

# ***Mining Down Under***

## How digital can dive deeper into Australian mining

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*IoT-enabled digital solutions can help improve profitability and safety in Australia's mining industry.*

**Australian mining witnessed a decade of rapid growth from 2003 onwards. But in recent years, declining productivity coupled with increasing costs has led to a significant fall in profitability.**

Due to her abundant natural resources, Australia is a lead player in many segments of the global mining industry. The country plays an important role in the global supply of iron ore, nickel, bauxite, copper, gold, silver, uranium, diamonds, zinc and coal. Driven by exports and in particular by demand from China, Australia witnessed remarkable growth in mineral production from 2003 to 2014 resulting in a six-fold growth in revenue from 24 billion to 154 billion USD in the course of this decade.<sup>1</sup>

However, with rapid expansion in production capacity, there was a resulting decrease in both productivity and capital efficiency (Figure 1). PwC research highlights that Australia’s mining productivity fell consistently post 2002 (Figure 2).<sup>2</sup> Besides this, a slowdown in demand and intensity of global competition compounded the challenges for Australian mining firms:

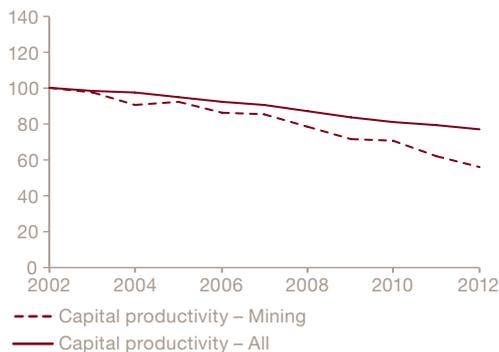
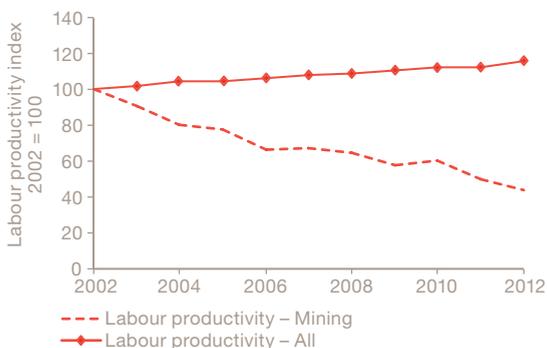
- **Increased cost of production and labour:** To keep up with the demand over the last decade, mines had moved into more difficult and hazardous territories in order to increase production capacity. This move not only resulted in an increase in marginal costs of production but also demands

by worker unions for higher salaries. High costs associated with fly-in/fly-out arrangements further contributed to the increase in labour costs.

- **Reduced prices:** As the rate of demand slowed after a decade of year-to-year increase, primarily due to Chinese growth hitting a plateau, Australian mining firms faced with the challenge of managing their over-capacity, opted to reduce prices. Rise in global competition from mines in Indonesia, South Africa and Mongolia also led prices to decline. For instance, by mid-2012, coal prices had fallen by 35%. Similarly, iron ore prices had also decreased by 30% from their 2011 peak levels. We see this trend continuing.<sup>3</sup>
- **Unrealised benefits of cost reduction initiatives:** Mining executives responded by focussing on cost reduction, primarily through initiatives, to improve operational efficiency. However, according to a study by Newport Consulting, 80% of such initiatives failed to achieve desired results due to the challenge in sustaining change and scaling cost reduction initiatives across the business.<sup>4</sup>
- **Increase in accidents:** As miners moved to deeper and more hazardous territories, safety concerns in Australian mining escalated. The industry reported 14 deaths in 2014, three times more than those in 2013. Over 36 mining deaths have been reported from 2007 onwards, 21 involving a vehicle.<sup>5</sup>

**Sharp decline in labour productivity vis-à-vis capital**

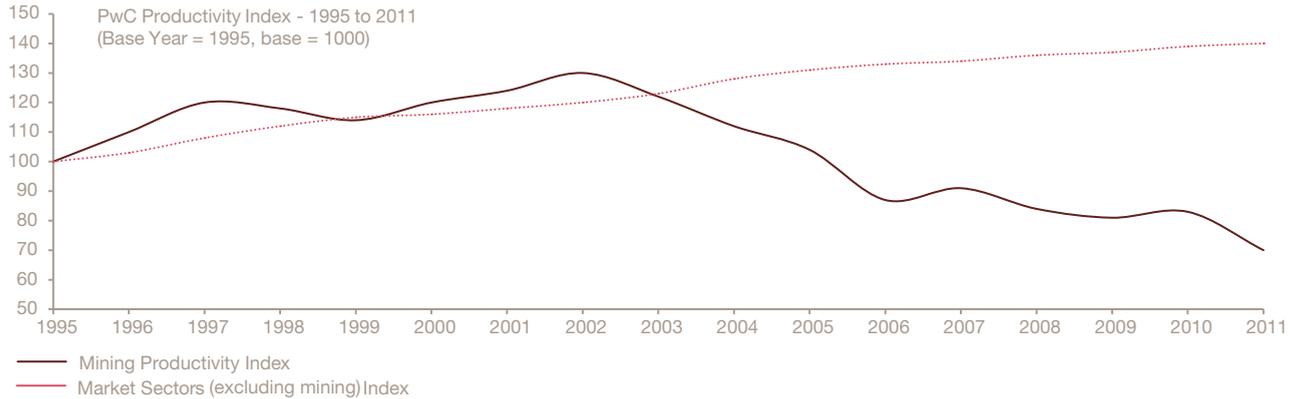
Figure 1: Labour and capital productivity in mining has been reducing over the past 10 years



Source: ABS (5260)

\*ABS estimates multifactor productivity (MFP) for 16 individual industries including mining in the Australian economy.

Figure 2: Declining mining productivity relative to other sectors



### Digital technologies that drive better decision-making through monitoring and surveillance of operations can improve the ability of Australian mines to enhance safety and machine productivity.

While much has been achieved by Australian mines to pursue operational excellence and safety in the wake of the above challenges, the emerging digital world of the Internet of Things has the potential to create new approaches to drive value for this sector. Three elements of digital technologies can be integrated to create a new genre of smart services and solutions in the mining ecosystem with significant potential to drive improvement:

- **Smart devices could drive remote and continuous data collection from dispersed mine assets:** Ranging from small sensors that capture valuable data, to giant driverless trucks which haul ore autonomously, smart devices hold high potential for mines. Vehicle telemetry data can enable better automotive safety and route optimisation by modifying the programmed route according to live information on the terrain. Health monitoring devices connected to mine workers can help assess their physical condition and raise alerts in cases of incidents.
- **Data centres with analytics capabilities could enable better operational decision-making by drawing upon large and often unconnected data sets:** Digital solutions that assimilate data collected from multiple sources and

convert it into usable information have the potential to impact mine safety as well as mine productivity. The intelligence generated through advanced analytics can assist mine managers on operational performance and predict trends and outcomes over a period of time.

- **Connectivity:** High quality and reliable network connectivity can ensure that data travels securely and quickly from remote locations to data centres for assessment and analysis, even from mining locations in remote areas.

Numerous IoT solutions drawing on these three elements can be deployed to connect machinery and equipment to improve productivity and safety in remote mining locations.

*A global mining equipment manufacturer has leveraged IoT solutions to collect mass volumes of data that lead to a quicker and efficient decision-making process. The integrated system helps collect, store and analyse data from 15 mine sites and over 1,000 machines. The remote monitoring and analytics processes around connected devices have helped the firm anticipate failures successfully, reduce the cost of mining resources and improve the safety of site and human capital.*

# Real-time tracking of data for improving productivity

IoT-enabled digital solutions using sensors, data analytics and automation capabilities can bring about material improvements in mine productivity and efficiency (Figure 2). For instance, sensors can be placed in locations throughout mines that can, in real time, detect multiple parameters to conduct the following:

- Improve asset utilisation:** Predictive analytics and remote monitoring technologies can help track the productivity of assets onsite and enable managers to prevent breakdowns by reducing unplanned downtime.
- Extend asset life:** Predictive maintenance solutions have been successful in foreseeing mechanical failure up to two months in advance with a confidence interval of 85%, according to recent studies conducted by Cisco. Such monitoring capability can result in lesser downtime and longer asset life.
- Improved air quality and environmental performance:** Sensors sending data from the cutting face can specifically monitor air quality and CO2 levels, improving environmental efficiency and safety.
- Reduce costs:** IoT solutions can help improve the sustainability and scalability of cost reduction initiatives. For instance, remote monitoring can enable better multiple site management from a lean central management function, resulting in better labour deployment and more efficient processes. (*Getting in the driver's seat*, a PwC paper commissioned by Orange Business Services, explores how digital solutions are enabling logistics and fleet management companies in Asia to save 2-3% in operating costs through smart connected fleets, lower fuel consumption and better risk control.)

## The Internet of Things technologies in mining

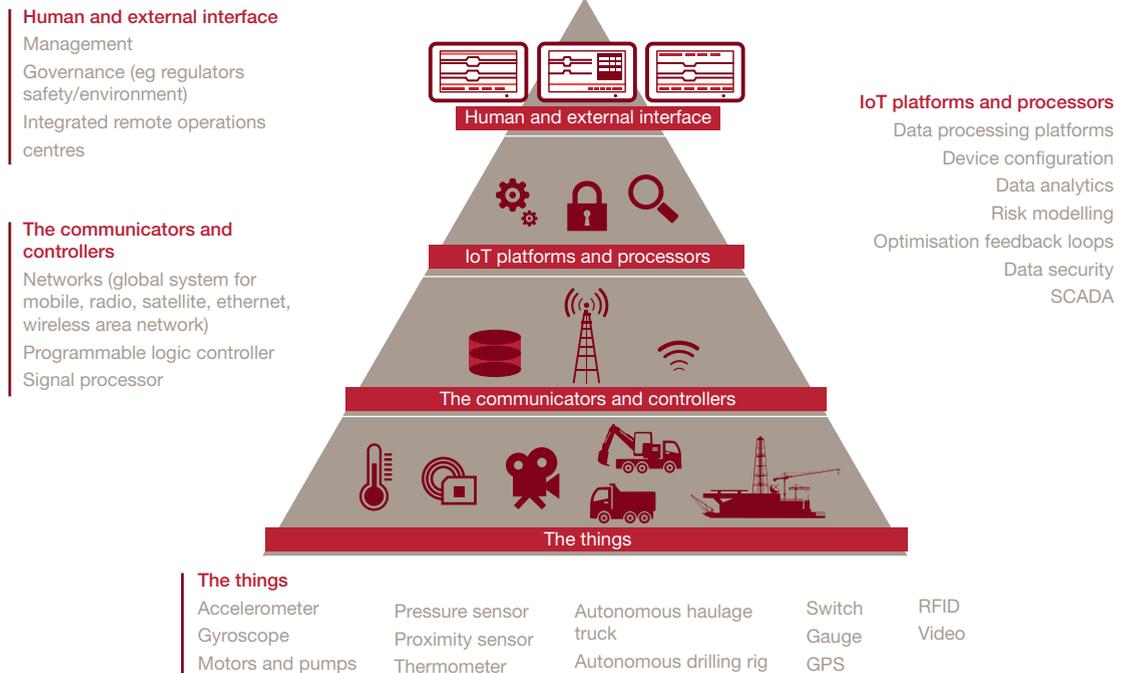


Figure 3

## Reduction of manual dependency to improve health and safety

Digital solutions, such as RFID, GPS and video surveillance in remote locations coupled with real-time health management tools can improve how mining companies track worker and mine safety. RFID tags can provide real-time location monitoring which can be used to focus rescue efforts in case of an emergency, as already used in emergency response systems used in ambulances in smart cities. The technology can be integrated with the mines' HR database in order to track unauthorised or unsafe personnel movements as well as employee attendance. Location monitoring can help improve workplace safety. For example, by alerting crane or heavy vehicle operators or personnel close by. Australian mining companies have plans to use driverless trucks to improve safety by addressing hazards. These can be managed autonomously with adaptive feedback mechanisms used to maximise production.

## IoT-enabled digital solutions can change many 'conventional' mining practices

Conventional practice	IoT-enabled solutions for integrated operations
Managers and teams present physically at each mine, limited operational integration between mines	A lean and centralised management team monitoring multiple mine sites, unifying information and insight
Worker safety, a function of training and process; site access and movements as the responsibility of the mine manager	Smart technologies to centrally track employee location, site security, training certifications and health onsite
Availability and location of equipment managed manually	Sensors to feed analytics into a remote operations centre with predictive maintenance and asset deployment solutions
Asset management done separately across sites, and distinct from strategy and business planning	A centralised asset management program integrated with enterprise systems to provide a coordinated view of asset use

## An Australian mining company is implementing digital solutions to improve productivity while optimising the use of human and capital resources.

The company has invested in IT, automation and remote monitoring and control in order to increase productivity at its mines. The major components of the implemented digital solution are as follows:

- **Remote operations centre** that operates all mines, ports and rail systems from one location
- **Automated haulage systems** that allow material to be moved efficiently and safely
- **Intelligent drills** which is an automated drilling system that can be managed remotely
- **Driverless trains** that are autonomous, heavy haul, long-distance rail systems

Investment in these technologies has increased nameplate capacity—the intended full-load sustained output of a mine—by 3%, from 230 million tonnes per annum (MT/a) to 237 MT/a. This is attributable to productivity improvements as no new major infrastructure has been added since 2008 before which improvements were also made due to low-cost de-bottlenecking.<sup>6</sup>

The use of remote equipment monitoring solutions along with automated trucks and rail systems has helped optimise payloads in haul trucks. These payload improvements have resulted in fewer haul trucks in the company's fleet yielding significant savings of 4.5 million AUD per truck.<sup>7</sup> As a result of these initiatives, the company foresees a 16% improvement in efficiency in human resources by 2017.<sup>8</sup>

*IoT-enabled, digital solutions can help improve profitability and safety in Australia's mining industry. Implementation of these solutions could help drive better decision-making through monitoring and surveillance of operations and could improve the ability of Australian mines to enhance safety and machine productivity.*

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