



Energy & Resources

Empowering the Mining Industry

Digital transformation's next phase



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Introduction

Digital transformation is widely adopted in the mining industry. While some companies undertook bold programs to advance their Mine-of-the-Future visions, many took an incremental approach focused on specific problems. A few were quite late starting their transformations and are catching up quickly. The digital transformation path was similar for mining industry OEMs, ISVs, distributors, suppliers, and service providers.

Companies reaped benefits and value from digital transformation, but the journey is not over. Some transformative opportunities were only partially addressed, others left untouched, and new ones emerged.

This first phase of digital transformation saw some tendency to simply digitize established processes. In this next phase, companies will be more strategic and innovative. They will rethink processes from the first principles and reimagine business processes powered by digital platforms and ecosystems.

Dramatic events have changed the world and its marketplaces during recent years, creating new challenges and opportunities. Companies must now balance and optimize across a complex set of priorities from profitability and productivity through health and safety to energy transition and sustainability. The next two and half decades will be a period of heightened innovation.

Now is the time to explore digital transformation's potential for creating even greater value in a rapidly changing world. Imaginative thinking and innovative digital solutions will help mining organizations drive growth, improve business performance, enhance safety and health, operate more sustainably, maintain their license to operate, be seen as an 'Employer of Choice,' and more.

The following pages examine the progress miners have made, the challenges that remain, and new developments for the next phase in the digital transformation journey.

Our Rapidly Changing World

The mining industry may well stand at the doorway to redemption. At no point in human history has it faced such a wide tapestry of countervailing challenges and opportunities, nor with such urgency.

New Legislative Actions

[United States](#)

In mid-August 2022, the President of the United States signed the Inflation Reduction Act into law. This legislation includes US \$369 billion in energy and climate investments through clean energy and advanced manufacturing tax provisions, emissions reduction provisions, and energy and natural resources programs.

The funding and tax credits under this legislation, which are inwardly directed to the United States, will increase demand across the Climate-smart mineral portfolio. This, in turn, will impact global markets. In effect, the Inflation Reduction Act cements the nascent Climate-smart minerals super-cycle.

During the last week of August 2022, California passed additional legislation to fight climate change which includes US \$54 billion in climate investments targeting clean energy, electric vehicles (EVs), and drought resilience. It adds impetus to existing efforts to reduce and eliminate greenhouse gas emission by mandating that the state stop adding CO₂ into the atmosphere by 2045.

California is the world's fifth largest economy just ahead of the United Kingdom (UK). Its new climate legislation further cements the super-cycle.



What happens in California matters and it matters to miners.

[European Union](#)

In July of 2021, the European Commission introduced a package of legislative proposals aimed at achieving climate neutrality in the European Union (EU) by 2050. The legislation includes an intermediate net GHG reduction target of at least 55% by 2030. In addition, it also focuses on investing in leading-edge research and innovation and preserving Europe's natural environment.^[1]

The European Commission published a Raw Materials Action Plan in 2020 which outlined several non-legislative measures addressing mineral supply and responsible mining practices.

The Act has urgency for both the European Union and for miners, underscoring the need for a more diversified, resilient, and sustainable supply. Projects have long lead times, often 10 to 15 years or more and demand for critical minerals has been increasing due to the transition to renewable energy sources and electric vehicles. To meet forecasted growth in Climate-smart mineral demand ahead of 2030 goals, the parties have a mere two-year window to adopt this legislation and start essential projects.^[2]

A Growing Urgency

A unique set of tensions is in place, which executives must deftly navigate. They must overcome mining's reputation as a 'dirty industry' while providing minerals and metals for clean renewable energy.

Mining companies must discover and bring to market climate-smart minerals and metals even as ore depletion makes reserves replacement increasingly difficult and costly. The tension between prospecting-to-discovery, an often years-long investment, and the rapidly growing demand for climate-smart minerals, requires miners to be far more successful and cost effective in exploration.

It is also important to increase production, in some cases up to 500% by 2050, while reducing and eliminating carbon emissions in operations and supply chains. The tension between discovery-to-production, averaging 12.4 years, and climate goals for 2030 and 2050 requires miners and governments to accelerate the Establish Phase in the mining lifecycle. Miners must shorten the time from commencing production to producing quality products at full design scale, which some find lengthy and frustrating.

In short, miners must be better, faster, and more economical in finding ore bodies and bringing them to production. They will look to OEMs, ISVs, distributors, suppliers, and service providers for new solutions.

License to Operate

A mining operation must receive a legal license to operate and must earn a social license to operate. In recent years, the social license has risen in importance and is now top-of-mind for company boards and executives. In many cases, it is a precondition to receiving a legal license to operate and a condition for the continuance of the legal license.

Obtaining and sustaining these licenses is increasingly difficult. There are temporal incompatibilities between the stakeholders. Miners often plan, invest, and operate across decades. Politicians are concerned with the next election cycle, investors care about quarterly returns, and communities and activists want action. The complex mix of stakeholder values, objectives, and priorities amplifies the difficulty.

Reality and perceptions are important to obtaining and continuing the license to operate. Modern mining companies strive to be good stewards of the Earth. They have implemented many successful projects to restore land, keep air clean, and protect water and ecosystems. In today's digitally connected world, myths and misinformation perpetuate in the absence of facts. Miners must tell their stories well, and companies are turning to a wide range of digital solutions to turn data into meaningful actionable insights.

Climate Change

Around the world, climate change will impact mining operations. Unseasonal and unexpectedly heavy rainfalls threaten infrastructure from pit-to-port with tailings dam safety being a particular concern. Increasingly violent storms imperil transportation for workers who commute to the site and the digital infrastructure for remote workers who tele-operate critical equipment. Brush fires and forest fires can stop mining operations as happened at Western Areas' Forrestania mine in Western Australia during December 2019^[3] and at Pure Gold's Red Lake mine in Ontario, Canada during August 2020^[4].

Mining industry OEMs, ISVs, distributors, suppliers, and service providers will not be spared. They too will experience these impacts.

Increasingly, organizations are applying digital solutions to predict disruptive events and to perform adaptive planning and scheduling in response to real-world conditions. The already-fragile global supply chains are especially susceptible to climate change impacts. Organizations are digitally enabling resilient agile supply chains and are leveraging data for deeper predictive insights.

The impact of climate change on insurance costs is often overlooked. For more than a decade, many insurers have reflected climate risk in their policies and premiums. Organizations can utilize data and analytics to mitigate certain risks and lower insurance costs. For those organizations who self-insure, data and analytics can optimize risk reserves and free up capital for productive investment.



Geopolitical Risk

Increasing volatility and uncertainty in power dynamics around the world during the past decade heightens geopolitical risks. This can be attributed to several factors, including rising nationalist and resource nationalization sentiments, deepening political polarization, growing terrorism, and increasingly sophisticated cyber-attacks. The COVID-19 pandemic, supply chain disruptions, fiat currency-induced inflationary pressures, rising energy prices, and climate risk further exacerbated volatility and uncertainty.

Mining companies as well as their OEMs, ISVs, distributors, suppliers, and service providers, are subject to geopolitical risk and its impacts. In response, they are applying digital solutions to evaluate a wide variety of risks including those in the geopolitical space. They are leveraging data and analytics for more resilient and agile supply chains and are digitally enabling relationship management to form deeper and more durable connections with governments and other stakeholders. They are creating digitally enabled open mining ecosystems and platforms to realize greater value, accelerate innovation, and lower costs and risks.

Supply Chains

Most supply chains are a mix of challenges and opportunities as well as legacy decisions and innovative promises. The COVID-19 pandemic revealed the fragility of global supply chains created to drive high-efficiency, low cost, and fast delivery. Companies around the world, not just those in the mining industry, experienced supply chain disruptions during the last few years.

Now, driven by multiple forces, mining supply chains must undergo a triple transformation. Supply chains must be decarbonized to meet emissions targets, transformed and expanded to deliver Climate-Smart minerals for clean renewable energy, and become more resilient and agile in the face of geopolitical, climate, cybersecurity, and other risks.

New digital technologies, which leverage artificial intelligence and enterprise optimization capabilities, are key to transforming these supply chains. With improved supply chains, miners and their partners are taking mine-to-market to near-real-time levels and creating open mining ecosystems and platforms.



Miners must adjust to rapidly increasing mineral demand, changing commodity demand mix, and price volatility. Supply chains, already reeling from disruptions, will be stretched to their limits. Digital solutions will play a key role in demand forecasting, commodity pricing, adaptive planning and scheduling, portfolio management, logistics, and more.

Joseph Starwood,
Director, Mining Industry, Microsoft

Energy Transition

The mining industry plays a dual role in energy transition. It is a major energy user, consuming 10% of the world's energy.^[5] So, its first role is to reduce energy consumption and better manage energy use in operations. The world must reduce its annual CO₂e emissions from 50 giga-tonnes (metric tons) per year^[6] to net-zero by 2050^[7] to avoid catastrophic climate consequences. So, mining's second role is to provide Climate-Smart minerals for clean renewable energy as quickly and cost-effectively as possible.

Mining operations are leveraging data and utilizing advanced analytics to reduce energy consumption in energy-intensive processes. Some are transitioning to clean electric powered vehicles and are exploring hydrogen-fueled vehicles. Others are utilizing regenerative charging on electric vehicles and are building solar and wind farms. And most are employing sensors and energy management software to drive efficiency across their operations.

Digital Imperative

Digital transformation has redefined how organizations use digital technology with people and processes to drive new business, increase revenue, and meet changing customer and stakeholder expectations. Early digital transformation projects, or 'DX projects' as they were called, began to deliver results.

The past nine years can be seen as the first phase of digital transformation. During this period, companies varied in the degree to which they applied digital transformation, from quite basic to very advanced.

The mining industry was slower to begin and adopt digital transformation than most other industries. For many companies, this period exhibited some common tendencies:

- Selectively digitize processes based on potential value; though not always quantified and less often verified
- Simple digitization of the selected existing processes; typically reports, dashboards, and predictive maintenance
- Early reliance on IT-led efforts; sometimes with little or no business input

In the next phase, mining companies and their partners will be more strategic and innovative in their application of digital transformation. They must be! From energy transition through climate change to license to operate, circumstances require it.



Every organization in every industry will continue to infuse digital technology into every business process and function so that they can do more with less.

Satya Nadella,
Chairman and CEO, Microsoft

Strategy

Companies must continue to grow their business while meeting many new challenges. Reviewing their digital transformation progress is a key step in charting a course forward. This requires analyzing their results, reasoning over facts, and synthesizing various findings and insights into a strategy for the next leg of their digital transformation journey.



Reframe Value – Prioritize investments based on value and utilize proof-of-value (POV) exercises that rapidly yield digital minimum viable products (MVPs) that, when shown to be successful, are then implemented at full operating capability (FOC)



Rethink Work – Leverage digital technologies to transform where, why, and how people work to become an employer of choice



Redesign Processes – Apply a first principles approach to build digital-first business processes for better business outcomes and greater value realization



Reshape Business Models – Engineer powerful digitally enabled business models that transform the way business gets done



Refashion Relationships – Leverage open ecosystems and other consortium models to form Dynamic 360-degree relationship networks with suppliers, customers, and other stakeholders for greater value

Innovation

Companies must innovate far more rapidly than they have in recent years.

Some companies are addressing Energy Transition opportunities and challenges by establishing Energy Innovation Centers of Excellence (CoE). An Energy Innovation CoE combines the talent, insights, and tools to envision and accelerate innovative new energy solutions and business models across energy efficiency, generation, purchasing, consumption, and management as well as balancing across renewable, clean, and fossil energy sources. It introduces new energy-smart capabilities into an organization, the creation of new energy-smart products and services, and the development of new energy-based revenue streams.

As other companies combine forces to drive co-innovation in sustainability, miners are co-innovating with the suppliers, customers, and academics on new mining equipment, processes, and products that enhance sustainability and provide low-carbon and even zero-carbon commodities to the marketplace.

Companies are also innovating in four broad categories.



Operate for the future – Modernize for more connected operations and assets, for improved worker health and safety, and for more resilient and agile supply chains



Transform your workforce – Leverage digital technologies and mobility to create a workplace that empowers office and field workers, improves talent management and skill enhancement, and strengthens communication and collaboration leading to productivity and process improvement



Transition to clean – Digitize the enterprise to more fully utilize renewable and clean energy sources, better manage and reduce emissions, and enhance environmental performance to meet net-zero commitments



Reimagine Energy – Envision the future of energy in mining with innovations that create energy flexibility, enhance energy resiliency, lower cost, expand market position, open growth opportunities, and enable new business models



The Digitally Transformed Mine

Mining is at a crossroads. Optimizing across the value chain and across the lifecycle for the many different goals and constraints now exceeds human capacity and capability. Miners must optimize operations for profitability, productivity, labor, and reserves, as well as for safety, health, and environmental outcomes. Miners must operate sustainably across emissions, water, waste, and ecosystems and preserve their license to operate, while securing against cyber-threats. Such optimization cannot be done with pencil and paper, manually updated status boards, scattered spreadsheets, or even a handful of siloed industry-specific applications.



What's really needed going forward?

To accomplish such complex optimization, and in the time frames now being imposed, miners must convert real-time data into actionable insights. These insights must be communicated to the right person where they are working, and, on the device they are using. To optimize across so many priorities and constraints and achieve desired outcomes, miners must employ Intelligence Driven Mining.

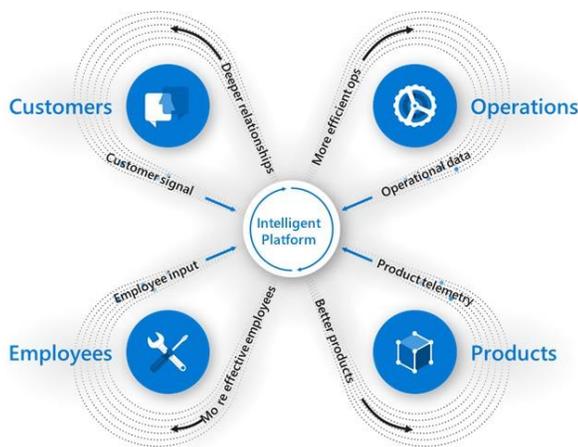


Intelligence Driven Mining

Intelligence Driven Mining (IDM) welds digital transformation to the Intelligence Driven Organization (IDO) concept in the mining industry context.

Digital Transformation

Digital transformation strategically applies digital technology to transform business processes and even business models. It leverages a Systems of Intelligence model including digital feedback loops and an intelligent platform to derive better insights from data. It brings people, data, and processes together for deeper insights into customers, employees, operations, products, and services. In doing so, the organization creates greater value for its customers and stakeholders.



Optimize Operations – Transform operations into an intelligent, highly integrated digital ecosystem to optimize and stabilize processes, improve efficiency and productivity, and work more safely at the speed of business

Empower Employees – Create an engaging digital workplace that enables employees to connect seamlessly and securely, communicate effectively, collaboratively solve problems, and get work done where they are working and, on the devices, they are using

Transform Products & Services – Create innovative new products and services and transform marketing, sales, and customer service to move from hindsight to foresight, disrupt with new business models, win new customers, and open new revenue opportunities

Engage Customers – Build a 360-degree view of customers to enhance their experiences, improve service, build trust, and form long-lasting relationships

Intelligence Driven Organization

The Intelligence Driven Organization concept is a transformational vision—unifying strategy, culture, operating model, and technical capability—to deliver on business objectives and outcomes. In this vision, processes are digitized so that they can be implemented, monitored, and measured, then continuously improved and adapted over time. In an Intelligence Driven Organization, data is surfaced to the business processes that need it. There are no data silos.

An Intelligence Driven Organization strategically uses its data to generate and surface actionable insights that are then presented to employees on their devices where they are working. With in-time in-context insights, workers can make better decisions for better business outcomes, which fosters growth, innovation, speed to market, and cost efficiency as well as enabling energy transition, sustainability, ESG, and other business outcomes.

Digitally Connected

Actionable insights require accurate and timely data, which increasingly comes from sensors and digital networks that miners have installed and are installing across their value chains.

New equipment now often comes with a host of sensors. In addition, mining operations are deploying new automated vehicles and equipment. These kits come with a large array of sensors. On legacy equipment, mining operations are selectively retrofitting sensors.

Increasingly, mining industry organizations are installing digital networks either across their operations, in support of their clients, throughout their manufacturing plants, or within their service centers. This often includes a combination of cellular, coaxial cable, Ethernet, and/or fiber. Recent advances in technology are enabling miners to deploy private mobile edge computing (PMEC or private MEC) wireless networks. These deliver a significant advantage over wired networks in mining where pit and underground configurations change frequently. They are also ideal for mining processes requiring near real-time insights and decision-making or requiring additional data security. [Azure private MEC](#) is one example. Azure private MEC combines network functions, applications, and edge-optimized Azure services. It delivers high performance and ultra-low latency capabilities to address the challenging business needs of miners and their partners.

Other organizations are looking to deploy low-latency satellites to provide off-grid broadband communications for data transfer as well as precise geo-positioning for autonomous mining. [Azure Orbital](#) is one example. It is a fully managed cloud-based ground station as a service that allows organizations to streamline their operations by ingesting space-delivered data directly into Azure.

Digitally Represented

Data enables organizations to ask important questions about their operations. What is happening? Why? What caused it? What will happen if we make this change? Digital twins, at various scales, help miners answer these questions.

A digital twin represents in digital form one or more parts of or even the entire operation. With digital twins, organizations can design and predict how new and modified processes will perform and see how changes will impact both up- and down-stream processes. They can operate and visualize to gain insights into what is working as planned and where decisions must be made. And they can observe and analyze to find root causes for problems as well as continuously improve performance.

Mining operations adopt digital twins to improve haulage, enhance mineral processing, improve safety, secure tailings dams, and optimize across the mining value chain. One example, [Azure Digital Twins](#), enables organizations to create a digital representation of real-world things, places, processes, and people.

Optimize Your Operations

Applying digital transformation across the value chain, organizations are optimizing their operations. They are gathering data across a wide, diverse set of endpoints and are using analytics and Artificial Intelligence (AI) to derive deeper operational insights and make better decisions for better business outcomes.

Discussion

Miners are using data-driven insights to improve exploratory drilling programs, optimize drill and blast, streamline load and haul, and enhance comminution and mineral recovery. They are using these insights to improve and stabilize complex processes, predict and prevent equipment failures, monitor and secure tailings storage facilities, and protect worker health and safety. And they are using these insights to create more resilient and adaptive supply chains, transition to clean energy, operate more sustainably, and forge better relationships with communities and indigenous peoples.

Mining OEMs are using data-driven insights to optimize their manufacturing processes, improve product and service quality, and reduce waste. These insights help improve equipment performance in the field, recommend optimal maintenance and rebuild points, and extend vehicle service life. They also help protect worker safety and health, manage inventory levels and costs, and gain control over their supply chains.

Case Study: Metinvest Holding

Ukraine-headquartered Metinvest Holding is a major name in steel manufacturing with integrated iron ore and coal mining. Its operations in Ukraine, Italy, Bulgaria and the UK manufacture coke products, iron, and semi-finished steel products, sections, and flat products. Metinvest Holding wanted to improve the efficiency of its blast furnaces and used digital transformation to think differently by combining good science with a simple but elegant digital solution.



In line with our Cloud First strategy, Metinvest Group uses Azure services as an enabler for implementing digital initiatives. We use cutting-edge technology stack like the one we see in the forecasting silicon content project. Moreover, we are moving forward to building corporate Data Lake and Data Warehouse based on Azure that helps us significantly improve the culture of Data Management and maximize our operational efficiency at Metinvest.

— **Sergiy Detyuk**

Chief Information Officer at Metinvest Holding, and CEO at Metinvest Digital

Fuel usage in a blast furnace depends on several factors, one of which is the silicon content in the cast iron. The company executed a pilot project leveraging **Azure Data Factory**, **Azure Machine Learning**, and **Power BI** to reduce fuel consumption by controlling the silicon content in its iron. As a result, silicon variability decreased from 0.16 to 0.10, making it possible to reduce the silicon content in cast iron and obtain the targeted savings on coke.

[Now, Metinvest Holding's ambition is to embed digital solutions](#) along the whole value chain to bring significant operational improvements from the next level of data-driven process management.

Empower Your Employees

The nature of the workforce and of work has changed dramatically. Experienced senior professionals are retiring, taking a motherlode of knowledge and expertise with them. Meanwhile, digitally savvy younger workers are seeking employment, bringing new expectations about ways of working. And the COVID-19 pandemic made remote work and hybrid work a necessity.

Through digital transformation, organizations have an opportunity to empower employees, make work more engaging, help employees perform better, improve workforce safety and health, promote diversity and inclusion, and even transform the workplace environment.



Digital transformation starts with your employees and how your culture empowers them to transform and grow the business. At Microsoft we aspire to have a culture with a growth mindset, with an insatiable curiosity about our customers' needs, and a drive to find new market-making opportunities.

Kathleen Hogan,
Chief People Officer, Microsoft

Successful organizations use the power of mobility to deliver data-driven insights and empower collaboration where employees are working and, on the devices, they are using. They utilize near real-time business metrics, dynamic dashboards, collaboration platforms, and the power of social conversation to enhance workforce productivity and effectiveness. As a result, workers make timely in-context decisions that create better business outcomes.

Discussion

Organizations use modern digital workforce technologies to improve communication and collaboration, enhance decision making, and enable remote and hybrid work. With low-code and no-code platforms, like Microsoft [Azure DevOps](#) and [Power Platform](#), they empower workers as citizen developers. And data visualization platforms, like Microsoft [Power BI](#), empower workers as citizen data scientists.

Organizations are improving safety, reducing travel costs, and solving problems in real-time through remote assistance capabilities, such as [Microsoft Dynamics 365 Remote Assist](#).

As small as it may seem, one of the most beneficial solutions in the mining workplace is replacing manual paper-based processes with mobile applications or even automated data capture from sensors and devices. Such solutions have a significant impact on data accuracy, quality, and timeliness. They also have a dramatic impact on workforce safety.

Mining OEMs for movable and fixed equipment are using mobile solutions and augmented reality, such as Microsoft [Dynamics 365 Connected Field Service](#) and [HoloLens 2](#), to enable field service professionals.

Some organizations are taking a more strategic approach. They are using modern workplace platforms, such as [Microsoft 365](#) and [Teams](#) to increase knowledge sharing across organizational boundaries, support collaborative problem solving, and even promote a more unified corporate culture.

Case Study: Mining Engineering Company

Microsoft worked with an innovative engineering company that provides equipment and services to mining organizations around the world, who use the equipment and services to improve performance, reduce costs, and protect the environment. The customer's sustainability ambition is to enable mining companies to move towards zero emissions by 2030.



Better faster engineering results are critical to providing a steady stream of new innovative solutions to meet customer needs and realize the sustainability vision. The company's engineering teams needed greater computing power to achieve better results faster. These geographically dispersed engineering teams also needed more convenient access and reduced latency.

Through digital transformation, the customer found the perfect mechanism for optimizing the engineering simulation platforms that depend on high-performance computing, and chose the UberCloud Engineering Simulation Platform, built on Microsoft technology. It incorporates [Azure high-performance computing](#) (HPC) with [Azure CycleCloud](#) to ease access, optimize performance, and simplify management of the full HPC cycle.

Engineers benefited at once from increased performance. In one instance, they achieved results 10 times faster, and no longer faced latency and computing limitations. In addition, the IT team was freed from provisioning computer resources. It's a win-win.

[Learn more about how Microsoft empowers employees.](#)

Transform Your Products and Services

Organizations are using digital transformation to fundamentally change the way they innovate. They are using digital technologies to connect people and ideas, enable better collaboration, and work across organizational and geographic boundaries. Through digital solutions, they facilitate knowledge sharing and problem solving, and creating a Culture of Innovation.

These organizations are using data, often from smart products, to gain valuable insights. These insights lead to better operational performance, increased productivity, improved maintenance, longer equipment life, greater profitability, and enhanced safety. Insights revealing how equipment is operated to improve the way they work. Insights about equipment performance enable manufacturers to improve product designs and manufacturing processes.

Digital transformation empowers organizations to create an accelerated pipeline of new ideas and bring new products and services to market quickly. This increases value to customers, strengthens competitive position, and generates new and improved revenue streams.

Discussion

Climate change is a significant new driver for innovation in mining products, equipment, and services. Companies are bringing low-carbon and zero-carbon products, like aluminum and iron, to the market. Manufacturers in the mining industry are introducing new energy-efficient equipment and are lowering the embodied carbon content of their products.

Mining companies, now more strongly focused on ESG performance, are implementing sustainability projects to reduce emissions and waste, and protect water and ecosystems. Manufacturers in the mining industry are introducing new equipment and processes including electric and hydrogen powered vehicles, dry mineral processing, renewable electrical generation, and energy management systems.

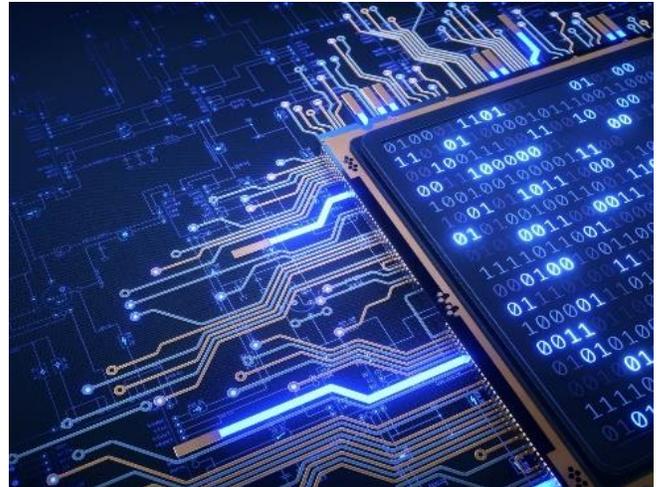
Safety and health are top of mind and continue to drive innovation. Mining organizations are protecting worker safety using digitally enabled safety platforms, mobile incident reporting applications, and more. Manufacturers in the mining industry are working with customers to eliminate live work (ELW), remove people from high-risk equipment, processes, and areas. They are introducing new stand-off equipment diagnosis solutions, collision avoidance systems, worker proximity warning systems, and exposure monitoring devices among other things. Independent software vendors (ISVs) are introducing video and image analytics based solutions to detect people in restricted areas, protect people near moving equipment, identify people entering and leaving work areas, and more.



Case Study: Sandvik

Sandvik is one of the world's largest suppliers of mining equipment for drilling, blasting, loading, and hauling. The company is committed to making mining more sustainable with innovative leading-edge technology.

Miners operate in remote locations under extreme conditions. It is critical that mining equipment operates at optimal efficiency. Until recently, mining operations often had limited visibility on the state of the equipment.



Sandvik's equipment is fitted with hundreds of sensors that constantly collect telemetry data on the state of the equipment. In the past, this data was stored locally on servers. This prevented Sandvik from leveraging the power of Big Data and advanced analytics.

Embracing digital transformation, Sandvik created an AI-enabled solution that uses data to generate insights about the state of mining equipment. The solution uses [Azure IoT Hub](#) to securely ingest telemetry data from the sensors. The data is cleansed using [Azure Databricks](#) before being centrally stored in [Azure Data Lake Storage](#). The solution applies Azure Synapse Analytics and [Azure Machine Learning](#) to produce actionable insights into equipment performance and status.



Our solution can help us to identify when the machine is going to fail, understand its state and intervene before it actually fails. This allows us to deliver customers benefits in terms of productivity, safety, energy, and fuel efficiency.

— **Esa Mattila**

Reliability & Productivity Center Manager at Sandvik

These insights help miners optimize equipment operation. Sandvik, being an original equipment manufacturer (OEM), utilizes them to prevent issues from escalating into system failures. Together, [Sandvik and its customers are achieving significant sustainability and efficiency benefits](#) across many mines.

Engage Your Customers

Organizations are using digital transformation to engage customers in powerful new ways. They are transforming their marketing, sales, and customer service for better customer outcomes and experiences. They are applying a holistic approach that incorporates customer relationship management and multi-channel capabilities with social listening and advanced analytics to acquire new customers, build brand awareness, and increase lifetime customer value.

Discussion

Those mining companies that have direct customers are improving product quality and delivery, anticipating needs, and forging deeper relationships. Some are even collaborating and innovating with their customers to better serve their customers' customers. As the circular economy takes hold, and mining companies examine the lifecycle of their commodities, even those companies that do not now have direct customers will seek downstream insights about manufacturers, distributors, retailers, and consumers.

Manufacturers and ISVs in the mining industry are shaping new ways to engage with customers. Some are leveraging data from their smart equipment and products to provide better operational performance, improve service call outcomes, or even to create entirely new digital offerings.

A few mining companies, manufacturers, and ISVs are rethinking the business model entirely. They are beginning to build open mining ecosystems and platforms, an industry-specific case of the open industry ecosystems concept. In these ecosystems, participants securely share data and algorithms to unleash greater value from their data. They even enable participants to securely monetize data and algorithms.

Case Study: Komatsu

Komatsu manufactures mining, construction, forestry, and military equipment as well as other industrial products. Its goal is to achieve dantotsu—an unrivaled level of quality and reliability. This requires the company to be highly innovative.

Daily, tens of thousands of Komatsu equipment pieces are operating around the world. Each provides a rich stream of telemetry data for productivity and condition. The company needs highly efficient and effective tools to aggregate and draw insights from so much data.





The fuel for innovation and digital disruption in our business and our industry is data

— **Todd Connolly,**

General Manager, Construction Solutions at Komatsu Australia

In this case, [Komatsu Australia wanted a modern solution for data analysis, visualization, and presentation](#). It would replace numerous existing mainframe applications. The desired solution had to work well with other existing applications and have an easy-to-use interface for data modeling and organization.

Embracing digital transformation and cloud computing, Komatsu Australia assembled a solution using TimeXtender Discovery Hub, [Azure SQL Database Managed Instance](#), and [Azure Analysis Services](#) running on the Microsoft [Azure](#) cloud platform. The solution also employed Power BI for dashboards and visual analytics giving employees seamless access to information.

Komatsu Australia now has a single consolidated source of truth. Having the data on a single platform helped with data cleansing which led to better understanding and confidence in its accuracy. The company is increasingly automating its analysis for deeper insights. Workers now easily access logistical data, make better decisions, and better manage inventory in response to market and customer needs.

Komatsu Australia has seen a 49 percent cost reduction and 25 to 30 percent performance improvement. This has a direct impact on day-to-day operations. Workers depend on the latest data to do their jobs. The new platform gets data to them more quickly, and as a result, processes run faster and more frequently.

Accelerate Digital Transformation with Microsoft

Microsoft has a strong track record of helping customers accelerate digital transformation. That's because Microsoft's holistic platform and advanced technologies, open and flexible approach, enterprise-grade solutions, and partner ecosystem build on your existing technology investments and deliver results quickly and cost-effectively. Working with Microsoft brings a distinct set of business advantages.

A trusted, flexible, and open cloud platform

Today, the Microsoft Cloud infrastructure supports over 2 billion customers in more than 190 countries. With this unique experience and scale, the Microsoft Cloud can achieve higher levels of security, privacy, and compliance than most customers can on their own. Azure has received more compliance certifications than any other cloud provider, including major global, national, regional and industry standards and regulations. Microsoft's extensive global datacenter footprint covers more regions than any other provider, to better meet data sovereignty requirements. Azure supports a fully hybrid architecture, giving you complete flexibility and control of data and applications delivered between public and private clouds as well as edge computing. The Microsoft Cloud works with any operating system, database, middleware, and application framework, enabling you to use the tools and platforms of your choice.

Comprehensive, enterprise-ready solutions

Microsoft solutions span the full spectrum of business needs, from data access, high performance computing, advanced analytics, visualization, and business process automation. Windows 11 offers universal application capability across devices, with innovations like Surface, Surface Hub and HoloLens. Individual and enterprise productivity is increased by providing the right information to the right people at the right time for actionable insights and decisions. This is accomplished through a suite of collaboration, knowledge management, work process, mobility, business insights, and advanced analytics capabilities.

Advanced technologies designed for ease of use

Microsoft helps organizations apply advanced technologies to business challenges once deemed too costly or complex to solve. For example, Microsoft's Industrial IoT capabilities enable organizations to ingest data from any source, in any format; apply machine learning models, visualize data, and integrate results into collaboration and work process solutions. Data-driven insights enable individuals to make better business decisions and deliver better business outcomes.

Largest ecosystem of industry-leading partners

Microsoft has an extensive ecosystem of prominent systems integrators and independent software vendors which leverages existing technology investments and offers the flexibility to select the best solutions for each business. Our partners design and deploy innovative, industry-focused solutions built on a Microsoft foundation, giving customers best-in-class technology coupled with deep industry expertise.

Microsoft offers a leading end-to-end portfolio as well as an open and flexible approach which helps customers drive digital transformation across their organization to change the way it optimizes operations, empowers employees, transforms products and services, and engages with customers.

Transform your Business

Work with Microsoft and its global partner ecosystem to extend and develop solutions that will transform your business. Tap into our knowledge and expertise with a business outcome workshop, deeper solution session, private preview, or customer focus group—or develop a proof-of-value or minimum-viable-product to drive the right implementations and solutions for your business.

For more information on business solutions and case studies, please visit the [Microsoft for Energy and Resources website](#).

Contributors



Joseph Starwood

Director, Mining Industry, Microsoft



Uwa Airhiavbere

Chief Commercial Officer, Energy & Resources Industry, Microsoft



Hany Soliman

Americas Business Leader for Energy & Resources, Microsoft

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End notes

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1. European Commission, European Green Deal, https://climate.ec.europa.eu/eu-action/european-green-deal_en, Accession: 2022-OCT-14
2. Politico, EU mining code plans alarm both industry and NGOs, <https://www.politico.eu/article/eu-mining-code-plans-alarm-both-industry-and-ngos/>, Accession: 2022-OCT-14
3. Mining Business Media, Western Areas: Brushfire Halts Nickel Mine - Update, 2019-DEC-05, <https://www.miningbusiness.net/content/western-areas-bushfire-halts-nickel-mine-update>, Accession 2022-AUG-25
4. Mining.Com, Forest fire halts Pure Gold's Red Lake operations, 2020-AUG-11, <https://www.mining.com/pure-gold-suspends-operations-at-red-lake-due-to-forest-fire/>, Accession 2022-AUG-25
5. The World Counts, Global Challenges, <https://www.theworldcounts.com/challenges/planet-earth/mining/energy-use-in-the-mining-industry>, Accession 2022-AUG-25
6. Our World In Data, Emissions by Sector, <https://ourworldindata.org/emissions-by-sector#:~:text=The%20world%20emits%20around%2050%20billion%20tonnes%20of,to%20first%20understand%20where%20our%20emissions%20come%20from>, Accession: 2022-AUG-25
7. United Nations, Climate Action, <https://www.un.org/en/climatechange/net-zero-coalition>, Accession 2022-Aug-25