Tearing down the walls
Why mining companies need an integrated technology operating model to compete and prosper in a digital future

by Anthony Willmott
For many mining companies, conversations about the convergence of information technology (IT) and operational technology (OT) can tend to focus on technical issues, such as standards, data formats and Internet protocol networks. Those discussions can lead to complacency among mining companies that they can adapt incrementally and at their own pace to technology developments that are still some way down the line.

While practical considerations are important, concentrating on them exclusively obscures the much bigger, more valuable and more challenging picture. Above all, IT/OT convergence is a profound business transformation—driven by digital—that reshapes how mining companies create and deliver value.

The term convergence is somewhat misleading. What is really taking place is digital transformation. There are mining companies, such as Roy Hill, that are unencumbered by legacy technology silos, and have been able to build a single technology platform serving end-to-end business needs.¹ In a world where driverless trucks are moving more than 100 million tonnes of earth a year for one mining company,² having a single operating model for technology that helps to deliver real productivity improvement will only become more important.

Designing and implementing an integrated technology operating model is not primarily a technology challenge to solve. It is a significant business opportunity. And mining companies that grasp the potential are already pulling ahead to become lighter, more agile and more efficient businesses. For example, mining companies that can autonomously track ore along the entire value chain are gaining efficiency improvements of 5 to 10 percent in recovery.³ What is more, integration is happening now.⁴ For example, we are seeing one mining company remotely operating seven mines, two ports and a 1,000 kilometer railway. Another is doing the same with 14 mines, three ports and a 1,500 kilometer heavy-haul railway.⁵ The race has started.

Keeping up with such progress demands a new relationship between two functions that historically operated independently and continue to be suspicious of one another. Rather than seeing technology integration as an isolated development, it needs to be viewed as a movement that offers mining companies the opportunity to transform their business models. Instead of focusing on the synergies between IT and OT, attention should switch to the business gains that will be created by the integration of the two domains into a single technology operating model.
IT and OT convergence means tearing down the walls of conventional practices. Driven by digital, business transformation involves reshaping how mining companies create and deliver value.
Digital transformation

Big opportunities

What drives the integration of information and operational technologies? The momentum stems from the disruption driven by massive, simultaneous and rapid developments across multiple digital technologies: the Internet of Things, big data, analytics, cloud, new service models and autonomous operations, to name a few.

Opportunities include harnessing vast and growing amounts of data to support real-time decision making. The explosion of connectivity, sensors and intelligent devices creates unprecedented possibilities to remotely monitor and control assets, equipment and materials. New cloud platforms can support greater knowledge sharing and collaboration—making information available where it is needed, and shared within and beyond operational teams at significantly lower cost. Analytics and new mathematical tools can deconstruct vast amounts of information and predict patterns to support better decision making. The result? Increased safety, throughput and lower costs. One example is Rio Tinto whose Analytics Excellence Center in Pune, India monitors performance across global operations. And as more disruptors emerge—from 3D modeling in mines to virtual supervisors—they will continue to generate major opportunities for companies to become true digital leaders in the mining industry. (See the characteristics of digital leaders.)

Characteristics of digital leaders

Digital leaders, across industries, have been shown to exhibit five key characteristics that are enabling them to succeed on their journey to becoming truly digital businesses. This includes being:

1. Value focused—using digital investments to drive value.
2. Design driven—designing for digital customer experiences.
3. Rigorously data led—using data to create customer insights.
4. Digitally inclusive—building digital into their operating models.
5. Agile and experimental—combining scale with flexibility to move quickly and effectively.

...and significant risks

But the good news is tempered with the significant business risks and major challenges created by technology integration. These include far greater risk from cybersecurity that will extend beyond enterprise systems into the operational environment itself. There are risks from operational technologies that have developed without software governance, with much software effectively irrecoverable. And there are significant risks, too, from fragmented technical support across the wide array of OT.

These challenges are compounded by an often fractious relationship between IT and OT departments in which the balance of power can be a source a real tension. IT and OT teams’ limited knowledge of each other’s operational domain can not only inhibit performance, but also pose real threats to safety, environmental compliance, productivity and organizational agility.
A new perspective on integration

Tearing down walls

Identifying the main challenges of integration is simple: they are wherever the line is currently drawn between the IT and OT domains. Developing a new approach to technology integration should start with a number of important questions. These can help to identify business value that cuts across existing barriers. For example: What are the opportunities for quick wins? What steps can turn them into reality? What is the strategy for digital and how should investment, organization and technology line up to support it?

Instead of responding to these broad questions, mining companies tend to engage in small, disparate projects and pilots that focus on a specific and limited opportunity. Multiple, parallel initiatives are taking place across an organization. Solutions are developed at one site but are not being rolled out to the whole company, duplicating the cost in terms of time, effort and money.

Constructing convergence

A different, broader approach is needed—one that produces local and global outcomes that benefit the whole organization. To do so, clear priorities are needed to identify the greatest opportunities and a commitment to collaboration so that lessons, successes (and failures) are shared throughout the business. In turn, mining companies need to identify the right skills and resources, forging business partnerships and supporting teams with the platforms that can help accelerate innovation. As solutions develop, they must be applied across the organization, with information flows through IT and OT.

Digital transformation will continue to exert pressure on IT and OT organizations to integrate. This is not a trend from which companies can choose to opt in or out. As the environment becomes increasingly complex, mining companies have to act, or risk increasing inefficiency, higher costs, lower quality of service and a gradual weakening of the ability to innovate. And all of these outcomes could lead to a loss of competitiveness and increasingly poor financial performance.

On the other hand, a clear strategy for technology integration can support operational excellence, improve real-time decision making, enhance process efficiency, and raise production throughput and quality. Globally managing standards and suppliers can reduce the total cost of ownership. Better collection of condition-based maintenance data can improve asset lifecycle management. In addition, technology integration will promote collaboration, empower people with information and generate significant gains through reduced variability in processes.

Securing these transformational gains rests on developing the right integration strategy.

Digital transformation will continue to exert pressure on IT and OT organizations to integrate.
Securing the benefits of IT/OT convergence

An integrated approach to IT/OT has the potential to help mining leaders achieve benefits such as:

• Lower total cost of ownership for technology through standardization.
• Increased speed of implementation for digital projects.
• Greater automation with effective governance extended across IT and OT domains.
• More effective asset management through predictive, condition-based maintenance.
• Increased project effectiveness through a coordinated approach across the whole organization.
• Increased productivity through integrated planning and scheduling, data to support leading practices, and advanced process controls.
A strategy for developing an integrated technology operating model needs to focus on three important areas:

### Data and mathematics
The fundamental requirement to move forward with an integrated technology operating model is clean operational data. Gathering, managing and harnessing the massive volumes of data generated from multiple sources is foundational to implementing digital technologies that will drive business value, such as analytics, mobility and cloud.

But there is more to it than that. Mining companies will become sophisticated users of mathematical tools, such as algorithms and their related software. A future for mining in which many assets are operated by machines that run automatically means that the only capability that will matter will be the ability to make decisions based on the information those assets provide. Having the right data at the right time, and the tools and capabilities to understand the data, becomes absolutely fundamental to business success. That understanding is critical to planning the way that a company will manage the data delivered from everywhere, every second of every day, across the whole operation.

### Organization and governance
Having the right operating model is crucial to managing all technology across the whole business. This is not a matter of deciding who is responsible for maintaining the OT or if implementation of the IT governance methodology is appropriate. Rather, having the right operating model is about defining the structural and executional changes that will create value for the organization (see Figure 1). This might mean that the ultimate responsibility for technology needs to move from the CIO to the COO, or even a new senior role, such as the one Cliffs Resources developed, with express responsibility for integration.⁸

### People
The workforce will undergo the biggest and most important transformation of all. The changes go far beyond simply redefining roles and responsibilities. As mining companies move toward automated production environments, the essence of what people do in a mining company will fundamentally change. Mine operations will increasingly need two categories of people: those who plan and those who maintain equipment. This provides new opportunities for mining companies that embrace a talent-led business model and requires a rethink of every stage of the talent management cycle.

The combination of pressure on the mining industry to improve performance, cut costs and increase productivity, with the explosion of new technologies and the opportunities they afford, creates a compelling case for a new, integrated approach to technology. The organizations already tearing down the walls of existing practices are securing a clear advantage. The rest cannot afford to stand by and watch.

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#### Figure 1.

**Business Strategy**

**IT/OT Strategy**

<table>
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<tr>
<th>Structural changes</th>
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<td><strong>What?</strong></td>
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<td>• Long-term plan</td>
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<td>• Right capabilities</td>
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<tr>
<td><strong>Who?</strong></td>
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<td>• Governance/roles and responsibilities</td>
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<td><strong>Where?</strong></td>
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<tr>
<td>• Footprint</td>
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<td>• Critical activities that need investments</td>
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<thead>
<tr>
<th>Execution changes</th>
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<tbody>
<tr>
<td><strong>People</strong></td>
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<tr>
<td>• Organization structure and design</td>
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<td>• Right skills and culture</td>
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<tr>
<td><strong>Process</strong></td>
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<td>• Centralization</td>
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<td><strong>Tools</strong></td>
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<td>• Standardization</td>
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<td>• Innovation</td>
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**Technology**

- Rationalize existing technology
- Invest in new technology to drive OT cost efficiency and platform to achieve better growth
- Enhance current technologies to add functionality, adhere to compliance or simply function
References


⁵ ibid


⁷ “ANZ Top 100 Digital Index: Digital Leaders and Digital Laggards,” Accenture, March 2015


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