

A Ventyx Whitepaper:

## Ventyx Mining Solutions: Bridging Functional Silos to Improve Business Performance



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# Introduction

From exploration through construction, extraction, processing, and trading, mining is a technically difficult and risky industry. Mining operations must deal with highly variable raw material inputs, often with limited data available to predict and plan for these variations. This makes operations processes particularly difficult to optimize. Technical challenges also create reliance on scarce and expensive engineering skills, which tend to be clustered within the numerous functional divisions that mining's long and complex value chains require.

Long and complex value chains necessitating many functional divisions – combined with the need for deep technical skills within each division – have resulted in the formation of functional silos in many mining companies. This issue is exacerbated by the lack of information systems crossing the functional divisions.

## Non-aligned Performance Metrics

A costly problem arising from functional silos is the barriers they present to implementing key performance indicators (KPIs) that support end-to-end optimization of business processes. Some well-known examples include:

- **Blast optimization.** Mining engineers want to maximize tons of ore mined, while metallurgists want to maximize recovery. Both typically also look to minimize costs within their area. In particular, mining engineers often cut costs by minimizing blasting. This greatly increases costs at the processing plant – crushers go offline after getting blocked by large rocks, grinding power costs go up due to larger starting particle sizes, etc. – and throughput drops. Working across cost centers to optimize costs and output for the overall operation can increase production by five to eighteen percent for equivalent plant and energy costs, a huge benefit to cash flow and margins. But KPIs derived from an integrated view of mining activities and plant performance are required to incentivize such a program.<sup>1</sup>
- **Concentrator-to-smelter optimization.** Concentrator managers work to achieve a minimum concentrate grade at a minimum cost. This generally means minimizing concentrate regrind and cleanup costs to achieve the lowest acceptable grade. So excessive gangue minerals arrive at the smelter, where the energy required to remove them costs roughly ten times what it would to remove them at the concentrator. Further, removing waste components before they reach the smelter can net production increases comparable to adding additional smelting capacity, but without the exorbitant capital expenditure.<sup>2</sup>
- **Aligning maintenance with supply.** Supply managers look to drive supply costs down, while maintenance managers need to keep inventory available to maximize equipment uptime. Visibility into inventory usage and criticality of equipment, such as through a graphical electronic parts catalog, can enable these teams to work together to eliminate obsolete inventory without incurring undue outage risk. The result can be millions of dollars (perhaps 20% of inventory value) in capital saved.

Clearly it is important for organizations to align their incentive plans across divisions to maximize business value. As the above examples illustrate, when mining operations are able to work across cost centers the result is often increased production output at significantly lower expense. However, making the right information available in the right form is essential to crafting measurable KPIs that can reward cost-effective decisions and actions.

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<sup>1</sup> For more information on the benefits of “mine-to-mill” optimization: [http://www.jkmrc.com.au/research/mine\\_mill\\_geometallurgy/mine\\_mill\\_optimisation\\_aggregate\\_production.htm](http://www.jkmrc.com.au/research/mine_mill_geometallurgy/mine_mill_optimisation_aggregate_production.htm)

<sup>2</sup> For more information: [http://www.ausimm.com.au/content/docs/elephant\\_mill\\_xstrata.pdf](http://www.ausimm.com.au/content/docs/elephant_mill_xstrata.pdf)

## Inefficiency Within and Across Business Processes

Isolated functions with little information flow between them also lead to a proliferation of ad hoc, unstructured business processes with low levels of automation and high risk of errors. A reliance on standalone or weakly integrated point solutions from multiple technical mining software vendors compounds the problem.

This lack of automation obliges technical staff to spend valuable time managing data rather than improving operational efficiency. In consequence, operations are further challenged to maximize yield, recovery, and throughput; and revenues and profitability are negatively impacted.

Informal and/or standalone solutions not only tend to be inefficient in and of themselves, but also hamper business process improvement efforts because the need to plan, execute, and maximize value across the entire operation has not been considered. This contributes to sub-optimal utilization of assets, increased total operating costs, and reduced viability of data for executive decision-making, among a host of other inefficiencies.

## Challenges Attracting and Retaining Skilled Employees

The optimization of mining operations processes are hampered not only by poor communication and collaboration across functional areas, but also on a growing scarcity of the vital technical skills upon which operations depend. A high percentage of key technical staff are approaching retirement age and not enough skilled workers are being trained to replace them, resulting in workforce shortages. Attracting and training the right people – and retaining not only skilled employees but also their knowledge – is a long-standing, industry-wide concern.

## Remote Operations Centers

To better attract and retain employees with essential skills, as well as to facilitate business process improvement and optimize efficiency and profitability across their operations, forward-looking mining companies are moving toward the creation of “remote operations centers” (ROCs) that accommodate and centralize key operational services in a single, conveniently located facility.

Rio Tinto’s well-publicized plans to establish an ROC to automate mining and transport operations are a prime example of this trend. The ROC will allow operators in Perth, Western Australia, to oversee iron ore mines and processing plants in the distant Pilbara region. The company cites “...more attractive working conditions that will help Rio Tinto to recruit and retain staff in the highly competitive labor market” as a key reason for this initiative.<sup>3</sup>

ROCs will enable skilled employees to collaborate more effectively, while at the same time reduce the need for technical staff to travel to remote sites far from their families and preferred living areas. ROC initiatives are also in alignment with ongoing technology advances that enable increasing automation and remote control of mining fleets and processing facilities.

Establishing ROCs entail greater reliance on integrated software systems as a way to leverage and extend technical skills and manage knowledge. Current difficulties with bridging disparate, standalone functional systems are a major impediment to realizing these goals – as they are to implementing any program that attempts to align business processes to maximize value.

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<sup>3</sup> See the Rio Tinto press release at: [http://www.riotinto.com/media/5157\\_7037.asp](http://www.riotinto.com/media/5157_7037.asp)

# Solution Requirements

What is needed to bridge functional silos and optimize business processes are integrated, comprehensive software solutions that encompass the whole of mining operations. Such systems can make the best use of vital technical skills both on- and off-site, helping to streamline activities end-to-end while providing information for improved executive decision-making.

Technical professionals, whether they are maintenance planning engineers, mining engineers, mining geologists, etc., need the ability to globally understand and communicate with one another about:

- What has been happening with the operation as a whole over time
- What is about to happen at various stages of the operation in the near-term
- What needs to happen going forward to optimize business processes

For example, a metallurgist needs to know about the characteristics of the ore that is about to be delivered to the processing facility, so that adjustments can be made for variations in grade and yield can be optimized. An extreme case of value loss caused by a lack of such information exists in the gold industry: so-called “preg-robbing” ores with high carbonaceous material content delivered to a Carbon in Leach (CIL) plant without advance notice can cause massive recovery losses representing as much as seventy percent revenue loss for the timeframe involved.

## The Need for Cross-Functional Integration

Because of the technical complexity and site specificity of mining industry information system requirements, software vendors have largely focused their efforts on addressing the needs of one or a few points in the mining value chain. The choice of most vendors to provide site- and department-level flexibility at the expense of enterprise-level visibility is a widespread deficiency in today’s technical mining software offerings.

A typical mining operations software environment may include (and this is by no means an exhaustive list):

- General Mine Planning software for ore reserve estimation, mine design, and some basic planning
- An optimizing scheduler for medium- to long-term mine planning
- Blast Design software to lay out blast holes and define detonation sequence
- A real-time fleet dispatch program
- A system for maintenance planning and execution (Enterprise Asset Management)
- Process control systems
- Plant reporting spreadsheets or custom database applications
- Stockpile management spreadsheets or custom database applications
- Systems for water quality monitoring, both into the site and site discharge
- Pollution inventory reporting calculation spreadsheets
- A land disturbance tracking spreadsheet or custom database
- Software for safety incident reporting
- A training management system
- A product dispatch tracking system
- A sample management and tracking system
- A laboratory management solution

By continuing to rely on disparate point solutions, however individually robust, mining operations will continue to be hampered by informal, spreadsheet-based integration points between those solutions, which thwart cross-functional communication, impede process optimization, and introduce uncertainty into decision-making.

To enable business process improvement, formal and integrated IT solutions must replace informal, spreadsheet-driven processes. However, solution modules must be configurable to adapt to both department- and enterprise-level needs. Each functional area can then “add value” to the overall operations process by providing its critical piece from which the complete “information picture” is created. Data management can then be largely automated and rules-based, freeing technical experts to focus on optimizing the value chain end-to-end through improved collaboration.

For example, mining, processing, and logistics areas all have requirements for planning, scheduling, and optimizing operations at the departmental level. However, there is a growing recognition of the business need to optimize these tasks across the operation, or commodity, or region. Cross-functional integration is essential to taking an enterprise-level approach, but this has repeatedly proven to be prohibitively costly, slow, and failure-prone across multi-vendor IT environments.

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“As in many of the other industries that ARC tracks, there is significant need [in the mining industry] to increase real-time information integration across the many different systems in place across a mining operation.”

DICK HILL  
VP, MANUFACTURING SERVICES  
ARC ADVISORY GROUP

“Silo Breakers” by Richard Roberts  
HighGrade.net, 14 September 2009  
[http://www.highgrade.net/article/2009-09-14/Silo\\_breakers](http://www.highgrade.net/article/2009-09-14/Silo_breakers)

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## Beyond ERP

Enterprise Resource Planning (ERP) platforms are a critical part of running a large, complex mining enterprise. However, typical ERP systems alone are not sufficient to support key strategic and operational decision-making in a mining environment, as they were not designed to handle the high level of detail needed to drive these key decisions.

An obvious example of this insufficiency is the requirement for complex, three-dimensional geological and grade models to make downstream strategic and operational decisions. A subtler concern involves the range of error in production estimates. Many ERP systems have their roots in the discrete manufacturing sector and are designed to manage consistent, repeatable processes. Conversely, mining inherently involves highly variable inputs due to differences in the quality, location, and other characteristics of the ores being mined.

The great variation within processes that is the nature of mining is poorly managed by ERP systems. Tracking manufacturing inventory (e.g., bolts and other parts) is quite different from tracking, for example, “about 1,245 tons of ore coming into the plant, bearing about 2.57 grams/ton of gold, of which roughly 45% comes from carbonaceous geological domain and so requires different reagents to process...”

To make informed decisions about performance, mining operations need a clear picture of production that takes into account measurement error across each step in the process. Correlating the effects of variation in process inputs to performance at different production steps likewise requires highly granular tracking and analysis. The over-aggregation of production data, combined with an inability to track key mining production variables (e.g., ore blocks, ore domains, grades of multiple components, mineralogy data, etc.), characterizes ERP summary production records.

These manufacturing-centric limitations thwart any meaningful analysis of mining production from the standpoint of improving operational performance. Worse, operations that lack the granular data required to manage variability when it inevitably arises may be forced into a reactive, wasteful mode – a situation compounded by difficulties in communicating and solving problems holistically across siloed functional systems.

# Overcoming the Barriers to Optimization

To support remote technical operations and optimize processes end-to-end, mining companies need an operations management platform that:

- Encompasses the complete mining value chain from exploration to market
- Provides robust features and a high degree of configurability within each module to support variations between mine sites
- Provides ready access to information across the value chain to bridge the communication gaps between departments
- Captures reliable data for planning and forecasting
- Maximizes the accuracy of production cost data
- Incorporates industry best practices
- Is purpose-built for the mining, metals, and mineral processing industries
- Leverages and integrates with current investments in ERP and technical point solutions
- Entails a short and achievable implementation cycle
- Is supported by professionals with deep mining industry experience and long-term focus

What is required to align KPIs, improve information flow, reduce the costs and complexity associated with managing multiple point solutions, and successfully implementing and managing ROCs, is an integrated mining operations management platform that bridges the functional silos. This enables more holistic performance measures to drive profits, not tons, while also leading to faster and more on-target analysis of operational problems wherever they arise.

Mining companies that can bridge the gaps among functional areas and begin streamlining their operations as a whole can enjoy increased production and improved safety while at the same time slashing energy and other operating costs and reducing capital expenditures.

Reflecting thirty years of ongoing collaboration and partnership with leading mining organizations, Ventyx's mining operations management solutions offer both rich feature sets and unrivaled integration, enabling customers to make better decisions to optimize operations, assets, and profitability – even in unpredictable environments.

In addition to delivering proven, integrated solutions to manage planning, extraction, processing, and delivery of raw materials, combined with B2B collaboration tools, Ventyx offers integrated systems for managing the entire mining support mechanism, including equipment, maintenance, logistics, production, and personnel. Further, Ventyx offers a full range of outsourcing and value-added consulting services from implementation to systems integration to technical support, including managed services.

## Conclusion

With a comprehensive mining solution spanning all key processes from exploration to receipt of payment for products sold, Ventyx is uniquely positioned to help mining organizations maximize profitability, safety, and compliance.

### About Ventyx

Ventyx, an ABB company, is the world's leading supplier of enterprise software and services for essential industries such as energy, mining, public infrastructure and transportation. Ventyx solutions bridge the gap between information technologies (IT) and operational technologies (OT), enabling clients to make faster, better-informed decisions in both daily operations and long-term planning strategies. Some of the world's largest private and public enterprises rely on Ventyx solutions to minimize risk, enhance operational and financial performance, and execute the right strategies for the future.

To learn more about Ventyx solutions visit [www.ventyx.com](http://www.ventyx.com) or contact a Ventyx sales representative today.