

How rethinking project management can boost mining's capital productivity

Mining and metals megaprojects



Building a better
working world

Transforming how capital projects are managed can deliver up to 30% more value

The ability to consistently manage and deliver successful capital projects on time and on budget, and sustain high productivity from capital spending, is not a new challenge for the mining sector. As of June 2021, a global study of 192 mining and metals projects with investments over US\$1b showed that 40% of the projects were either on hold awaiting higher prices or for regulatory approval. Of the 60% active projects, 64% of projects faced either cost or schedule overruns, with the average cost overrun being 39%.

Capital productivity, on both a volume and cost basis, is becoming an even bigger concern for global mining executives amid unprecedented volatility and uncertainty. The disruption of COVID-19 has created huge pressures on in-flight projects, including restrictions on cross-border transportation, supply disruptions and workforce constraints.

These factors exacerbate a series of long-standing risks that impact capital productivity. The mining and metals sector has opportunities to tackle the issue, by adopting an innovation mindset and taking an integrated people-process-technology approach to change. The organizations that do so successfully can address legacy performance issues and build resilient operating and project delivery models to weather future storms.



Capital projects overrunning their budgets or schedules

As of June 2021, 64% of projects faced either cost or schedule overruns. 39% of projects face cost overruns (an improvement on 62% observed in EY's study in 2016).



Geographic distribution of capital project investment



Source: Global Data, Q4 2020.

Capital productivity – what it is and how to improve it

Capital productivity is a measure of the efficiency and effectiveness of capital investments in generating operational outputs and is defined by the Australian Bureau of Statistics as the “ratio of output to capital input.” In short, capital productivity assesses “value for money” on a multibillion-dollar scale.

There are two key levers for companies to enhance their capital productivity:

1. Minimized and predictable “input” through controlled project delivery

2. Maximized and sustainable “output” through earlier asset operationalization (e.g., schedule acceleration) or operational efficiency (e.g., improved equipment availability and utilization processes and skills)

Successful capital projects in mining drive enhanced capital productivity outcomes by addressing both these levers. In contrast, at-risk capital projects commonly face challenges of both input inflation (such as cost and schedule variance) and compromised output performance (such as operational impacts of poor design).



Six major risks to capital productivity in mining

Our experience of supporting mining and metals companies on large, complex capital programs around the world has helped us identify six key risks to the productivity of megaprojects :

Project management factors

- ▶ Inadequate scenario planning to identify and mitigate risks
- ▶ Poor rigor in cost and schedule estimates and contingencies
- ▶ Delivery practice disparity and suboptimal owner and contractor relationships

Stakeholder conflicts

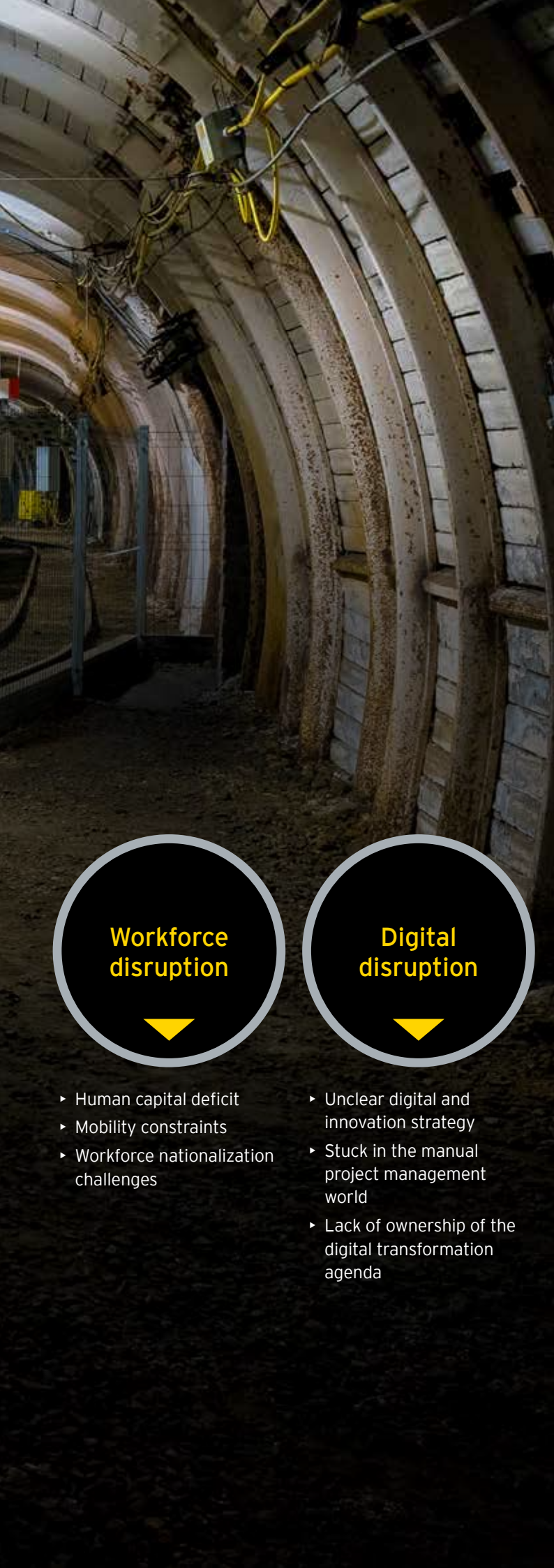
- ▶ Conflicts between project operators and government
- ▶ Conflicts among partners
- ▶ Conflicts with the local community

Supply chain disruption

- ▶ Supply constraints driven by COVID-19-driven site shutdowns
- ▶ Lack of supply chain resilience with outdated contingency plans
- ▶ Limited optimization of the value chain

Unstable and uncertain external environment

- ▶ License to operate (LTO) challenges
- ▶ Global economic and commodity price volatility
- ▶ Complex geopolitical environment and national protectionism
- ▶ Uncertain future demand
- ▶ Unclear strategy to respond to greenhouse gas emission targets



Workforce disruption

- ▶ Human capital deficit
- ▶ Mobility constraints
- ▶ Workforce nationalization challenges

Digital disruption

- ▶ Unclear digital and innovation strategy
- ▶ Stuck in the manual project management world
- ▶ Lack of ownership of the digital transformation agenda

1. Project management factors

A lack of comprehensive planning can undermine many mining projects from the outset. In particular, an inadequate cost and schedule estimation methodology, optimism bias when building business cases, and insufficient allocation of risk-based contingency are all common causes of poor planning that can lead to cost and budget blowouts and threaten capital productivity. Missed opportunities to establish key project management disciplines, such as governance, risk management, contract management and project controls in the early stages of a project can have repercussions across the delivery life cycle, reducing performance transparency, planning effectiveness, delivery control and an organization's readiness to address risks.

2. Stakeholder conflicts

Miners need to work with a range of diverse stakeholders to articulate their positive contribution to the economy and society if they are to avoid the productivity pitfalls of potential conflict. For example, the government red tape that slows down project approvals could be reduced by proactive engagement that aims to guide governments on how to encourage greater investment in the sector. This will be increasingly important amid rising resource nationalism.

Productivity of capital projects can also be undermined by a lack of real engagement with local communities. This is an area of underinvestment for many miners, resulting in a poor understanding of specific community issues and concerns. Adopting a holistic approach to community considerations can help mining and metals companies allocate adequate time and capital to those projects that deliver meaningful shared value for the company and all stakeholders. Miners need to continually review and reset processes and policies around third-party rights, and engage proactively with local Indigenous communities.

Challenges in achieving mutually acceptable consensus between delivery partners regarding commercial terms, ownership structure, development options and design changes are also major factors behind project delays.

3. Supply chain disruption

Without contingency plans in place for supply chain disruptions, miners risk substantial cost blowouts and time delays caused by potential shortages of materials from upstream suppliers. This risk, exacerbated by COVID-19, has highlighted a widespread lack of resilience across entire supply chains of organizations and their capital projects, with the impact extending across materials, equipment and workforce.

Recovery from the disruption of COVID-19 is expected to be volatile. Miners should not expect supply chains to return to “normal,” and instead use this time to build and execute supply contingency plans that will create the foundation for greater resilience in future project delivery.

4. Unstable and uncertain external environment

Geopolitical issues are now a top 10 risk for miners, according to EY's Top 10 business risks and opportunities for mining and metals in 2022 report. Increasing protectionism and workforce nationalism have exacerbated what was an already challenging operating environment for miners; they must continually work to maintain their license to operate (LTO). Complex social and environmental issues, and decarbonization, were identified as the number one and two risks respectively to miners in 2022 in EY's risk report. Mining and metals companies must meet growing expectations to share the true value of their projects' outcomes with the countries in which their mines exist.

5. Workforce disruption

Constraints around securing the significant and specific labor, equipment, services and infrastructure resources required to execute significant mining projects have always been a challenge. And when multiple projects are being delivered simultaneously in a single region, the market for high-performing human capital and critical equipment can be quickly exhausted, leading to inflated resource costs, lower-quality outputs and project delays. In regions where infrastructure investment is slow to catch up with exploration and development, access to resources such as water, power, roads and rail is often costlier and more time-consuming than initially planned.

Nations have closed borders and limited international and national mobility. Miners have responded by

consolidating their focus on innovative approaches to maintaining operations, such as adjusting site rosters, reducing fly-in fly-out (FIFO) reliance in preference for a local workforce, and shifting staff to remote working where possible.

We may see a more permanent shift to many of these characteristics, particularly where governments drive greater nationalism of workforces to build resilience to any future pandemic-type disruption. Miners need to prepare for this and look toward alternative workforce models that limit fly-in to specialist labor and find a balance between local on-site workforces and remote subject matter expertise. During the COVID-19 crisis, we observed that those companies that had already adopted remote operations centers fared well, as they were able to isolate more easily and protect critical employees more quickly.

Miners can bolster workforce resilience by considering how they can increase flexibility further, reduce their reliance on mobility and expand automation and integration of the value chain.

6. Digital disruption

Investment in digital transformation provides organizations with the capabilities to collect, process and analyze data to uncover new insights, and the agility to respond to these at scale and speed. The onset of the pandemic further emphasized the advantages of a strong digital agenda and accurate use of data. Those mining companies that focused on their data sets kept productivity outcomes stable or even improved them and, as a result, investment in digital transformation is accelerating.

But while harnessing data intelligence can drive competitive advantage for miners, the ability to manage and maximize data is a challenge that is set to increase. Integrating digital capabilities into projects and operations adds complexity, increasing the risk of interoperability issues, which require a specialist skillset to interpret, respond and resolve. For miners to ensure digital disruption is a boost, not a barrier, to capital productivity, they should take time now to ensure their digital strategy and road map are fit for purpose.

Improving capital productivity through enhanced project management

Some of these risks to capital productivity are long-standing while others are newer, or have been exacerbated by the impact of COVID-19. And, certainly, miners have less direct influence over some risks than others. One firmly within their control is effective project management, a factor clearly linked to capital productivity levels. While it is often seen as an overhead – a necessary cost, but one that must be minimized – our research shows that the right approach to project management can add real value.

Doing so requires a move from a siloed approach to a holistic view of capital project delivery, to fully realize synergies and efficiencies, make the most of digitization and build the organizational resilience that will support ongoing sustainable capital productivity and operations in a time of uncertainty and volatility.

Our evidence suggests that project management that enhances capital productivity includes five key elements:

1. Front-end design informing scenario planning

Scenario planning is a methodical approach to exploring possible futures. In essence, it asks “what if?” in the context of various challenges that may be encountered during the project. Typically, structured scenario planning is a discipline reserved for corporate strategy future proofing, but these techniques are also ideally suited for application in the context of portfolio, program and project management. Scenario planning can enhance the robustness of risk-based cost and schedule estimates and the performance of core project management processes across all disciplines (including project controls, risk management and quality management).

But the benefits of sound scenario planning extend beyond costs and schedule. Effective scenario planning allows agile miners to understand, position and react better than their competitors in volatile environments. It can also help lay the right foundations for contracting partnerships, by allowing organizations to establish centralized global



frameworks to achieve long-term supplier relationships, performance commitments and a standardized approach to project delivery. This helps miners realize productivity benefits through leveraging global buying power.

Ultimately, by helping miners identify and understand the impact of potential events, scenario planning allows management to respond with more agility and confidence when issues arise. It's this ability to act quickly and decisively that can make the difference between projects, programs and portfolios achieving high levels of capital productivity or stalling.

2. Adequate cost and time contingency

Every project and program has a degree of risk and uncertainty, and so requires some form of contingency allocation and a corresponding contingency management process. Including appropriate levels of contingency in business cases for investment decisions ensures these decisions are based on the best possible view of likely total capital cost and time. By appropriately considering the probability and impact of risks on delivery, miners can greatly reduce the potential for unforeseen and unmitigated cost and schedule impacts.

Leading contingency approaches are not “set and forget,” but require revalidation of contingency alignment at key stage-gating intervals. As certainty levels change and new information arises, contingency allowances can be revised in line with the project’s risk profile. These adjustments will typically enable a reduction in uncommitted contingency as a project progresses, which can be balanced and reallocated across a program or portfolio of parallel investments. It is also possible, however, that unforeseen risks cause higher levels of contingency drawdown than initially anticipated. In this scenario, investment committee reassessment may be required to determine if additional contingency will be needed to provide for project commitments through to completion.

Miners with the most mature risk management processes ensure that the negative impacts on cost and schedule are considered equally with the upside through cost- and time-saving initiatives. They also engage contractors within the process, transferring risk and rewards to those best placed to influence and control risks and opportunities. And the organizations with the most successful approaches to contingency encourage their teams to commit to the process by continually innovating around how to protect budgets and schedules, and drive true productivity across the project life cycle.

3. Resilient supply chains of materials, equipment and workforce

Projects can stop or see substantial cost blowouts if supply chains fail. The resilience of miners’ supply chains can be weakened through a combination of several factors, including a geographic concentration of vendors; low levels of safety stock; limited flexibility; and outdated contingency plans. COVID-19 has exacerbated these challenges, which extend across materials, equipment and workforce. For example, the rise of national protectionism, manifesting as demands for governments’ increased share of profits and accelerated nationalization of workforces, is an example of potential volatility that can impact the supply of talent and has long been a concern of mining executives.

Greater focus on upfront planning is therefore needed to ensure business and project continuity through volatility. This means identifying critical risk scenarios and potential points of failure, and then defining potential responses. These may include designing supply chains with inherent flexibility around bills of



materials and critical components, alternative supplier sourcing strategies and adopting diverse supplier networks. Early warning systems should be designed and implemented, informed by ongoing risk assessments, and comprehensive crisis response plans put in place with a clear “Plan B.” Building business cases for different resilience investment interventions can guide investment where value is greatest.

Building a digital twin, or supply chain control tower, can transform the effectiveness of scenario planning and allow miners to build end-to-end supply chain resilience. As a replica of the supply chain, including logistics, inventory and fleet status, and overlaid with global and local geopolitical and economic factors, a digital twin allows companies to predict potential issues before they happen, remove bottlenecks and improve productivity. The most effective digital twins run on the latest data, allowing decision-makers to run scenario analyses in real time and confidently assess the impact of potential disruptions on supply chains.



A key component of supply is workforce. Enhancing capital productivity requires mining and metals companies to reconsider workforce options, including reducing FIFO models, relocating critical skills and identifying how roles and rosters may change in the future. Again, scenario planning can inform better decisions, helping determine more accurate levels of contingency allocation, establishing whether dispersing teams would work and, ultimately, helping guide informed trade-offs based on assessed risk.

4. Agile governance to enable fast, informed decision-making

Even mining and metals companies with mature processes continue to see projects running significantly over schedule and budget. In our experience of helping clients with large, complex capital programs around the world, a key cause is often underinvestment in governance and reporting.

A well-structured and defined governance framework with clear roles and responsibilities can significantly enhance capital productivity by ensuring decisions are made by the right people and in a timely manner. And while this concept is typically well understood, it's the lack of relevant information in a usable format that is often the barrier to these informed decisions. This data deficit is particularly common in the area of "outer-horizon" key risks – risks that aren't in the "firefighting" stage currently but are material and require timely action. Embedding leading indicators into reporting dashboards can flag these risks as they emerge, empowering management with the insights they need to make fast, effective decisions, mitigating risks early before they drive budget and schedule slippage.

5. Capital portfolio management to improve long-term business performance

A robust and considered capital portfolio management strategy is critical to an organization's ability to effectively assess, plan, review and prioritize its financial resources to drive value creation. When mining and metals companies align their capital portfolio management strategy to their overarching corporate strategy, value can be created across both strategic and financial dimensions while mitigating any disproportionate investment in value-diminishing initiatives. Efficiently allocating capital means identifying and funding the right mix of investments, given financial and operational constraints across all levels of an organization and varied time horizons.

The COVID-19 pandemic has reinforced the need for organizations to remain flexible to adapting their capital portfolio management strategy so that it remains both fit for purpose now and is able to be rapidly transformed to respond to opportunities presented by emerging and digital technologies, changes in workplace and external environment factors and evolving business models and needs. Our experience in working with leading global organizations across industries tells us that the majority lack confidence in their current capital portfolio management strategies and are constrained by a shortage of capital to fund all projects. This reaffirms the need for companies to address potential long-term changes to their market, refocus their portfolios on their core business and carefully plan and prioritize which initiatives to fund in line with defined strategic objectives and goals.

Using leading indicators to mitigate risks to capital productivity

Using lead indicators to monitor delivery performance is a proven technique that raises early awareness of potential risks to capital productivity and enables timely intervention.

Leading indicators can flag potential issues across all aspects of a large project. For example, stakeholder management could be monitored via metrics such as the number of stakeholder queries, including complaints; the number of open queries; and the average time it takes the project team to respond to these queries. Other effective lead indicators, which every project should consider monitoring, include contingency drawdown rates (i.e., contingency funding consumption over time) and orphan-risk levels (i.e., no owners or mitigations). Both are effective indicators of risk management and planning alignment maturity. The former enables monitoring of contingency spend, which, when done

in parallel to monitoring and analyzing remaining risks, can help determine if contingency is adequate to account for these risks or if a reassessment is required. For the latter, having an indicator of the number of orphan risks enables identification of those risks that are not being actively managed but that could potentially threaten schedule or budgets.

However, while most projects can adopt a series of typical lead indicators, real value is achieved by identifying and developing bespoke indicators that are directly relevant to a specific project and its success factors. These bespoke indicators give delivery teams the tailored information they need to keep projects on track and optimize productivity. Reporting dashboards that incorporate leading indicators offer the deep insight into emerging risks and uncertainties that will enable the proactive decision-making that is critical to success.



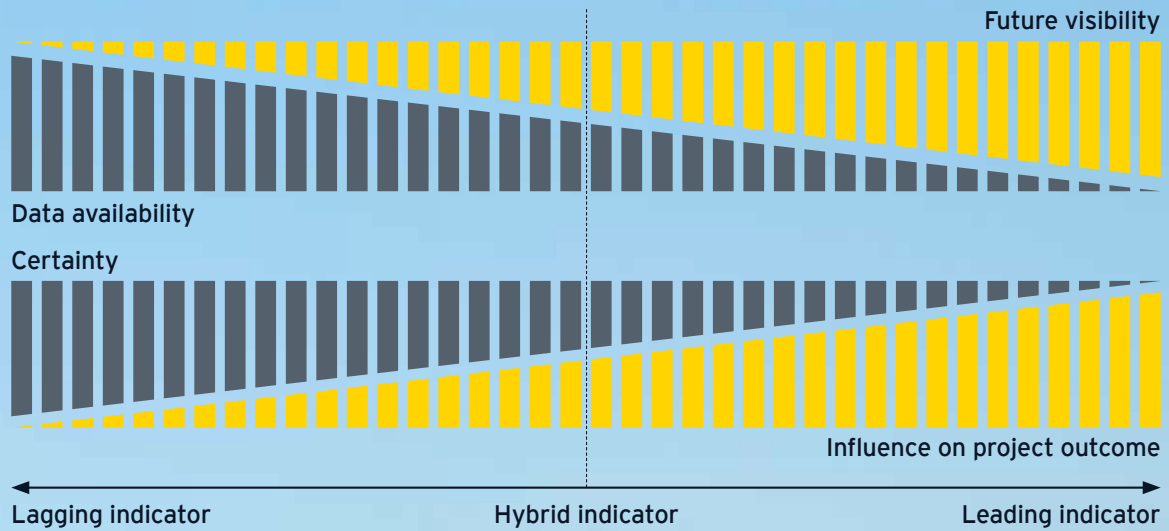
EY's leading indicator methodology

Building upon our global capital infrastructure experience, EY has developed an innovative leading indicator methodology reflecting high-maturity practices and EY's unique observations, insights and advancement of the program management state of knowledge.

Leading indicators use carefully selected current-state data to predict future-state trends and outcomes. Predicting

future events is an uncertain but important endeavor - it is only through future predictions that we have the opportunity to intervene proactively rather than just reactively respond.

EY's leading indicator methodology and supporting toolkit assists clients to identify the specific leading indicators that will most effectively forecast program performance outcomes within their bespoke delivery context and priorities.



Key questions

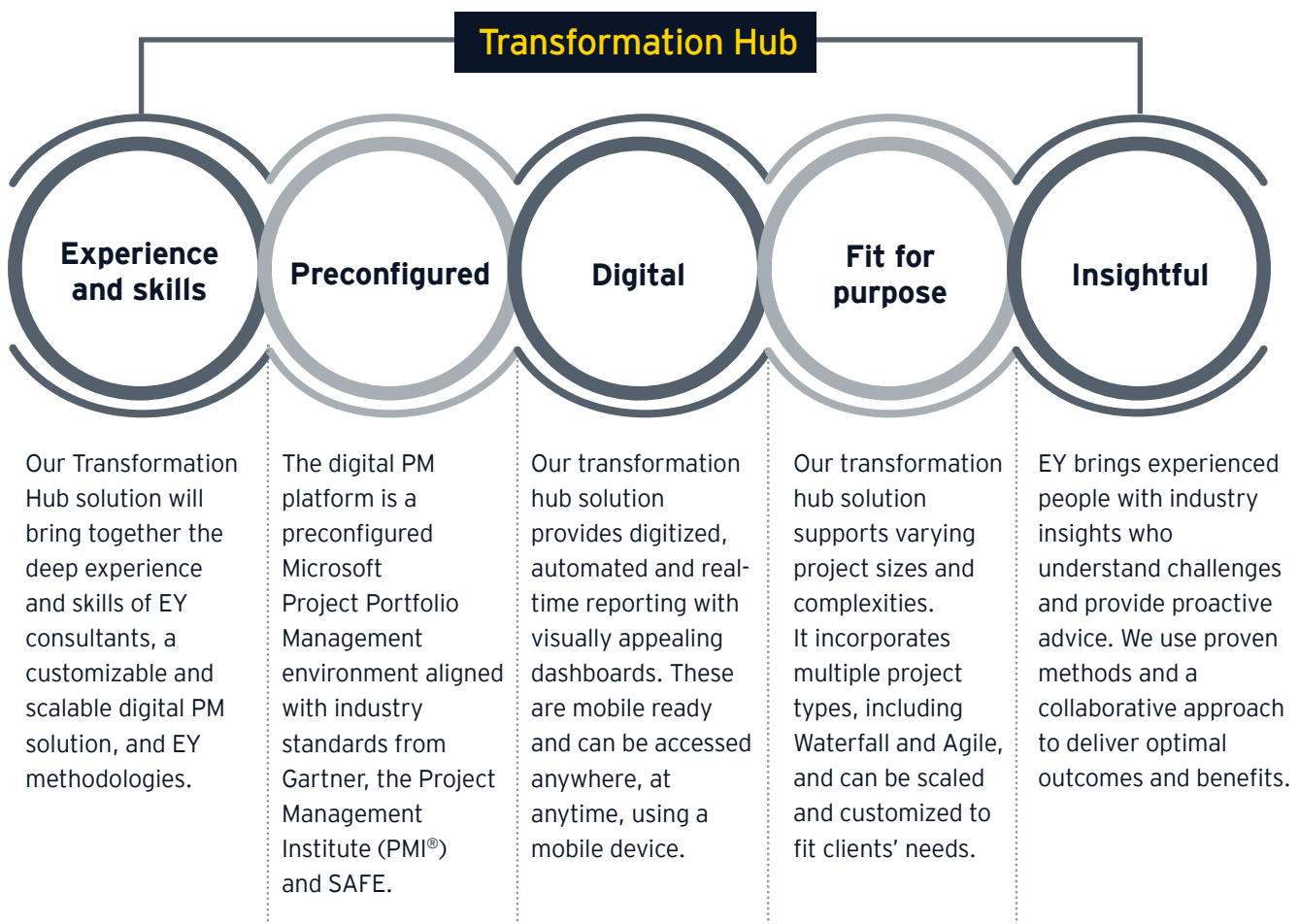
1. Do your dashboards focus on lag or lead indicators?
2. Are you getting the right information to change direction before risks eventuate or poor performance is reported by a lag indicator?



EY's digital project management (PM) solution: Transformation Hub

To support mining and metals organizations in improving project delivery performance and strengthening organizational and project resilience, EY is rethinking the challenge of complex program delivery. We have developed the Transformation Hub solution, a revolutionary approach to managing complex programs and projects by using the latest

digital project portfolio management technology. It combines this technology with robust processes and experienced professionals, at the forefront of their industries, to deliver real-time, data-driven insights into projects, programs and portfolios, enabling improved decision-making, governance and outstanding results for clients.



How EY's Global Mining & Metals team can help you

The transition to a low-carbon future demands that mining and metals companies reshape their role in what will be a new energy world. Bolder strategies that embrace digital innovation can help overcome productivity and cost pressures, create long-term value and secure a stronger LTO. EY's Global Mining & Metals team brings together the breadth of experience and talent needed to approach the entire transformation process. By considering four key pillars of change – structure and culture, customers, technology, and skills and capabilities – we can help you adapt for today and reap the opportunities of tomorrow. And together we can build a better working world.

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EY | Building a better working world

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