

IBM Natural Resources Framework for Mining

Smarter systems for improved operational efficiency and output



Highlights

- Improve visibility, operating efficiency and decision making
- Create near real-time visualization of system operations, assets and business processes
- React nimbly to market dynamics, weather and logistical issues
- Simultaneously monitor, analyze and optimize global activities
- Respond to shocks and shifts with flexibility and speed
- Speed decision making with enterprise-wide access to process performance
- Reduce regulatory risk and aid in compliance

It is no exaggeration to say that the business of identifying and extracting natural resources—including oil, gas, minerals, metals, fibers and wood—is critical to modern life on this planet. These raw and base materials make up our homes and buildings, they power our transportation systems, and they are found in nearly every product bought or sold.

As global population totals continue to grow—up to 10 billion by 2050¹—the demand for these natural resources intensifies accordingly. Driven by the increasingly open economies and growing middle classes in Asia-Pacific countries, spot prices and accompanying sales volatility are forcing natural resource companies, especially mining companies to focus on improving efficiencies across the enterprise.

The mining industry is increasingly investing in technologies to harness and use more renewable energy sources. Yet without the ability to manage and coordinate data, analyze and extract insight, and increase productivity, these new market investments could be wasted. From reducing environmental risk to increasing agility across production and supply processes, every business area must work more profitably.

Globally, the challenge is to enhance production, improve refining and manufacturing efficiency, and optimize global operations across production assets, mines, quarries and manufacturing plants. Being a successful player depends more than ever on

knowing in real time your own circumstances—assets, finances, markets, skills, and commitments—and being able to accurately evaluate information from partners and suppliers.

IBM Industry Frameworks

IBM Industry Frameworks integrate and optimize IBM software capabilities for specific industries. IBM Industry Frameworks help clients deploy business solutions faster while lowering project cost and risk. Industry extensions, prebuilt solution accelerators, best practices gleaned from customer engagements, implementation patterns, architectural blueprints, and support for open systems and industry standards help support companies seeking to benefit from smarter operations.

IBM Natural Resources Framework for Mining

The IBM Natural Resources Framework for Mining is a road-map for transforming how business users view and interact with their field assets and teams. The Framework provides production decision makers with new or improved capabilities, including optimal approaches to:

- Production operations
- Intelligent asset management
- Supply chain optimization
- Health, safety, risk and environment

Support for ore, refinery and plant production and delivery

The IBM Natural Resources Framework for Mining supports integrated operations between all lines of business. Natural Resources Framework solutions are designed to help you:

- Align technology with business needs, one project at a time
- Realize flexibility and choice
- Reduce cost and risk from capture to final destination
- Accelerate time to value
- Improve resiliency and security

IBM Metals and Mining Center of Excellence

The IBM Metals and Mining Center of Excellence (CoE) concentrates Metals and Mining expertise from IBM Global Business Services practice worldwide. Our core team consists of uniquely experienced, knowledgeable subject matter experts who have engaged in industry assignments in strategy, process improvement, and technology. The team also harvests various technology, process improvement and strategy capabilities from across IBM. Current capabilities include:

- Strategic Blueprints
- Process Improvement and Standardization
- Maturity Profiling
- Sales and Operations Planning
- Logistics Strategy and Execution
- Inventory Norm Setting
- Customer Relationship Management
- Corporate Dashboards and KPI Benchmarking
- Supply Chain Planning
- Financials and Controlling
- Technical, Administration and Application Development

Recently articulated client needs have included strategic sales allocation for mining, optimization of ore blending, and supply chain simulation, among many other projects. Clients have teamed with the Metals and Mining CoE to:

- **Reduce Working Capital:** Lower raw material and finished goods costs, lower work-in-progress, and lower accounts receivable.
 - **Decrease Operating Costs:** Optimize logistics costs, lower sales and administration costs, improve employment costs, and better manage operational variances.
 - **Increase Revenue Growth:** Improve order-book visibility, value creation, and service levels; identify missed opportunities, and increase customer satisfaction.
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Transforming metals and mining businesses

Many companies currently view their business in terms of the ability to optimize capacity, reduce costs, and help reduce yield and price vulnerability. Today, mining companies must do more with less, focus on value, and make the fundamental business model shifts that can help build financial solidity and breed a pattern of success.

Throughout the industry, companies are adopting the technology and instrumentation to improve exploration, production, and reclamation efforts. Expert remote management systems are using engineering expertise to improve efficiency and optimize existing drilling, completion and production techniques. Precise control of production conditions allows manufacturers to make metals with special properties. And smarter supply chains integrate production scheduling, inventory monitoring, and order backlog.

Transforming operations is not just about management. It's also about anticipating problems before they occur and in some cases adjusting automatically to prevent them, reducing the risks. To realize such advances, smarter mining enterprises are transforming their operations with IBM Natural Resources Framework solutions.

Smarter supply chains

As precious natural materials must be claimed in ever more dangerous locations, the need grows for companies to have reliable information to support timely decisions for operational safety and precise delivery. Today's high performance supercomputing can help integrate multiple sources of seismic and geologic data into advanced data models that increase resource capture success rates. And optimization and visualization techniques can advance your analytic capacity, rendering large amounts of complex data in more intuitive ways for improved insight and productivity.

The Natural Resources Framework has four Domains and 28 Projects

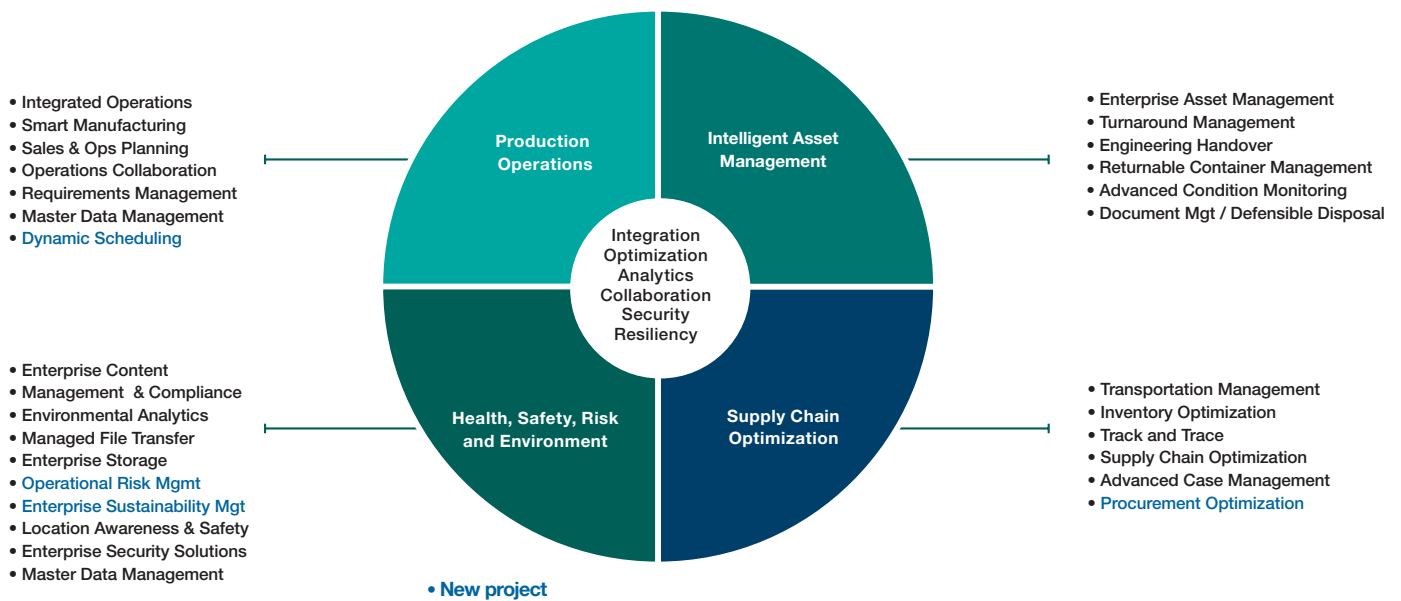


Figure 1: The Natural Resources Framework for Mining supports key business areas.

Improved refining and manufacturing efficiency

Downstream operations provide thin margins in the face of constant cost-containment pressure. Add the short-term volatility of raw material supplies, and the need for flexibility and responsiveness is clear. Near real-time operational visibility can help control costs by allowing nimble reaction to market dynamics, weather and logistics issues. Running computer simulations and creating ‘what-if’ scenarios can aid the optimization the performance of assets, facilities and employees, while improving safety and regulatory compliance.

Optimized global operations

Sharing ore, quarry, refinery and logistics data across global sites, organizational units and locations is a daunting challenge. Companies must make sure the right information, integrated seamlessly and without redundancy, is available to manage business areas and investments. Sensor-based technologies can help increase visibility across an entire enterprise, while advanced supply chain analytics can simultaneously monitor, analyze and optimize global activities.

Production operations: Streamlining the value chain from exploration to delivery

Smarter production begins with improved insight. IBM Natural Resources Framework for Mining solutions includes advanced visualization and analytics to render large volumes of complex data to help facilitate analyses that reduce exploration risk and cost. When a mine or plant is in production, spatial and temporal data assimilation and time-lapse seismic information can improve modeling, and increase extraction efficiency.

Smarter production also includes a flow of information—such as metallization rates, resource content, pressure acoustics and temperatures—that creates a near real-time visualization of system operations. The ability to effectively maintain equipment relationships, track events and conditions across multiple processing and production units, set triggers and alerts, and deploy monitoring regimes helps create situational awareness for deep insight.

Supply chain optimization: Using RFID technologies and integrated analytics

A smarter supply chain begins with improved visibility. Supply chain optimization offerings provide information visibility to increase transparency and control over the extended global supply chain through such technologies as RFID. Linking critical operations and assets throughout the network can help organizations optimize production across multiple sites, phase maintenance efficiently, and trace loading and routing from plant or mine to port, rail or truck.

Business intelligence and performance management offerings deliver greater insights for better decision making to optimize inventory with analytics-based solutions built upon industry-specific blueprints and dashboards. With dynamic planning and rescheduling, procurement and inventory optimization, strategic sourcing and transportation management, companies can enjoy a more agile supply chain. Responding to shocks or shifts in geothermal conditions, production, demand, and logistics with flexibility and quickness can drive process

improvements throughout the enterprise. And strategic planning that can span decades can be implemented with less risk and increased profitability.

Advanced Condition Monitoring

Mining operations manage a multi-trillion dollar asset base in which the costs for downtime, scheduled or unscheduled, are enormous. But current condition-based maintenance approaches are driven by single assets or situations rather than being prescriptive and proactive. Asset monitoring and management solutions that treat these issues as distinct business domains separate from revenue production are short-sighted.

Deep modeling and analytics integrated with business processes built from enterprise strategy objectives that comprise the whole supply chain treat system health as one output state. IBM Visualization for Condition Monitoring built on IBM Maximo® is not simply better maintenance and asset management but predictive, prognostic condition monitoring designed to help mining enterprises analyze, extrapolate, improve and eliminate defects and inefficiencies.

- **Optimize resource usage:** Improve visibility into asset conditions for making informed decisions and understanding of tradeoffs
- **Close the loop:** Between equipment performance monitoring and production operation scheduling
- **Improve team efficiency:** Provide a single dashboard to monitor any asset
- **Decrease unnecessary maintenance:** Extend the life of assets

Intelligent Asset Management: Optimize utilization while reducing cost and error

Smarter asset lifecycles begin with integrated and interconnected instrumentation. By combining workflow information and decision support tools into a comprehensive view of all asset types—production, facilities, transportation and IT—companies are helped to optimize asset utilization. Predictive analytics capabilities help to increase efficiency and performance of mission critical assets.

Increasing asset utilization can help companies streamline production workflow while improving employee safety and reducing human error and downtime. Dashboards can help optimize both planned and unplanned shutdowns, assess the preparedness of turnarounds, and run scenario planning with the benefit of mathematical models.

Health, safety, risk and environment: Mitigating risks while assisting compliance

A smarter environment begins with a holistic approach. Automated reporting and a strong governance model integrated into key health, safe and environmental systems can help companies comply with regulatory guidelines. Monitoring and reporting solutions offer efficient, cost-effective tools to help companies manage assets throughout the manufacturing process and prevent damage and loss.

Using technologies like RFID, near real-time visibility of employees, contractors and authorized individuals within your enterprise provides optimum awareness. Solutions work with Wi-Fi, ultra-wide band, and ultrasound and support all major manufacturers of both tags and sensors. Using such technology helps provide a safe and secure environment cleared of internal and external threats to people, content and operations.

Natural Resources Framework technology

The IBM Natural Resources Framework for Mining is built with distinctive, leading-edge technology and practices that make realizing these capabilities viable, affordable, and flexible, even in the most complicated system environments. Most importantly, using IBM® SMART SOA® and other techniques, the Framework approach does not require a replacement or transformation of existing IT, but instead embraces current IT investments as a foundation for building new and flexible data integration features.

Based on experiences from global metals and mining projects, the IBM Natural Resources Framework links to key industry standards and techniques for representing process equipment

and related measurement data, documents, reports and specifications. Our clients can now manage a previously overwhelming array of disorganized process tag information, including the ability to “name” and locate information for an entire enterprise.

Features

Figure 2 shows how different Mining users and systems access new business value in the IBM Natural Resources Framework landscape. The Framework is supported by key technology components that bring together information from a diverse and complex system environment. Distinguishing characteristics include:

- *Reference Semantic Model (RSM)*: Facilitates the exchange of information and does not constrain the way applications implement the information contained within the model, as described by industry standard ISA SP95. RSM enables a dual success: an integrated data set and source data that remains untouched in remitting systems. As a result, the RSM also contains the processes deemed important by the customer.
- *Global industry standards*: Speeds the creation and upkeep of the RSM for the hundreds of diverse data sources. The mix of standards best represents the varied aspects of metal and mining operations.
- *SMART SOA approach*: Deploys new applications rapidly without a “rip n’ replace” approach to old systems. New systems and capabilities can be installed and made available for use in other systems, while technology investments from the past are protected.
- *Configurable event rules engine*: An intelligent agent for complex business processes and web services initiation. The rules engine monitors data and key performance indicators (KPIs) based on particular thresholds as well as on sophisticated historical models.
- *User visualization, collaboration, and analytical toolset*: Provides a portal and metaphor for mine, foundry and plant operations, with visual, clickable representations of assets. The user can view metrics in their entirety by looking at animated summary icons, each with the ability to drive down into further levels of detail.

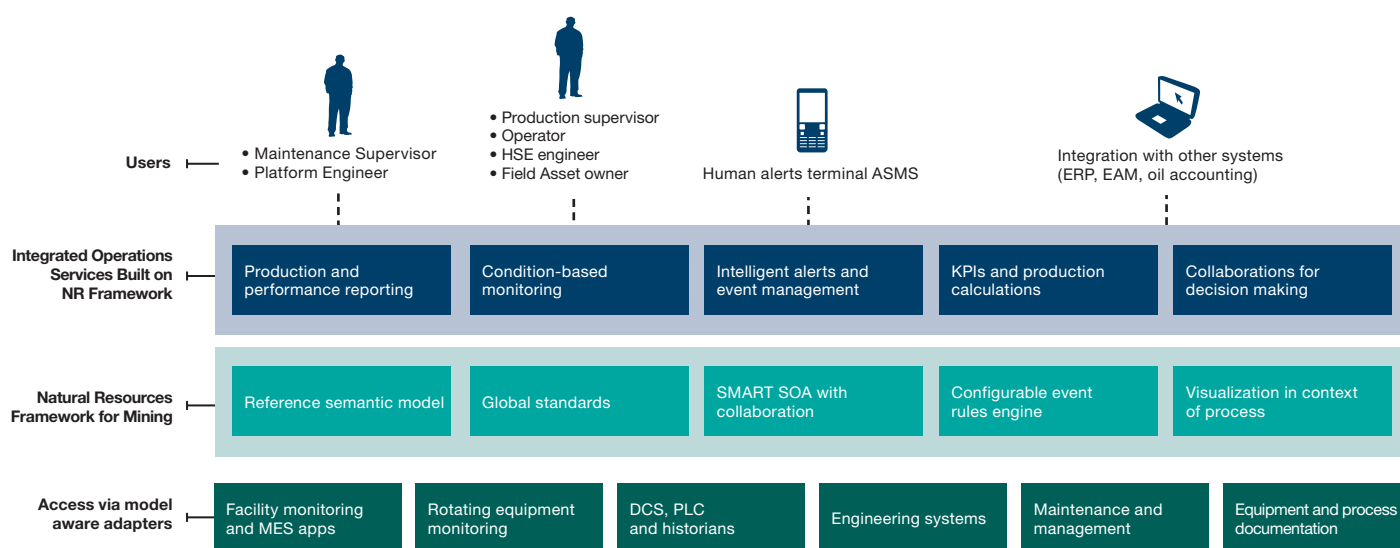


Figure 2: Distinguishing characteristics of the Natural Resources Framework landscape for mining organizations.

The IBM Advantage

As one of the world's largest and most successful consulting and technology solutions companies, we have the credentials and capabilities to deliver Natural Resources Framework solutions to your operations. Our deep understanding, investment and experience in successfully delivering these solutions to enterprise-class mining companies worldwide differentiates IBM from competitors.

Some key advantages that make IBM an ideal implementer of the Natural Resources Framework for Mining include:

- *A proven, deployed solution:* We've done the detailed design and construction of the Framework for the real world, and can bring this model and toolset to our clients, rejecting a "blank page" or theoretical approach.
- *Experience:* We've successfully piloted, tested and measured real results at leading companies across the globe.
- *Practice depth and breadth:* Our team is uniquely positioned to deliver innovative industry solutions throughout the mining value chain based on our deep R&D capabilities, comprehensive portfolio, and unmatched global presence.
- *A focus on results, partnership and innovation:* IBM prides itself on creating genuine partnerships with our clients that are focused on business results. We invest heavily in industry innovation and bring this benefit to our client partners.
- *Ecosystem of industry-leading Business Partners:* IBM Business Partners have true, world class experience in helping customers in mining industries achieve their potential in our comprehensive, value-driven approach to solving business problems.

Natural Resources Framework Solutions

IBM Smarter Operations Enterprise solutions design, build and integrate foundational elements into a complete view of the entire organizational ecosystem. Key components include asset management, repair planning and scheduling, inventory management, service level management, and condition-based maintenance. Projects are designed to help:

- Improve operational efficiency and reduce costs
- Reduce risk and increase safety for workforce
- Increase savings in supply chain efficiencies and use of assets
- Provide near real-time insights for better decision making
- Consolidate into one location for convenience and ease

IBM Smarter Supply Chain Enterprise solutions establish and optimize the supply chain, from specific process improvements and advanced condition monitoring to scenario planning and increased collaboration and visibility across all business sites. Key components include movement of materials from pit and plant to port and hatch, supply chain process management, stockpile analysis and risk management. Projects are designed to help:

- Reduce time and costs associated with processing and asset maintenance
- Manage predicative issues and analyze stockpiles in real time
- Provide greater control and oversight of product
- Increase time to market

IBM Smarter Health, Safety, Risk and Environment Enterprise solutions establish an integrated risk mitigation and compliance management environment to meet sustainability, security and safety objectives for better reporting and reduced investment. Key components include risk coverage and management, advanced visualization and monitoring, and deep analytics. Projects are designed to help:

- Create one total solution for all areas
- Use analytics to mitigate risk and measure compliance
- Limit overall investment
- Provide safer, sustainable work environments and technology

Let's continue the conversation

Are you ready to get started? We invite you to hear our story and learn about yours. We want to know more about your specific challenges, and explain to you in detail about the IBM Natural Resources Framework for Mining, and our vision for integrated operations and unit efficiency.

For more information

To learn more about the IBM Natural Resource Framework for Mining contact your IBM representative or IBM Business Partner, or visit: ibm.com/software/industry



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Produced in the United States of America
July 2012

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¹ US Census Bureau International Data Base, "Total Midyear Population for the World: 1950-2050 (table)," June 2011.



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