INFORMATION IS KEY TO MINING SUCCESS

In a famous English hymn of the industrial revolution, the writer dreams about building a new Jerusalem. In Australia today, minerals explorers are dreaming about finding whole new Kalgoorlies – whole new Golden Miles – buried deeply in the earth with no sign of their presence on the surface. David Mason-Jones finds that information, and the way it is handled, will be central if today's dream is to become a reality.

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Information technology is affecting the whole cycle of mining in Australia – right from the selection of greenfields exploration projects through to ore extraction and the global marketing process.

Real time production information is enabling senior executives to make real time decisions and the integrity of input information is making ERP systems more reliable. Better information about the production process enables CFOs to discharge their accounting an auditing duties with regard to standards set by Sabanes-Oxley and other legislation.

Some ways in which information technology is being used in the mining industry is truly innovative, leading edge and visionary. Other information processes may seem more work-a-day but represent the determination of CEOs, CIOs and CFOs to deploy, step by step, the full capacity of knowledge systems within their businesses.

Finding the buried Kalgoorlie

Most of the mineral deposits that are sticking out of the ground in Australia have been discovered. And, following the old adage, 'the place to find acorns is under the acorn tree', most explorers – particularly the small ones – are looking for new deposits near to the existing fields.

In the case of gold exploration, virtually every piece of ground around all the known deposits has been tied up in tenements and this makes it extremely hard for a small company to get the financial muscle to buy into the most prospective tenements.

It also causes headaches for the larger companies because they are hemmed in and sometimes unable to find large scale exploration targets that are really suited to the size of their operation.

"Everyone faces the old problem that to go off and search for completely new greenfields deposits is an extremely high risk venture," says Alf Eggo, lead IT consultant to Sipa Limited, a WA based minerals explorer. Sipa Limited, a relatively small company, has formed a joint venture with Newmont Mining – one of the biggest in the gold sector – in which the use of the Sipa information based approach is central to the JV.

"I believe that correct use of information technology to assemble and analyse the data can significantly reduce the risk in a greenfields exploration venture," says Eggo.

The problem for most of Australia is that much of the terrain is covered with eroded debris and wind blown material. This hides the rocks underneath – in many places it has buried them by hundreds of metres – but even where the depth is shallower, it only needs to be tens of metres before the underlying terrain is hidden completely from surface observation. This means that there may have been extensive surface exploration but the rocks and signs the explorers are looking for have just not been found.

"Other areas of the continent – for example the Yilgarn and Kimberleys in WA are relatively poorly explored – even on the surface," says Eggo.

"What information technology gives us now is the computing power to correlate and analyse vast data sets across the whole of the continent on a unified and consistent basis.

"The key is computing power and its increased availability over recent years. Mining companies have always seen computer analysis as important – I was in Rio Tinto for 20 years and we had rooms of mainframe computers worth millions of dollars. Today, I have at my desk, a workstation which has four processors. This station can compute 76 billion floating point operations per second and gives even a small company the capacity to analyse huge quantities of data. At the moment we are working with a data base of 4 terra bytes – (This is 4000 gigabytes and each gigabyte is 1000 megabytes.)

"This means that all the public information which has been made freely available from the State government authorities – containing millions of pieces of geochemical data collected from rock samples and stream sediment samples over the years – can now be analysed by a single computer program on a whole of Australia basis. This information software can now make links between pieces of what may have appeared unrelated data in one part of the continent with data in another part of the continent thousands of kilometres away.

"It is an analytical tool that could just not have been achieved in the days of paper geological reports and lower powered computers. The data has always been there but the ability to analyse this and turn it into information has not," he says.

The other source of a vast mass of new data is the release by the Americans of the digital terrain elevation data for the whole continent of Australia around two years ago. Using lasers from space the Americans have surveyed the whole world to a high degree of accuracy, originally for military purposes. This included the Australian continent and this information is highly

accurate – more accurate than any land based survey could be.

In an incredible act of generosity the Americans have now released this information for public access and it is free. Any company with the computing power and with the analytical software can now look at the whole of Australia in incredible detail for the first time. Computer analysis can now highlight small changes in the landscape which can help reveal where geological features may be located underground.

"But it is only the companies with the appropriate information technologies that will be able to leverage this data. There's no use in just having all the data, now you have to do something with it. Handling information is the key," says Eggo.

It is no longer a matter of geologist walking over the ground taping at a few rocks. It is now possible to produce geochemical maps over very large areas of Australia and link the information with other information to make predictive models which can be used to identify other areas of Australia for exploration.

We already have seen the potential mineral wealth that can be discovered when conceptual geological work leads to an ore discovery. The Olympic Dam project in South Australia – one of the world's copper/uranium deposits – is an example of this. It is an interesting example because it was discovered under thick debris cover with no surface indicators at all of its existence. And it is notable that it was discovered before the existence of the information analysis tools we now have. If this is what was achievable using conceptual geology before the information handling capabilities of today, imagine the potential with the information tools we now hold.

"With the example of Olympic Dam to prove that totally new deposits are present beneath the surface terrain in Australia, I have no doubt there will be further Olympic Dams to be discovered using better information process. We will find buried Kagoorlies and buried Golden Miles without any doubt," asserts Eggo.

Real time monitoring

Once a deposit has been discovered and mining commenced, information technology is being used to create real time monitoring and reporting to an accuracy never before possible. These information systems save time and money in physical monitoring and place real time information on the desks of CEOs, CIOs and CFOs, no matter where the executives are located.

Einar Vikingur, Santos' group executive, shared business services, to whom the CIO reports, says: "The Santos operations in the Cooper-Eromanga Basins in Central Australia are a case where we have deployed remote monitoring systems to enhance the accuracy and timeliness of our information base.

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"We have hundreds of gas and oil wells spread over a wide area in the remote basins. In fact the surface area of our tenements is equal to the surface area of Japan but there are only about 800 people living in the whole area. It could take an engineer an hour and a half to drive out and monitor just one of these wells – a huge expense in highly qualified employees and a great expense in wear and tear on what would have to be a large vehicle fleet.

"We use sensors and remote telemetry to monitor each well and the beauty is that the information is immediately available to senior management," says Vikingur.

Another example is in monitoring oil production at the Mutineer-Exeter oil fields of off-shore north-Western Australia. Santos has a converted oil tanker tethered to a buoy in the


Einar Vikingur , Group Executive Shared Business Services

ocean. The ship acts as a Floating Production and Storage Offshore (FPSO) facility which can be detached and sailed to safety when a cyclone approaches.

The well heads are on the sea bed and electricity generated by the ship is used to pump oil at a rate of around 70,000 barrels per day to up to the surface and for storage in the ship. The FPSO can hold around seven days' production while awaiting the arrival of tankers to take off the oil.

Sensors continually monitor flow and pressure in the wells and this information is available immediately at Santos' offices in Adelaide or Perth. "Our managing director and other senior executives can click on their PCs at any time and have a look at the production on a real time basis," says Vikingur.

Improving the operation of markets

Information technology is being used to increase the openness of trading markets for minerals. A case in point is the world cobalt market which, with only 30,000 – 40,000 tonnes global annual production, is certainly a niche metal.

Until a new internet based trading system was introduced in by Western Mining Corporation (WMC) in August 2000, the world marketing arrangements for cobalt were secretive and had an aire of being behind closed doors in smoke filled rooms. A London price for cobalt was published but nobody really knew what the trades had been nor what the highs and lows and volumes had been.

Vikingur, at that time CIO of WMC, says: "With only around 1000 tonnes of cobalt production per annum we, at WMC, were certainly vulnerable to a lack of information about the market in our marketing operations. It was impossible in those times to discover the floor or the ceiling in the market."

WMCs solution was to use the internet to create a transparent system of marketing for both its own production and for cross trades. The company published the trades and details about the tonnage and price but not the name of the customer.

"From an information technology point of view it wasn't technically difficult to start the new system," reports Vikingur. "All that it required was the recognition that an opportunity existed – this came from our own marketing people – and the technical competence to put it into place.

"Once we had decided to provide better trading conditions with improved market knowledge, we had the system up and running in just six weeks," he says.

This system of creating open information about the commodity has now changed the way that cobalt is traded in the world. Information about the metal available through this system has become a global benchmark.

BHP Billiton has subsequently taken over WMC but has

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maintained the website alive and trading. The Cobalt Open Sales System (COS) has simply been re-badged as a BHP facility and the improvement in world cobalt marketing has moved from an innovation to a standard practice.

Integrity of input information

A whole new issue has arisen with mining companies around the value of information accountability. In the late 1990s, partly in anticipation of the Y2K scare, there were a lot of enterprise resource planning (ERP) systems put into companies to tighten the level of business accuracy and accounting and to create a single instance of the financial truth.

ERP systems considerably helped companies tighten their reporting act and the internal coherence of their information and reports. CEOs and boards were relying on the information provided by the ERP system to make strategic decisions, to make stock market announcements such as profit projections, to report ore reserves and grade, estimate the life of the mine and to declare dividends.

But the problem still remained that, while the information was all internally coherent once it entered the ERP system, the integrity of the information at the point of entry could still be doubtful. The simple matter of tonnages of ore leaving a mine is an example. If each truck load is rated at 30 tonnes and a clerk counts off the trucks as they leave the site, then the tonnage entered into the ERP will be 30 multiplied by the number of trucks. But how do we know that each load is 30 tonnes? There is always a variation and some truck loads might be 27 tonnes and some 31. So, using a pencil and tally sheet approach, the integrity of information entering the ERP can be extremely poor.

Analysts these days regard wide variation in standard deviation as being rubbery numbers and suspect the mining company has a trick up its sleeve if it presents such numbers.

The US Sarbanes-Oxley legislation is also forcing new attitudes to the need for information entry integrity. There are many CFOs who thought that Sarbanes-Oxley applied only to the ERP system itself but now there's a growing awareness that the Act is forcing CFOs to be able to go back to the first level of information to be able to prove its integrity as well.

Alan Ferris, of Collaborative Solution Providers International Pty Ltd, (COSOL) says: "Weigh bridges and other sensors such as found on conveyor belts may have reduced the error but the fact still remains that there is a variation between what the machine measures and what actually gets moved. This can be a plus or minus variation but, once it enters the ERP, it is treated as absolute fact.

"The challenge for IT is to provide a much higher level of information integrity as it enters the ERP system.

"COSOL is addressing the level of information below the ERP. We are designing and installing new physical data systems in which all information entering the ERP is traceable, auditable and of high integrity. To improve the data going into the ERP system CFOs have to have correct measuring devices and clever, well built software to reduce the deviation of the information. New instruments of measure are providing these now in the form of cameras, for example, which can view a conveyor belt and do a size distribution analysis of the material on the belt. This can allow more accurate calculations of production, as well as improve operations performance, were available in the past," he says.

New sensors can detect the level of moisture in the operations process. Coal is an example. Some moisture is necessary to prevent oxidisation of the coal – in the worst case spontaneous combustion at sea – but too much moisture means that all the mining company is doing is shipping water around the world. At the delivery point the coal buyers will test the coal precisely and there will be costs if the moisture level is too high. Demurrage and underloading are major potential expenses for mining companies and any method of tightening the measurement of bulk has a direct bottom line effect.

Other detectors can measure the grade of the coal – how much coal and how much ash, how much dirt contamination – others can measure the radiation given out by a particular sample of an ore body on a conveyor belt or storage bin and derive accurate statistics from this reading.

"The smarter the coal companies get in understanding every feature of their coal deliveries, the tighter the contracts can be written," says Ferris.

"Until recently, improved levels of accuracy and analysis was hard to achieve. Use of spreadsheets was, and still is, widespread but these limit the way in which the information can be analysed and the performance audited. Now we have information software which is more flexible and can be used for a deeper level of analysis. Using this software a CIO can visually manage business logic and calculations. The system is built graphically using predefined icons and functional models in a click and drag approach. The resulting application is then transparent, traceable, manageable and auditable.

"Each of the icons contains smart blocks of logic – embedded calculations, logic and workflow models – which can be dragged off tool bars. While they are not commonplace now, they will certainly become more common as chief executives and boards demand better information," says Ferris.

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Conclusion

The knowledge age is demanding that chief officers in all sectors need better information to make better decisions. The mining industry is no exception to this. CO