy strategies**

Digital technologies require substantial financial investments. This aspect is critical to why companies and institutions in the developed world are usually the frontrunners in the creation of cutting-edge digital processes and capabilities. Developed economies are also less likely to be affected by the digital technology disruptions, for instance on labour, due to their diversified economic base, strong educational systems, higher skills set, advanced infrastructure, and lower unemployment rate (Ramdoo, 2019). Overall, mining companies improve productivity and reduce operational costs by adopting digital technologies.

Developed countries are already putting public policies in place, driven by digital transformations, for transitions in the demand for workforce skills. Australia has recently commenced a programme to trial innovative training solutions and address staffing challenges in response to the mining industry automation (Australia, 2020). The pilot for Skills Organisation programme, in partnership with Australian mining companies, intends to assist graduates from Australia's Vocational Education and Training system (VET) for acquiring skills and capabilities required in the sifting of global demand (Australia, 2020). Rio Tinto is one of the strategic partners of the (pro-mining) Australian government, having accumulated a vast experience in training employees for the digital future since the programme 'Mine of the Future' was implemented in 2008 to equip workers with intelligent tools (WEF, 2017).

Such initiatives are aligned with the need to redesign traditional occupations that have so far been physically performed. Indeed, activities such as drilling, blasting, driving, surveying are at risk of becoming obsolete. Instead, a modernised workforce needs to be digitally literate and acquire advanced skills for the operation of interfaces with machines such as computers, drones, and remote vehicles (EY, 2019).

On the other hand, lower-middle-income countries face different challenges in dealing with the consequences of the digital transformation in the mining sector. Previous economic studies estimate that the productivity gains of the mining companies adopting digital technologies have a potential negative impact in their contributions to host countries' revenues. In these cases, the losses range from USD 92 million to USD 284 million depending on the size of the mining activities (Cosbey et al., 2016). Also, reductions in the national gross

domestic product in the host nations will follow close at heels, as mining operations will require less fuel and other resources may typically be procured locally (Cosbey et al., 2016). Ultimately, mines operating with fewer employees will decrease local community revenues derived from domestic spending and personal income taxes (Cosbey et al., 2016).

The most evident impact of the digital transformations is the lack of skilled labour. Contrary to conditions in the developed countries, developing nations are more dependent on the traditional jobs and will probably encounter more difficulties in transitioning to technologically enhanced jobs (Ramdoo, 2019). Policy instruments that mitigate such negative effect, for instance establishing training programmes, will depend on long-term and costly investments (Cosbey et al., 2016).

India is an example of a lower-middle-income country that is preparing for the transition of workers in digital mines through public policy interventions in education. Like Australia, Indian institutions, such as the Ministry of Industries and Mines, the Government of Gujarat, and Steel Authority of India Ltd, have signed Memorandums of Understandings (MoUs) with Siemens in the past to enhance technical skills for workers (EY, 2017). Additionally, since 2016, Vedanta collaborates with the Directorate of Education in Goa in a pilot project to promote digital education in schools across the state (EY, 2017).

The training of the workforce in a world of work transformed by technological advances is one of the specific actions of the International Labour Organisation (ILO) 2019 Declaration for the Future of Work. Amongst its provisions, it specifically addresses that nations should take effective measures to support people through the transitions during their working lives (Article III, A). The Declaration comprises the provision on ILO's efforts for ensuring a 'just transition to a future work that contributes to sustainable development' and 'promoting the acquisition of skills, competencies and qualifications for all workers' (Article II, A). The latter is considered as a joint responsibility of governments and social partners to address skill gaps and to ensure education and training systems are responsive to the market needs in the context of evolution of work.

Aside from the jobs at risk, digital mines can influence the development of local communities in which they operate. Notions of 'shared-value' that companies need to implement in order to maintain a 'social license to operate' can help to identify the opportunities to improve social development. This can be enabled when the companies align societal interests with the core object of their business and expertise. Therefore, the projects

obtain adequate levels of support from local stakeholders, required for the operation of the mine (Cosbey et al., 2016). To some extent, mining companies have been engaging within broader development strategies for transformative local communities in the host States for a significant period of time (Bastida, 2014). Some examples include the sharing of existing infrastructure and logistics (railways, road, water treatment and supply, internet, electricity power generation) or the creation of new ones, supporting local suppliers, and building educational institutions (Cosbey et al., 2016; Ramdoo, 2019).

The digitalisation of mines is predominantly part of the mining companies' strategies, and have not been mainstreamed in public law and policies. Yet, they can present opportunities for the governments to make sure there are tangible social and economic benefits for the communities. To guarantee such ends, governments should prepare a robust framework of law and policies to align the aforementioned initiatives with national interests.

Examples of the synergies between digital mines and development of communities can include the granting of internet access to populations in remote rural areas that do not have current infrastructure. Reliable connectivity of computer networks in digital mines can contribute to the closing of Africa's internet gap, by providing access to billions of people who are still offline, including those in Nigeria, Ethiopia and Tanzania (McKinsey, 2014). The installation of a renewable power project on a mining concession providing electrification for surrounding communities at a low marginal cost, is another instance. It can contribute to access to clean and affordable electricity by the local community and economic growth (Maennling & Toledano, 2018).

Broadly, the digitalisation of the mining sector can open the opportunity for governments to design and implement policies that give traction to the United Nations Sustainable Development Goals (SDGs) in the Global South. The mining industry is already well-positioned for the enhancement of all 17 goals, particularly the ones relating to social inclusion, environmental sustainability, and economic development (CCSI et al., 2016). The examples discussed above demonstrate how initiatives that combine digital mines with internet infrastructure and the integration of renewable energy impact directly in the SDG 13 (climate action), SDG9 (infrastructure, Innovation, and Industrialization), SDG7 (Energy Access and Sustainability). In other words, new infrastructure and technologies of digital mining can expand access to energy, minimise energy consumption and greenhouse gas emissions, and generate new economic opportunities for members of local communities.

### **3. COVID-19: the right timing for digitalisation in the mining sector?**

The digital transformation of the mining industry is inevitable as it is a part of more comprehensive societal and business evolution. The COVID-19 pandemic crisis does not create the need for digitalisation in itself, as it was already part of the mining sector's agenda. Yet, the current crisis has the potential to accelerate digital processes that are on the way.

Indeed, mining companies are adopting new capabilities and operating models to keep their productivity while complying with the regulations and administrative measures presented by COVID-19, including quarantines, social distancing, temporary business shutdowns, travel bans and country-wide lockdowns. During this time, digital solutions have become even more critical, offering opportunities for organisations to adapt their business to a new reality.

Amongst the examined instances of digitalisation of the mining sector, some can be more relevant than others in the context of the COVID-19 crisis. To contain the spreading of the virus, governments have imposed restrictions on the number of people sharing the same work space or the closure of facilities. The digital processes that involve changes in the work environment or the nature of jobs, including remote working and the uses of machines instead of people, can probably ensure that the activities are carried out continuously during the crisis.

Additionally, it is possible to anticipate that digital technology can assist in the management of the critical situations created under the social distance rules and the imminent risks of contamination in enclosed spaces. By using smart sensors, companies keep track of workers' maintaining safe distance at least two metres or the equivalent length. Similar devices embedded in the smart headwear in use for fatigue measurement can probably be adapted for the screening necessary to monitor the health conditions of workers, sending alerts if the first symptoms of diseases are on the arise. These can be opportunities to stimulate a rapid transformation of the work environment in the mining sector.

Despite the many advantages from the digital solutions for the environment and safety, the acceleration in the digital transformation of the mining sector represents some risks. It takes time to complete the digital transitioning while dealing with its disruptive effects. The challenge is even more difficult if it involves the objectives to deliver social and economic benefits to lower-middle-income countries. Law and policy play an important and direct role



to mitigate the adverse economic and social changes in the adoption of digital technologies. Innovative legal frameworks can try to respond to certain questions such as: Is it legitimate to dismiss employees on the grounds of the introduction of new technologies? Is there a legal obligation to invest in education and training to assist workers to better adapt to technological evolutions in the workplace? Who is in charge of the welfare cost arising from the job disruptions?

Governments should start developing their strategies for a digital age, as part of a broader social and economic agenda. National development plans including education, inclusion, jobs opportunities must follow more generic strategies. New practices are on their way for some time now, especially in educating and training of workforce of the future. Identifying and engaging meaningful partnerships between government and corporations is a way to address the digital transition in the mining sector, while helping developing countries to reach SDG targets. In this time of uncertainty and fast-changing environment, the digital transformation of the mining sector has a potential not only to increase productivity and safety at mines, but also for economic and social growth of host communities.

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