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Tracking the trends 2024

Navigating global challenges and opportunities in mining and metals

Introduction

Navigating global challenges and opportunities in mining and metals

As we enter 2024, the mining and metals industry finds itself at the center of a complex matrix of challenges and opportunities, expectations, and demands.

With supply shortages looming in metals that are critical, not just to the energy transition but to global urbanization and industrialization, stakeholders are acting strategically to secure their supply chains (copper, for instance, is expected to see a supply deficit of 9.9Mt by 2035¹). With supply source alternatives such as urban mining still in their infancy, downstream companies and even governments are striking deals with miners and metals providers in a reshuffle that has seen some traditional value chains realign over the past 12 months.

Organizations also remain under pressure to improve the efficiency of existing assets and operations by embracing generative artificial intelligence (gen AI), leveraging third party delivery models with specialized back office capabilities and to unlock new value in assets. Additionally, the need for mining and metals companies to collaborate with industry peers, suppliers, and competitors to tackle productivity and environmental issues, all while upholding environmental, social, and governance (ESG) expectations in day-to-day operations remains a priority.

With strong business strategies in place and 2050 sustainability targets as its North Star, now is the time for the mining and metals industry to accelerate growth. However, with heightened uncertainty in the global geopolitical sphere and volatility in commodity markets, to do so may not be easy. Companies that navigate uncertainty, work with governments to address permitting issues for new projects, rethink the strategic value of exploration, work with regional players to address skills shortages, and drive toward becoming more purpose-led organizations are most likely to prevail.

In this, the 16th edition of Deloitte Global's *Tracking the trends*, a team of professionals from around the world provides insights and examples as well as practical ideas to help mining and metals companies rise to the challenges that lie ahead and capitalize on new opportunities. We're looking forward to discussing these trends with you in more depth and helping your organization to continue forging its own pathway to success. Thank you for your ongoing support.

Endnotes

1. Camellia Moors and Kip Keen, "[Looming copper shortage shifts attention to alternative supply solutions](#)," S&P Global Market Intelligence, 7 September 2022.



Trend 9

Bringing generative AI into mining and metals:

Capitalizing on current and future opportunities

Shak Parran, partner, Ecosystems & Alliances leader, Energy, Resources & Industrials, Deloitte Canada

David Alonso, partner, Generative AI leader, Deloitte Australia

Sonia Solova, senior manager, Consulting, Deloitte Canada

2022 was a landmark year for artificial intelligence (AI) with the release of ChatGPT, Midjourney, and Bard, which brought generative capabilities and foundational models into homes and businesses around the world. While early traction with these technologies was mainly in consumer-facing industries, generative AI (gen AI) also holds huge potential in industrial and enterprise applications.

In the mining and metals industry, adopting gen AI presents a range of attractive opportunities, including addressing energy security and improving profitability, improving operational efficiencies and resilience, and reducing emissions. Although companies are beginning to realize the potential that gen AI could offer, adding contextual awareness and humanlike decision-making to workflows could significantly change how companies do business in time.

This trend will explore some potential uses that could help to drive productivity and streamline tasks in the short term; look

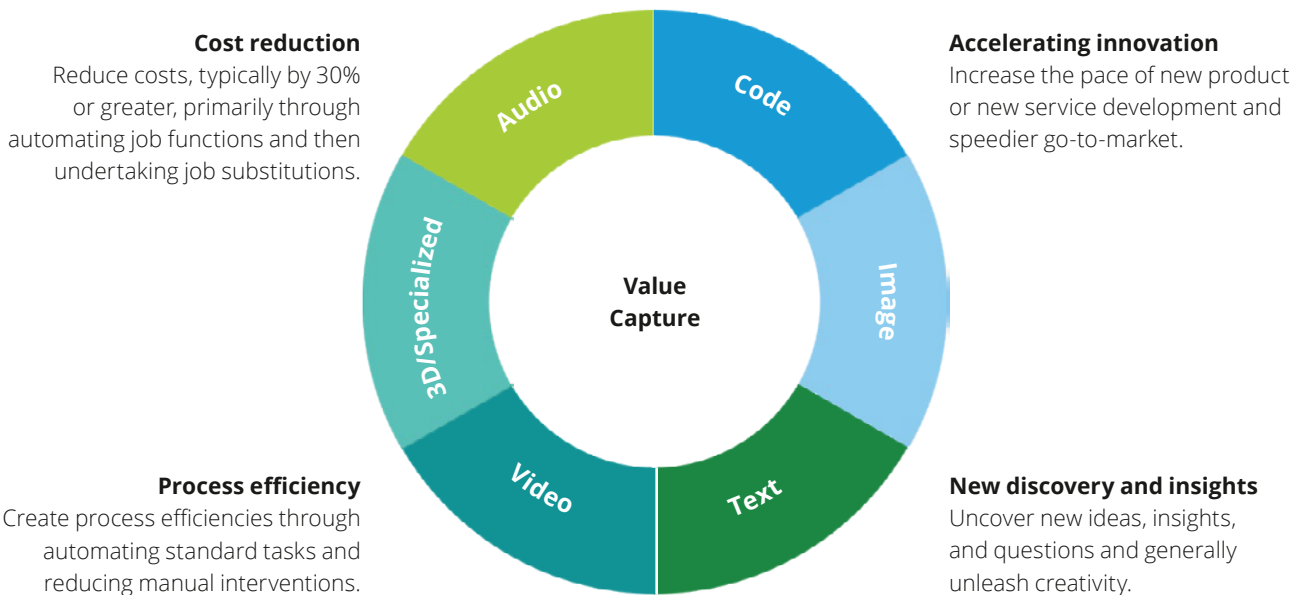
at how early adopters in other sectors are using gen AI to navigate complex and uncertain environments; and discover how mining and metals organizations can prepare for more radical, long-term opportunities enabled by gen AI (figure 1).

Getting a head start with gen AI

While gen AI may be nascent in mining and metals, it's far from new in other industries. For example, [research from Deloitte Digital](#) has found that one in four business to business (B2B) and business to customer (B2C) organizations are already harnessing gen AI in content marketing,² and industry-specific solutions are helping to accelerate pharmaceutical drug discovery and reduce associated costs.³

Historically, the sector has taken a conservative approach to deploying novel technologies and, consequently, companies may be hesitant to become early adopters of gen AI.⁴

Figure 1: The value that Gen AI use cases can enable can be conceived across four dimensions: cost reduction, process efficiency, accelerating innovation, and new discovery and insights.



Source: Deloitte AI Institute, *The Generative AI Dossier*, 2023¹

“Mining and metals organizations have an inherent advantage in this domain, as most possess exclusive and proprietary data that can be used to finely calibrate gen AI models for specific requirements and value-driving use cases. This presents the potential to take a market-leading position when leveraging gen AI models in applications, such as operational optimization or reducing emissions.”⁵

**David Alonso, partner, Generative AI leader,
Deloitte Australia**

According to the Deloitte AI Institute, initiating the adoption of gen AI at this juncture goes beyond gaining a competitive edge in the present, it also creates a foundation for future growth by investing in the workforce. The Institute’s [2023 Generative AI Dossier](#) states, “Contemplating the energy, resources and industrial sector’s future, gen AI will assume a central role in many functions. For example, in optimizing and mitigating health and safety risks by generating worksite-specific safety training that replicates real-world settings and critical scenarios.”⁶

As companies transition to more environmentally sustainable business models—for instance, those built on circularity and climate action—gen AI could also help develop real-time, bespoke training materials that support workforce transitions and the adoption of sustainable practices.

Understanding potential use cases

There are various uses for gen AI that could transform the way mining and metals organizations operate over time, from changing the way that individuals work, to the way that enterprises and their value chains operate. Opportunities and applications will also span different business teams and functions, from exploration to mine design through to shipping and metals trading.

Foundation models are what differentiate gen AI from traditional AI. These are complex learning models that have been pretrained on a broad dataset and can be adapted to solve various problems. Many foundation models today are in the text domain and are driven by vast quantities of available training data. However, gen AI can create artifacts across various modes, including code, images, video, audio, and 3D models. Text, image, and voice are the modes frequently used by consumer-facing gen AI applications today. However, increasingly, the possibility for different modes and even multimodal models could both disrupt and drive step changes in productivity across a range of functions (figure 1).

Transforming work in mining and metals

In the near term, gen AI will likely have an impact on mining and metals organizations mostly through workforce productivity and efficiency. For instance, in the back office, employees are beginning to use tools such as Microsoft Copilot to handle emails, schedule meetings, and write documents. Developers could also use gen AI to enhance their efficiency when writing code, ensure its compliance with various standards, and reduce cybersecurity risk.

“In the field, gen AI could be used for knowledge retrieval, to help individuals access information held within the organization that might be relevant to the task they’re completing.”

Shak Parran, partner, Ecosystems & Alliances leader, Energy, Resources & Industrials, Deloitte Canada

For example, if a technician is changing a part on a haul truck, gen AI could scour the organization’s data for manuals and information that could help them to complete the job more effectively. It could tell the technician which tools and skills they need, and where accidents or mistakes have occurred in the past and how to avoid them.

Virtual “field assistants” like these could help to not only improve safety, but also bridge skills and knowledge gaps by capturing valuable information and experience that could otherwise be lost from institutions as experts retire. Additionally, they could guide new recruits and contractors through processes and workflows where human mentors are not available.

In the future, organizations could use gen AI’s ability to simulate, model, and generate data-driven insights to support supply chain resilience and optimization. For instance, gen AI could help identify and simulate potential disruptions in metals supply chains through assessments of port congestion, shipment routes, and supplier mapping. Supply chain managers could also use these tools to run what-if scenarios in a digital twin environment that reflect the real-world supply chain.⁷

Navigating supply chain complexity with gen AI

Some multinational companies are using gen AI to navigate increasing complexity in their supply chains in the face of geopolitical tensions and pressure to eliminate links to environmental and human rights abuses. For example, Unilever, Siemens, and Maersk are among those using AI to help negotiate contracts, find new suppliers, or identify those connected to human rights matters.⁸

Gen AI can also explore many possible designs to find the most suitable match for a company’s objectives. It not only augments and accelerates design in many fields but has the potential to “invent” designs or objects that humans may have otherwise missed.⁹ This means that, in the long term, it could transform the way in which operations are designed and run.

“Today, engineers spend months, even years, optimizing the design and delivery of mine sites from different dimensions, not just spatially, but also from cost and sustainability perspectives. Once the design is locked in, it can take years to develop and commission the mine, by which time the technologies selected might have been superseded. The ability to generate and adopt new designs through gen AI could be a game-changer.”

David Alonso, partner, Generative AI leader, Deloitte Australia

Capital project delivery and mine design are two functions that could potentially benefit from this capability, which is already proving its worth in other sectors. For example, drug discovery company Insilico Medicine uses an NVIDIA solution to develop new therapies for diseases, such as pulmonary fibrosis. In June 2023, the company announced it had used gen AI for each step of a new preclinical drug discovery process. Doing this using traditional methods would have cost US\$400 million and taken up to six years. But with gen AI, Insilico Medicine accomplished it for one-tenth of the cost and in just two-and-a-half years.¹⁰

Unlocking the value of data

One of the most important capabilities that gen AI provides mining and metals businesses is that it helps people to interact more deeply with data. Despite significant investment in digital transformation over the past decade, some companies continue to work to implement the right infrastructures that allow their workers easy access to the data they need to do their jobs more effectively.

“For many people, interacting with data is still an intimidating process. Even where systems do exist to provide data-based insights to workers, they may not be in formats that are easily understandable or usable. Because gen AI allows people to interact with data through different modalities, like speech and video, it has the potential to act as a facilitator. This could enable a huge leap in the way that organizations interact with their data.”

Sonia Solova, senior manager, Consulting, Deloitte Canada

Although gen AI platforms are still relatively nascent, they're already well-developed, and their capabilities are advancing quickly. Goldman Sachs predicts that as tools using advances in natural language processing work their way into businesses and society, they could drive a 7% (almost US\$7 trillion) increase in global gross domestic product (GDP) and lift productivity growth by 1.5% over a 10-year period.¹¹

By embarking on the exploration and implementation of gen AI now, mining and metals companies could acquire valuable insights, adapt to its nuances, and evolve alongside the advancing technology. This strategic approach may position organizations to leverage the full capabilities of gen AI as it reaches maturity.¹²

From ideas to actions

- **Educate the workforce:** Educating and upskilling the workforce could help remove the fear of the unknown, create buy-in as new gen AI tools are introduced, and help workers perform their tasks better and more efficiently. Education will also help leaders pose the correct questions of gen AI. Investing in this knowledge now will help ensure a strong foundation for when gen AI becomes more widely used in the workplace.
- **Identify and prioritize use cases:** Determine use cases that might be relevant to the organization in both the short and long terms and that can be scaled for the greatest return on investment. Mapping and prioritizing implementations in this way can also help establish whether a build or buy approach is best suited for each solution.
- **Centralize and prepare data:** To produce useful results in knowledge retrieval applications, gen AI models require access to a company's data. Creating a data lake, or similar repository, could help. For more advanced applications that require the tuning of a large language model (LLM), it's important to assess the current state of the organization's datasets ahead of time, as this could affect deployment timelines.

Endnotes

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Global contacts

Stanley Porter

Global Energy, Resources & Industrials Industry leader

Deloitte Global

+1 301 793 4170

sporter@deloitte.com

Ian Sanders

Global Mining & Metals Sector leader

Deloitte Global

+61 3 9671 7479

iasanders@deloitte.com.au

Regional/Country Mining & Metals Leaders

Africa

Louis Kruger

+27 11 806 6165

lokruger@deloitte.co.za

Mexico

Valeria Vazquez

+52 55 5080 7548

vavazquez@deloittemx.com

Australia

Nicki Ivory

+61 422 024 597

nivory@deloitte.com.au

Southeast Asia

Jarrold Baker

+65 9896 1225

jarbaker@deloitte.com

Brazil

Patricia Muricy

+55 21 3981 0526

pmuricy@deloitte.com

United Kingdom

Stacey Toder Feldman

+44 20 7007 0051

stoderfeldman@deloitte.co.uk

Canada

Van Ramsay

+1 416 998 4905

vramsay@deloitte.ca

United States

Teresa Thomas

+1 713 982 2059

tethomas@deloitte.com

Chile

Chris Lyon

+56 9923 44429

clyon@deloitte.com

United States

John Diasselliss

+1 303 305 3972

jdiasselliss@deloitte.com

China

Jill Wang

+86 10 85207766

jillwang@deloitte.com.cn

United States

Bradley Johnson

+1 412 338 7987

bradjohnson@deloitte.com

India

Rakesh Surana

+91 22 6122 8160

rvsurana@deloitte.com

Authors

Trend 1: Putting purpose at the heart of mining and metals—Creating social momentum

Ian Sanders, Global Mining & Metals Sector leader, Deloitte Global | iasanders@deloitte.com.au

Mike Robitaille, partner, Purpose & Momentum practice lead, Deloitte Canada | mrobitaille@deloitte.ca

Trend 2: Navigating global uncertainty—Building capacity to thrive in the face of disruption

Andrew Swart, partner, Energy, Resources & Industrials leader, Deloitte Canada | aswart@deloitte.ca

Patricia Muricy, partner, Energy, Resources & Industrials leader, Deloitte Brazil | pmuricy@deloitte.com

Trend 3: Dealmaking for future-focused growth—Rethinking minerals and metals investments

Nicki Ivory, partner, Mining & Metals leader, Deloitte Australia | nivory@deloitte.com.au

Mark Upton, partner, Tax, Deloitte Australia | maupton@deloitte.com.au

Stacey Toder Feldman, partner, Mining & Metals leader, Deloitte UK | stoderfeldman@deloitte.co.uk

Trend 4: Working toward net-zero—Building capacity and futureproofing ESG strategies for a credible transition

Celia Hayes, partner, Risk Advisory, Deloitte Australia | chayes@deloitte.com.au

John O'Brien, Sustainability & Climate leader, Mining & Metals, Deloitte & Touche LLP | johnobrien1@deloitte.com

Trend 5: Collaborating with governments to rethink regulation—Unlocking critical resources through permitting

Professor Deen Sanders OAM, partner, Integrity lead, Deloitte Australia | deensanders@deloitte.com.au

Michelle Leslie, senior manager, Financial Advisory, Deloitte Canada | milesie@deloitte.ca

Louis Kruger, partner, Energy, Resources & Industrials leader, Deloitte Africa | lokruger@deloitte.co.za

Trend 6: Going back to grassroots—Nourishing growth through investments in exploration

Charles Hooper, director, Consulting, Deloitte Canada | chooper@deloitte.ca

Van Ramsay, partner, Mining & Metals leader, Deloitte Canada | vramsay@deloitte.ca

Trend 7: Addressing workforce challenges through a skills-based approach—Equipping mining and metals companies for the future

Kristy Delaney, partner, Consulting, Deloitte Australia | kdelaney@deloitte.com.au

Joanne Doyle, senior manager, Consulting, Deloitte Canada | joandoyle@deloitte.ca

Trend 8: Unlocking new value in existing assets—Balancing complex priorities and meeting supply demand through operational optimization

Herman Lombard, partner, Industrial Smart Operations leader, Deloitte Canada | hlombard@deloitte.ca

Shak Parran, partner, Ecosystems & Alliances leader, Energy, Resources & Industrials, Deloitte Canada | sparran@deloitte.ca

Trend 9: Bringing generative AI into mining and metals—Capitalizing on current and future opportunities

Shak Parran, partner, Ecosystems & Alliances leader, Energy, Resources & Industrials, Deloitte Canada | sparran@deloitte.ca

David Alonso, partner, Generative AI leader, Deloitte Australia | davalonso@deloitte.com.au

Sonia Solova, senior manager, Consulting, Deloitte Canada | ssolova@deloitte.ca

Trend 10: Third party delivery models—Gaining agility and competitive advantage through next-gen approaches to outsourcing

Tim Boehm, principal, Global Operate leader, Energy, Resources & Industrials, Deloitte Consulting LLP | tboehm@deloitte.com

Rob Hillard, partner, Consulting leader, Deloitte Asia Pacific | rhillard@deloitte.com.au

Mahendra Dedasaniya, partner, Consulting, Deloitte Canada | mmedasaniya@deloitte.ca



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