

# Newcrest Case Study

Mining firm uses digital IoT and data science to cut downtime, reduce costs



## Turning data into insights into business gold for Newcrest Mining

In the area of New South Wales where Newcrest Mining Limited operates its Cadia Valley mines, about 250 kilometres west of Sydney, the sweeping landscape offers extraordinary natural beauty and a temperate climate—but it's a different story underground. Down in the mine, more than a kilometer beneath the surface, the combination of dust, debris, extreme heat, and earth tremors creates a challenging environment for man and machine alike.

One of the world's largest gold producers, Newcrest operates both gold and copper mines in Australia, Indonesia, Papua New Guinea, and Canada. Many of Newcrest's mines are located in remote areas, where both workers and equipment endure challenging conditions and intense pressure as they work to keep the mines operating around the clock.

"Newcrest and other large-scale mining operations face two big challenges," says Richard Lee, Data & AI Principal Consultant at Insight Enterprises, a Fortune 500 company that helps customers around the world digitally transform their businesses. "The first is how to keep essential machines running continuously to optimise production and avoid costly downtime. The second is how to create and maintain a safe working environment for mine employees."

Insight is currently engaged in an extensive program of work with Newcrest, a step-by-step journey that combines many smart-mining initiatives, all aimed at helping Newcrest use Internet of Things (IoT), intelligent-edge, and data-science technology to achieve unprecedented business benefits. Lee explains that "smart mining" refers to the use of advanced technology to help mining companies optimise and automate many of their operations, improving worker safety and increasing productivity while minimising costs.

"At a time when smart solutions are transforming everything from cities to factories, the mining industry is an increasingly important and fast-growing market for IoT," Lee says. The research confirms the rapid growth and widespread adoption of smart-mining solutions. According to Transparency Market Research (TMR), the global smart-mining market is expected to grow from US\$6.80 billion in 2016 to US\$16.25 billion by 2025, at a compound annual growth rate (CAGR) of 10.2%.

"By implementing a soft sensor that uses a machine learning model, we can constantly predict the level of crushed ore in the bin with about 85 percent accuracy... which will enable us to cut our unplanned downtime and gain significant revenue, with an ROI within three months."

**Gary Slater,**  
Digital and Data Science  
Architect, Newcrest Mining  
Limited



## Going for the gold with smart-mining IoT solutions

One persistent challenge that Newcrest had been working to overcome at Cadia and its other mines was how to maintain peak production by keeping its ore crushers and other machines running continuously, with no unplanned downtime. One key to achieving that level of production is the crushed ore bin, which sits downstream from the crusher and has a sensor that constantly measures the level of crushed ore in the bin.

“Having continuous, accurate information about the amount of ore in the crushed ore bin is a critical component of our operation,” says Gary Slater, Digital and Data Science Architect at Newcrest. “If the level of ore in the bin drops too low, then too little ore is being fed onto the conveyor. If the bin gets too full, then we need to stop the crusher and empty the bin in what amounts to a manual process. By always knowing how much ore is in the bin, we can regulate the level to keep production high and avoid shutdowns.”

Slater explains that when machines such as crushed ore bins (COB), run-of-mine (ROM) bins, semi-autogenous grinding (SAG) mills, gyratory crushers, or loaders shut down, it can cause a domino effect that may take several hours to correct. When such failures happen frequently, as they often do in mining operations, the resulting downtime can cost a company millions of dollars annually in lost production. All too often, human workers are required to go deep underground to do visual inspections, make physical repairs to stalled or damaged machines, or clear blockages to get production lines up and running again. Removing manual intervention reduces safety risks.

“The hard sensors in our crushed ore bins were failing at a rate of two or three times every month per crusher, and it often took hours to get the process up and running again,” Slater says. “Over a period of six months, just one of our Cadia Valley mines experienced 4,780 minutes of downtime due to sensor failure in the crushed ore bins, which equates to a significant dollar value in lost opportunity.” Newcrest’s workaround involved using human spotters to visually monitor bin levels, a manual process that required the spotters to work deep underground in challenging conditions. So along with improving operational efficiency, Newcrest wanted to create a safer working environment for its employees.

Newcrest had tried several hard-sensor solutions without success.

“There’s a lot of dust and rock flying around, so the sensors get damaged or deliver inaccurate readings,” he says. “We tried infrared, we tried laser, but nothing worked. When we spoke to Insight, our technology partner, they suggested using the Microsoft Azure IoT intelligent edge platform and data science to tackle the problem.”

**Gary Slater,**

Digital and Data Science Architect,  
Newcrest Mining Limited



## Unearthing major productivity gains and cost savings

Working together, Insight, Microsoft and Newcrest created a smart-mining IoT solution tailored to Newcrest's international mining business. At many of its mines, Newcrest uses block caving, a large-scale mining method that allows huge amounts of ore to be extracted efficiently with minimal drilling and blasting. Under the right conditions, block caving is a highly productive and cost-effective process. Solving the problem of the failing COB sensors would allow Newcrest to reduce costly downtime, increase profitability, and get the maximum benefit from its block-cave mining operations.

"Using Microsoft Azure, we collaborated with Newcrest and their partners to create an Intelligent Edge solution that optimises the underground crushing circuit. The model pulls data from other upstream sensors: tons tipped, apron feeder speeds, weightometers, and so on. The model then analyses the data to predict the level of crushed ore in the bin and uses that information to control the flow of ore to the crusher, keeping the ore moving at an optimal level of productivity and preventing the bins from overflowing."

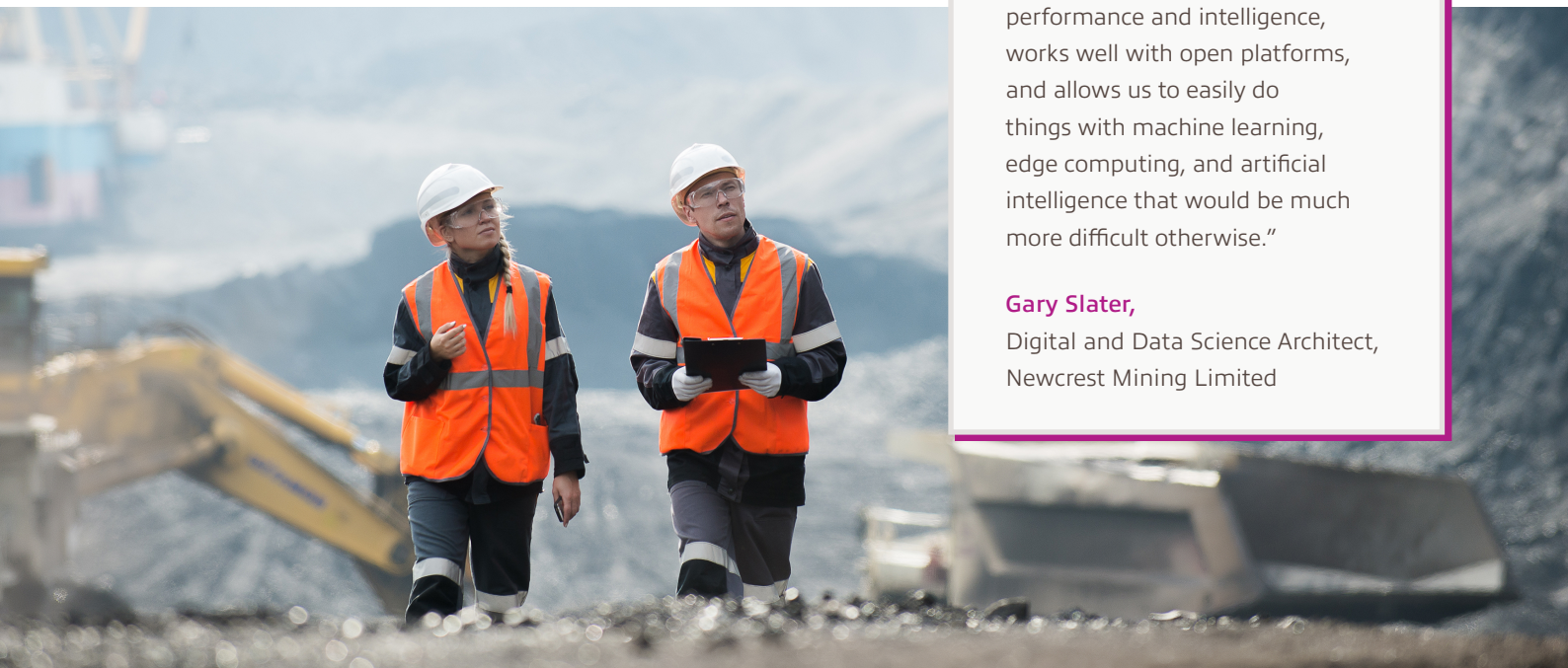
**Richard Lee**, Data & AI Principal Consultant, Insight Enterprises



The Azure-based solution enabled Newcrest to accelerate operational innovation at its mines by pushing AI workloads to the edge, which led to significant productivity gains and cost savings. By leveraging data science, Insight collaborated with Newcrest and its other partners to develop and deploy the solution, which predicts the level of ore in the bins, mitigates sensor failure, and reduces downtime. Lee says this is an example of the type of industrial IoT and intelligent edge project that is helping Newcrest set a new performance standard for the mining industry.

"With this solution we will not only reduce operational downtime for our heavy assets, but also improve mineral recovery performance by pushing the computational AI models closer to the edge and connecting them to our control systems," he says. "Microsoft Azure offers extraordinary power, performance and intelligence, works well with open platforms, and allows us to easily do things with machine learning, edge computing, and artificial intelligence that would be much more difficult otherwise."

**Gary Slater**,  
Digital and Data Science Architect,  
Newcrest Mining Limited



## What's next?

Looking ahead, both Insight and Newcrest believe the work they are doing with Microsoft Azure will lead to new opportunities.

"For now, we're using this solution exclusively at one of our Cadia Valley mines in New South Wales, but once we have more experience we plan to expand it to all of our mining operations that use the same crushing process," Slater says. "We have similar issues with the crushers, crushed ore bins, and sensors at other sites, so this will definitely be a solution we can use in each location. Although we may need to adjust for subtle variations in different operations and operating environments, for the most part it would be a cookie-cutter approach."

"Azure IoT Edge has enabled Newcrest to build and deploy new machine learning models to the edge in a matter of days instead of months."

**Richard Lee,**  
Data & AI Principal  
Consultant, Insight Enterprises

Meanwhile, by leveraging the Azure Industrial IoT and Big Data Platform, Newcrest implemented an open data science platform that ingests data feeds from 100,000 machinery sensors (approximately 40 billion records) from across their international mine sites, and runs the data through Azure IoT Hub as the foundation for pursuing open data-science initiatives internally and with its partner ecosystem.

The work with Newcrest has allowed Insight to extend its growing capabilities in digital innovation and smart solutions to clients in a variety of industries, including mining, utilities and manufacturing.

"Many organisations are on the journey toward autonomous operations, but leveraging artificial intelligence, edge computing, and open data-science platforms is still quite new," he says. "At Insight, we have the expertise to help our customers with those critical steps."

**Richard Lee,** Data & AI Principal Consultant, Insight Enterprises

