Drastic innovation increases yield in mining

Digital transformation necessary

Mining is a very diverse industry. Iron ore, precious metals, coal and shale gas each have different price developments, geological and political challenges and future prospects. In this cyclical market with strongly fluctuating prices, technological innovation is a necessity for businesses in order to increase their stockholder value while improving staff safety guarantees.

The emergence of electric cars has led to a surge in prices for the materials used in batteries. The price of cobalt doubled in 2017[1], while the price of iron ore dropped by a quarter within six months due to the disappointing expected demand from China[2]. Ten years after the start of the global economic crisis, the world economy is in a recovery phase. However, according to the International Monetary Fund, this is not yet cause for celebration. The IMF World Economic Outlook of October 2017 shows that the medium-term outlook in large parts of the world is still disappointing, and the growth has a fragile basis.

Yields in mining have dropped

This is not great news for most mining companies. Spending on exploration for new mines has decreased over the past five years, and that trend is set to continue[3]. The Total Stockholder Returns (TSR) in the mining sector have dropped steadily since 2011. According to a study by Deloitte, global mining stocks performed considerably worse than the global stock index[4]. The stockholder value is very important to mining companies.

This is the benchmark for value creation and affects a company's credit status, its capacity to raise the stock and market yield. This is very important, as mining projects cost a huge amount of money and the entire revenue model in the sector is based on leverage, with new projects being financed with loans in dollars. We see that the mining industry traditionally performs less well than other sectors, in spite of its significance[4].

Mining companies are stronger together

The mining sector holds on to traditional reflexes and incremental changes. This means companies will also only take small steps in terms of raising their profit. In a playing field where cooperation and quick knowledge exchange are becoming increasingly important, a soloistic approach will probably not yield the best returns. According to the report by Deloitte referred to above, cooperation will become increasingly vital. Strong leadership, a long-term vision and the use of innovative technology from other sectors will be required to maintain competitiveness. It is becoming harder and harder for companies to organize everything efficiently by themselves; they will have to cooperate with chain partners and even competitors.

Austmine, for example, has started an initiative[5] in which both stakeholders and competitors can share their knowledge. Australian mining companies, suppliers of equipment, technology and services and research institutions use these Co-Labs to brainstorm about the challenges in the sector. Bringing together senior executives from different disciplines allows insights to be shared, and when that knowledge is used, partners will discover new ways to save money, improve labor productivity, increase efficiency and strengthen the supply chain. A similar step in knowledge exchange has been taken in the industry in Canada, by means of the Canadian Mining Innovation Council. This is necessary because cooperation is the key to getting a solid grip on an area of activity that generally has little stability.

1: http://money.cnn.com/2017/09/12/investing/cobalt-tungsten-rare-earths-metals-commodities/index.html
2: https://www.bloomberg.com/news/articles/2017-09-20/iron-ore-sinks-as-peak-steel-call-supply-angst-rattle-market
3: http://mineralsmakelife.org/wp-content/uploads/2017/04/Worldwide_Mining_Exploration_Trends_2017.pdf
4: https://www2.deloitte.com/content/dam/Deloitte/global/Documents/Energy-and-Resources/gx-er-tracking-the-trends-2017.pdf
5: http://www.austmine.com.au/News/articleType/ArticleView/articleId/4200/Austmines-Co-Labs-Update

No more easy wins to be made

The mining industry is subject to a number of risks. Political conflicts, capricious labor unions, environmental risks, industrial accidents, unexpected geological conditions, labor unrests, breakdowns and the availability of materials and equipment, as well as weather conditions and staff shortages, can quickly turn a profit into a loss. Since the crisis, most mining companies have reduced their costs in a traditional way. This has resulted in far fewer easy wins. Genuine innovation is needed now to be able to achieve a sustainable improvement. To become more robust, mining companies have to raise their production yield while simultaneously reducing their labor, energy and capital intensity. New technology plays an important part in this.

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Innovation supports chain partners in their development and brings them closer together. They should not be afraid to genuinely share their knowledge, as was the case during a hackathon in 2016[6], where programmers from BHP Billiton used real data to develop predictive maintenance or automated warning systems. There is more and more evidence that new forms of technology, such as drones, sensors and the data they produce, are increasingly important in process improvement.

No more easy wins to be made

Data and new technological possibilities promise to be the next step in productivity growth. The mining industry can, for example, take a page from the automotive industry, where full automation, artificial intelligence, 3D printing, lean techniques and outsourcing are commonplace. RFID tagging or GPS tracking make it easier to monitor the inventory, and provide a more flexible and cheaper method for inactive inventory storage. This facilitates the introduction of a just-in-time supply chain model.

Companies can use drones to inspect locations that are dangerous or difficult to reach. These cheap, flying inspectors are already being used in the chemical industry to check up on aboveground pipes and storage tanks. Drones can perform geophysical surveys in real time to help with calculating sources, erosion detection and evaluating the stability of the earth's surface. Real-time modeling of ore bodies can lead to completely new ways in which mining companies can find mineral deposits.

Automatic grip on staff and equipment

Wearables and mobile sensors give staff an extra pair of eyes or noses, so that hazardous gases or situations can be measured and reported automatically. Assmang Limited in South Africa introduced the SmartCap in the Beeshoek mine in 2014. This baseball cap has sensors that measure the driver's brainwaves and analyze their alertness in real time.

6: https://unearthed.solutions/bhp-and-caterpillar-reap-rewards-of-first-unearthed-hackathon-in-san-francisco/

Fatigue-related incidents have decreased considerably on the site since its implementation.

It can also be monitored whether staff or the fleet is behaving abnormally in terms of speed or location. Furthermore, staff can be warned automatically when they are entering a dangerous zone. A survey among 100 globally operating mining companies shows that almost half these organizations want to start using this data, thereby improving the safety of their staff, the environment and cost-effectiveness[7].

"The mining company Rio Tinto already uses almost 80 self-driving mega trucks in Australian mines."

These kinds of modern technologies may sound like science fiction to some, but many companies are already using these new applications. The mining company Rio Tinto already uses almost 80 self-driving mega trucks in Australian mines. The profit generated by these trucks is estimated at 15%. This mine also uses robotized rock drills. Its transport also involves increasingly few error-prone human hands. The company uses self-driving trains, which load and unload automatically[8].

Big data optimizes efficiency

It is not just the automation of physical processes, such as drilling and transport, that improves the efficiency of operations. By fitting sensors and tracking systems onto equipment, a huge amount of valuable data is produced. On the basis of this data, a mining company gets a much more centralized grip on all its processes and raw materials. This is especially the case if it shares process data with its chain partners, as this makes it easier to check where and how wastage occurs and allows the company to learn from past situations.

For example, the global manufacturer of mining and construction materials Komatsu and General Electric have announced that they are jointly going to provide big data services[9], which should increase efficiency during mining activities. Fleet management software ensures optimum route planning and truck speed, so that the flow of traffic improves, fuel use drops and downtime is minimized.

Downtime of equipment can lead to huge costs. If a mining truck blows a tire, this often has massive consequences. Not only does a new tire cost ten thousands of dollars, but its delivery can also sometimes take several months. The biggest problem is that this puts continuity and the delivery date at risk. The sub-process comes to a halt (loading and unloading), which delays the entire operation. It is crucial for the whole company and its chain partners to be informed as soon as possible of the consequences of, for example, this flat tire, sick employees or unworkable days.

7: https://www.globaltelecomsbusiness.com/article/b14ycfzt7npxj5/mining-industry-benefits-from-better-health-and-safety-thanks-to-iot?copyrightInfo=true
8: https://www.technologyreview.com/s/603170/mining-24-hours-a-day-with-robots/
9: https://www.australianmining.com.au/news/komatsu-and-ge-team-up-with-big-data-technology/

Better overview thanks to an integrated ERP system

An integrated ERP system provides a closed chain in which human resources, scheduling and the financial department, among others, can immediately see the consequences of a project's current state. The organization itself must quickly be informed, but since so much work is done using subcontractors, they must be brought up to speed in a timely manner as well. If this is done, a project can be concluded much more efficiently.

That is not always the case, because there is no "single source of the truth". This makes it nearly impossible to make quick, correct decisions, even though time is a lot of money in mining. This money is lost due to inadequate intervention and the fact that the profits, costs and project duration cannot be properly estimated. However, an integrated ERP system that guarantees transparency of the entire project and allows it to be better managed and planned can change this.

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