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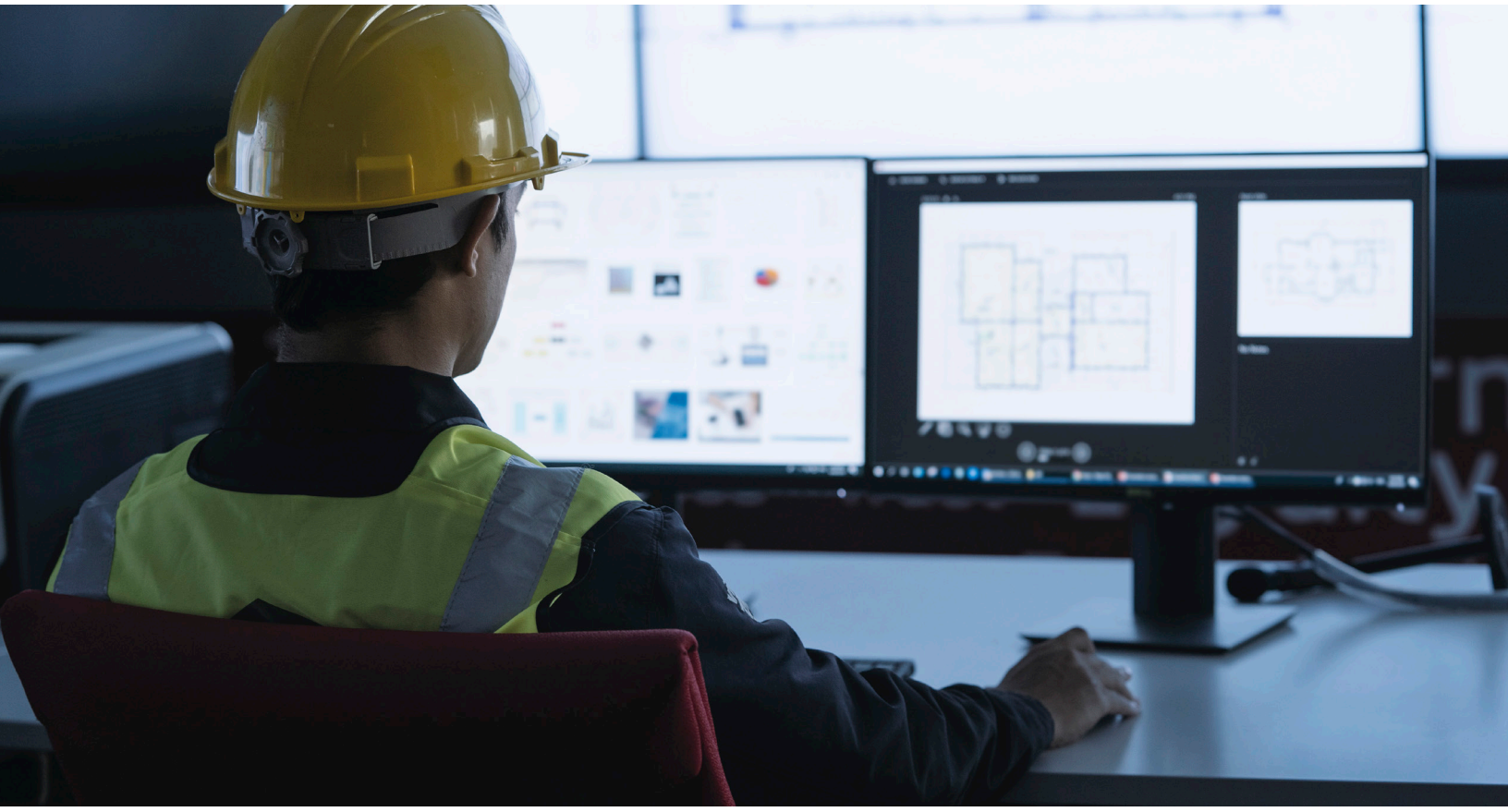
Remote operating centers in mining: Unlocking their full potential

As the COVID-19 pandemic accelerates innovative working practices, mining companies are reimagining their operating models to provide more productive and enjoyable remote work locations for employees.

by Roberto Gallardo, Dave Goddard, Stephan Görner, and Bernardo Rubinstein



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As mining companies seek to mitigate the impact of the COVID-19 pandemic and act to safeguard employees, some have started to relocate around 15–20 percent of their on-site workforce by setting up "control towers" to facilitate remote working (especially for non-frontline roles like subject-matter experts). This is helping the industry develop more resilient, responsive, and flexible operating models suited to an increasingly uncertain environment. Now, however, companies are rapidly advancing their capabilities for remote means of working and collaboration. As expected, executives have a renewed interest in remote operating centers (ROCs) that build on remote working capabilities to unlock additional value, such as enhancing decision making by integrating functions across the value chain. Although not a new concept, ROCs present an opportunity for mining companies to reimagine and reform the ways they operate as remote working becomes imperative to ensuring value and sustainability.

Varied ROC landscape

ROCs harness technology to ensure safe, reliable operations from a centralized location. However, the maturity and sophistication of these collaborative workplaces varies based on the capabilities available within the mining organization. Some companies have implemented cloud-based systems that aggregate site data into a single data lake that can be accessed, analyzed, and visualized for decision support, creating a "room of screens"; other companies manage and actively control plant automation systems, fleet management systems, and remote-controlled machines from the ROC. The most sophisticated companies manage all these functions on a larger geographic scale, covering the value chain from end to end, optimizing post-processed ore logistics and port facilities used by multiple mine sites within a region, with regional parts and supply warehouses monitored across multiple assets for supply-chain optimization. The larger span of control of such operations helps to maximize best-practice benefits across site assets to drive operational improvements such as predictive maintenance among similar mine fleets.

Generally, companies focus on a combination of four value levers (Exhibit 1). We found that companies implementing ROCs tend to concentrate on a subset of these levers, although the most successful implementations capture value across all.

Observations from reviewing ROC implementations in mining

When we analyzed the challenges organizations must overcome to capture full value, we were surprised to find that companies generally do not see the technology development or investment costs for ROC implementation as major pain points. As one CIO told us, "The technology is the easy part." Numerous options for communications and data management exist, allowing mining companies to effectively implement and control applications that would normally be installed on site from a remote location.

Yet, only a few companies have demonstrated an ability to capture the full value potential in a ROC. Our research unearthed a common theme underpinning the root causes for this failure—insufficient emphasis on and investment in developing a robust change-management strategy and subsequent implementation. Two typical scenarios are discernable across the industry:

1. *Leaders do not set clear expectations of bottom-line impact from ROCs.* Leaders typically position ROCs as an experimental showcase or proof of concept for technical capabilities—or worse, as a strategic initiative to "check the box" on adding remote operations to their toolkit. The hope is that once built, the ROC's capabilities alone would convince the operations team to adopt it. However, this approach signals a lack of priority, management sponsorship, and commitment by the organization to the program. While, technically, such ROCs are implemented and functional, they drive limited to no value (see sidebar "ROC successfully delivered as proof of concept sits idle").

2. *Leaders position the ROC with limited authority within the organization.* We found

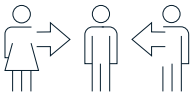
Exhibit 1

Companies usually focused on a combination of four value levers when implementing remote operating centers.

Four value levers for implementing remote operating centers (ROCs)

Integrated, data-driven decision making

- Operational issues are effectively and rapidly solved through real-time, data-driven decision making, enabled by system-wide data integration and transparency
- Decision making at portfolio vs asset level
- Integrated operational, logistical, and commercial data and decision making



Employee productivity and talent attraction

- More productive hours from white-collar workers
- Subject-matter experts shared across functions and areas (central vs site)
- Increased effectiveness of cross-functional teams
- Working location and conditions more attractive
- Focus on digital and analytic skills to attract top-tier talent

Organizational resilience and accountability

- Reinvigorate and strengthen the organization through new processes, roles and responsibilities, and achieve maturity to embark on remote-operations journey
- Agile decision making
- Performance transparency enabled by real-time key-performance-data availability increases sense of accountability

Centralized planning and emergency response for safer operations

- Centralized, remote outage planning and execution management allow on-site team to focus on operations
- Minimize interaction between heavy equipment and people through remote operations
- Preparedness to react to health hazards that require reduction of head count on-site (eg, COVID-19)

Source: Subject matter experts; McKinsey analysis

that successful implementations deliberately consider the changes the ROC has on the organization, the operating model, and the reporting structure. While defining the ROC as advisory to the frontline operations team is necessary and intended to help adoption, capturing value requires evolving ways of working to encompass new capabilities

ROC successfully delivered as proof of concept sits idle

A mining company's IT department initiated a ROC "proof of concept" as a way to gain support from executives and to avoid any need to involve on-site resources in setting up the facility. The project execution itself was a great success, and the proof of concept was completed ahead of schedule and below budget, with key operational metrics displayed across monitors lining the centers. If operators wanted, they could perform functions such as dispatch, equipment health monitoring, and maintenance planning, while situated miles away from the mine. But this never happened. Once operational, the ROC had no clear role in the organization and saw little productive use. Some operators feared an intrusion into their ability to execute their roles and worked hard to limit any involvement of the ROC in operations. The ROC started to feel like a room that just visualized data, in-line with its original charter. Soon the organization's leaders and top talent lost interest. The facility was eventually decommissioned.

enabled by the ROC. Without a new mandate, a new way of working, and a new decision making structure, the ROC staff will struggle to capture the frontline team's attention. And, although the ROC is implemented and functional, it never reaches full potential for value. Without a conscious focus on organization, a ROC can be counterproductive, creating redundant organizational structures, reinforcing silos, and alienating the central and site teams from each other (see sidebar "Full performance potential lost through failure to transform organizational structure").

Key factors for success when implementing ROCs

Success stories tell us that capturing the full potential of a ROC involves shifting to a new way of working. Leaders need to set an aspirational vision early on, setting out what the future operating model will look like. Five principles emerge when thinking about how to create value through ROCs, and each of these principles needs to be tailored specifically to the organization when applied.

1. *Define a clear and compelling business case around the value creation for the organization.* Defining a business case should involve robust analysis of all potential major value pools, including reduced travel costs, better emergency and incident response, improved productivity, and integrated, technology-enabled decision making. The analysis should cover the following key aspects:

   - *The ROC should elevate decision making so it integrates input from functions across the value chain.* The ROC fundamentally changes daily tasks and culture by enabling a seamlessly integrated planning process, breaking up silos that have existed for

Full performance potential lost through failure to transform organizational structure

A mining company recognized that one of its underground mines would benefit substantially from a ROC if it were located at the surface, close to the site. It would allow maintenance, operations, and site management to function in a co-located fashion, and avoid the need for travel to the working section of the mine. Working closely with site leaders, a central team helped implement the ROC to manage a single facility. The challenging project was successful in bringing to life all the technical capabilities needed to operate the mine from a remote location.

However, the operations team and frontline staff were only peripherally engaged during planning and implementation. This turned out to be insufficient. Shortly after implementation, it became clear that the site needed a rethink of roles and responsibilities and, ultimately, the organizational structure of the operations team. A plan was proposed, but the details were hazy on how the company would resolve potential gaps or overlaps in decision authority between the front line and ROC staff. This eventually led to friction and power struggles between teams.

The frontline operations team showed signs of rejecting the change. Issues ranged from ignoring centralized decisions to subtle sabotage resulting from reduced sensor maintenance and calibration that limited critical data available to the ROC and put the front line back in control. Additionally, working at the ROC acted as a structural disincentive by reducing so-called "hazard pay" for challenges faced at the front line. Over time, both operations leaders and the hourly paid frontline labor force started to abandon the ROC, reducing the value of co-location and integrated decision making.

The ROC maintained all its functionality but settled on the role of advisory center to the frontline operations team. The site now had redundant functions, at both the ROC and mine site. The on-site team retained full control of the facility but eventually learned to harness the ROC team's analytical and strategic planning capabilities to make incremental performance improvements. The full potential for improving the operating efficiency of the team was never realized.

decades. Effective integration requires that the ROC covers business-as-usual operation, operational risk, and business continuity, as well as safety and emergency responses. The center can serve as a catalyst to capture benefits such as frequent and rapid plan optimization, including real-time (even shift-to-shift) responsiveness to correct deviations. Importantly, using integrated information for site-level value management versus silo-based production and cost information alone can generate substantial EBITDA[1] impact. Calculating that value involves mapping value sources across the mining value chain (Exhibit 2), which can be the largest and most difficult value pool to capture.

- *Experts and leaders supporting multiple facilities should reduce travel spend on items such as transportation, lodging, and meals.* Clear expectations, tracking, and accountability for travel spend following ROC set up will ensure the value is captured.

- *Productivity improves when critical resources are co-located.* The organization should

Exhibit 2

Consider all the value sources in the value chain to estimate impact.

Value sources mapped across the mining value chain

Value chain	Planning	Control	Reliability
Mining	• Real-time data production planning • Develop short-term planning and scheduling	• Fleet allocation (across and within sites) and dispatch guidance • Production accounting	• OEE[1] improvements through data-driven defect elimination • Asset strategy continuous improvement
Processing	• Holistic mine-to-mill view • Operations planning and scheduling	• Operating guidelines and real-time adjustments to plant operators • Processing plant central control	• OEE improvements through data-driven defect elimination • Asset strategy continuous improvement
Logistics	• Plant-to-port scheduling system • Logistics planning and scheduling	• Material-movement coordination • Logistics and port-interface coordination • Travel and site-camp management	• OEE improvements through data-driven defect elimination • Asset strategy continuous improvement
Maintenance	• Maintenance planning (eg, major outages) and scheduling • Holistic fleet view	• Monitoring assets' conditions • Maintenance execution and coordination	• Managing asset health • Operations and maintenance; SMEs[2] coordination
Support and other functions	• Long-term operations strategy • Utilities planning	• Safety and health centralized control • Outage planning and execution management	• Coordinating emergency management
All functions	• Integrated planning • Digital planning capability building	• Integrated control systems and decision making	• Reliability systems standardization • Reliability knowledge center
	• Use of analytics to identify improvement opportunities • Optimize value chain with integrated planning, control logistics, and maintenance data	• Use of analytics to identify improvement opportunities • Optimize value chain with integrated planning, control logistics, and maintenance data	• Use of analytics to identify improvement opportunities • Optimize value chain with integrated planning, control logistics, and maintenance data

[1]Overall equipment effectiveness.
[2]Small and medium-size enterprises

[1] Earnings before interest, taxes, depreciation, and amortization.

explore the benefits realized over the medium to long term generated by combining teams, enabling experts to effectively support multiple areas, reducing on-site activities, and so on.

- *Remote monitoring of process parameters and operation of equipment can offer improved emergency and incident response.* This requires integration of multiple functions—such as pit and dispatch operations, and health, environment, and safety (HES)—via the ROC. Both setup and expected impact should be tailored to the specific requirements of the site or organization.

2. *Take a robust approach to organizational integration and change management.* A robust approach requires a carefully crafted change-management strategy, detailed organizational design with defined spans of control, and a detailed implementation plan. It must be executed by a strong, proactive leadership team committed to unlocking the full value at stake in a sustainable way. The process entails addressing common challenges along with the fears and emotions of the operations team during the transition. A robust approach that addresses all four dimensions of change management—role modeling, reinforcement with formal mechanisms, talent and skills development, and understanding and conviction—and is tailored specifically to the organization will prevent it from leaving value on the table (see Exhibit 3 for examples of some quick wins). In addition, it enables a smooth transition to the new operating model and long-term acceptance by the on-site operations team.

3. *Ensure the organization is set up to attract and nurture the best industry talent to drive long-term performance and growth.* Attracting, retaining, and developing the best people is a key ingredient for innovation. Selecting a favorable geographic location for the ROC coupled with building a company culture that allows top talent to thrive will create an attractive long-term proposition for employees.

Exhibit 3

Robust change management ensures a successful remote-operating-center program.

Change management "quick wins" (selected illustrative key examples)

Understanding and conviction	Role modelling	Reinforcing with formal mechanisms	Developing talent and skills
• Design a communication plan for the transformation of roles and responsibilities of remote operating centers (ROCs) vs on-site operations to ensure right level of information and participation	• Commit top ROC and on-site operations leaders as role models (eg, setting "walk the floor" routines both at the ROC and the mining site)	• Refine annual incentives to align with new roles and responsibilities implemented (using tangible and highly visible key performance indicators [KPIs])	• Define new roles and hard and soft skills needed for the organization to ensure employees thrive in new ways of working presented by the ROC (eg, real-time data-driven decision making, co-located cross-functional teams, remote operation of mobile equipment)
• Communicate throughout the organization, via different channels (videos, emails, town meetings), to explain the new strategy	• Participate in "go and see" visits to companies that have deployed successful ROCs	• Develop nonfinancial strategies to mitigate adversity of employees experiencing reduced bonus payouts due to loss of hazard bonus	• Decide between hiring or developing in-house skills
• Provide regular updates on progress via multiple channels			• Decide between creation of new jobs and evolution of traditional jobs
			• Redefine roles to ensure role clarity

4. *Create the technology backbone of the ROC through technology stack and facilities integration.* While technology development is not typically a major pain point, careful consideration must be given to data and systems reliability, location of primary physical storage infrastructure, and design of back-up systems. Software integration at the ROC is as important as integration of human functions. Building a single source of truth is essential to enable the integrated decision making, transparency of information, and accountability needed to improve operations. In addition, a robust cybersecurity approach supported by a cyber-risk management and governance structure is critical to protect the ROC from potential threats. These decisions can impact connectivity, bandwidth, and latency, each of which must be sufficient to enable the ROC to effectively control on-site operations in real-time: for example, adjustment of plant processing parameters or remote control of mobile equipment and process optimization tools, such as machine-learning algorithms.

   With the right technology foundation, the ROC can function as the analytical center of excellence, setting data standards, creating and updating analytical optimization models, building analytics capability, and driving partnerships to codevelop solutions aligned with the new planning process for optimizing site-level profit. Such actions can move the organization toward new ways of thinking about hierarchy, decision rights, and ways of working.

5. *Understand social, environmental, and legal impacts.* Appropriate strategies must be developed to ensure all stakeholders are properly mapped, the scope of change resulting from implementing and setting up the ROC determined, and corresponding mitigation plans put in place. Those aspects were not considered by most organizations we surveyed; however, it undoubtedly deserves a place in any ROC strategy as a source of value for society as a whole and for potential risk mitigation.

Mining companies around the world are preparing to switch from crisis mode to establishing ROCs as the next normal for their operations. A collaborative, remote-working model, centered around a ROC-based architecture, can help companies capture the value of co-locating high-performing cross-functional teams to drive end-to-end decision making based on truly integrated information systems. Even beyond the very real need to build resilient operations that can thrive in times of crises, this can help create a smarter, safer, more productive, and more enjoyable workplace for future generations of digitally enabled mining workers.

Roberto Gallardo is an associate partner in McKinsey's Vancouver office, **Dave Goddard** is a senior expert in the Denver office, **Stephan Görner** is a senior partner in the Sydney office, and **Bernardo Rubinstein** is a partner in the Lima office.

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