VIEW POINT

REMOTE OPERATION CENTER: ENABLING DIGITAL DISRUPTION IN THE MINING INDUSTRY

Abstract

"Let automation make the mining business more productive and safer."

Plummeting commodity prices, shortage of skilled workforce at remote project sites, and safety issues are forcing mining companies to find innovative and cost-effective ways to reduce operational expenses while increasing throughput and ensuring the highest HS&E standards at the workplace. Furthermore, unprecedented situations like COVID-19 necessitate mining companies to be prepared to face such events without any impact on the business and keep the operations running. Establishing a remote operation center (ROC) can be one way to address these issues. ROCs can be located thousands of miles away from mining project sites yet are capable of better managing overall operations and more substantial resources with high cost, productivity, and safety benefits.

This paper explains the business drivers for ROCs and critical considerations when establishing one.

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Introduction

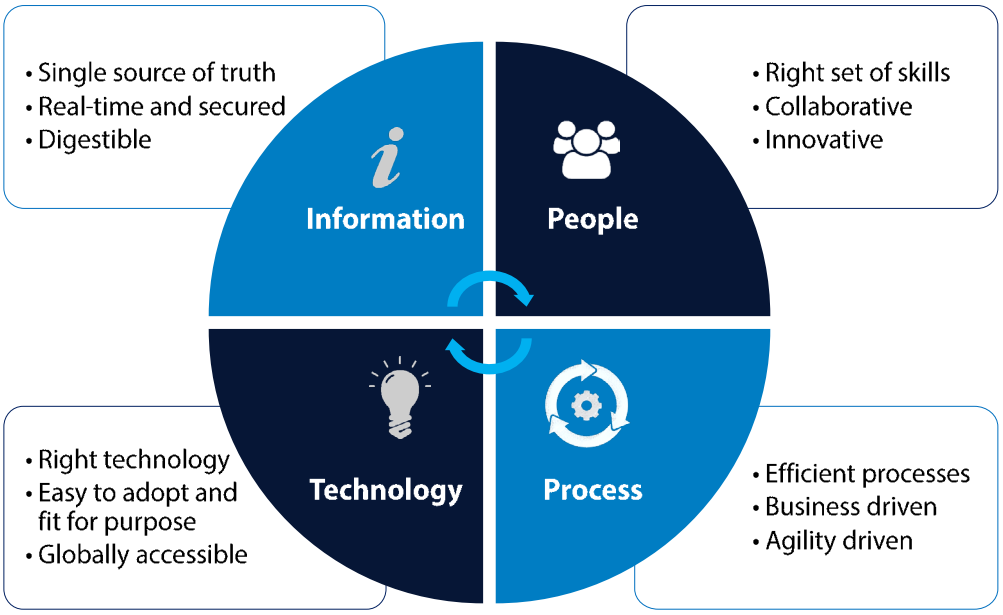
The mining industry is grappling with many challenges such as the availability of a skilled workforce, productivity improvement, safety, and environmental issues. These challenges are driving companies to integrate mining operations from pit to port and utilize the available technologies to maximize benefits. Typically, enabling sustainability across operations involves three factors, namely, economic, environmental, and social.

Environmental and social factors constrain the mining industry as it must adhere to guidelines and various government regulations. Thus, to drive economic sustainability, companies must focus on integrating people, processes, and technologies and utilize the available information optimally to increase productivity as well as profitability despite existing and future con1

To deal with economic factors such as market volatility and cash flow, mining companies must achieve minimal variations in planned versus produced, optimal throughput, and integrated operations. An Integrated Mine Model (IMM) helps in achieving these goals. This model allows large datasets to be populated and analyzed properly for clear insights into operations and improvements in key performance indicators (KPIs). The IMM provides real-time or near real-time visibility across the mining value chain for quick and easy monitoring. It also utilizes integrated processes throughout the value chain from knowledge and skill management to digitalization and continuous improvement, thereby providing a robust base for a next-generation ROC with the capability to monitor, execute and manage the mining operations remotely

ROC is not a new concept in the mining industry. But when it comes to capitalizing on the latest and emerging technologies, mining has traditionally lagged other sectors such as retail and finance. Nowadays, mining companies are stepping forward to collect, store and utilize the data about mining operations to improve their knowledge and business insights and to be able to drive automated mining operations. Leading mining companies are adopting advanced technologies with the required infrastructure, business and technical capabilities to reduce cost and boost safety and productivity.

Mining operations produce vast amounts of data in the entire value chain from Pit to Port that too in various formats being handled by numerous applications deployed by the organization. However, since these applications operate in silos, the effective utilization of the data to improve operational productivity and business remains a challenge. Technologies like AI, robotics, and big data analytics can help companies unlock the value of such data. ROCs can play a crucial role in such scenarios by providing a holistic and integrated approach to use this vital information and remotely support mining operations using the latest technologies based on business requirements.



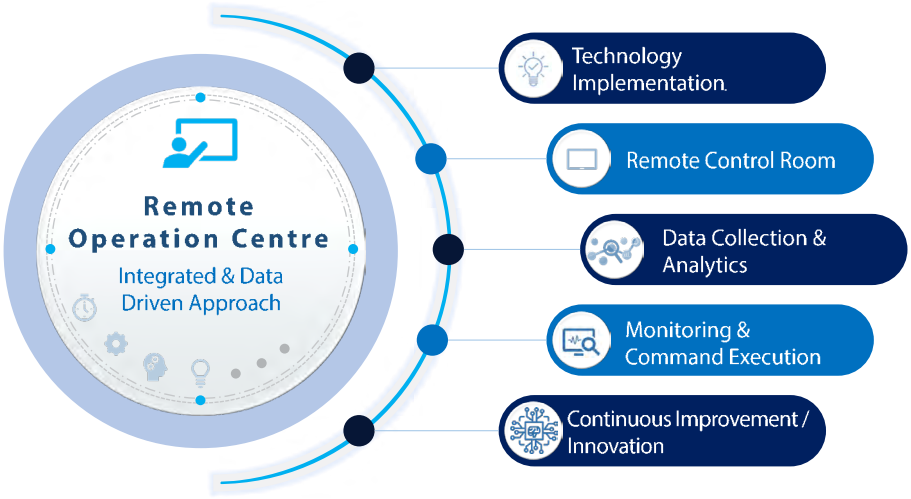
Business Drivers

Strategic vision, clearly defined business objectives, skilled resources, collaboration, and proper infrastructure, are some critical factors essential to support any digitization initiative. Since mining operations are typically carried out in remote locations away from cities, finding and attracting the right expertise and talent is a challenge. And in some instances, providing the required infrastructures to utilize the skills and technologies becomes a challenge.

ROCs address these challenges by slashing the human resources needed at mining sites and instead allowing companies to staff a wide range of people and resources remotely. It can minimize human intervention by automating processes, thereby improving decision-making. It has the potential to save time, cost, and safety involved in the fly-in fly-out (FIFO) modus of operandi. In the future, mining companies can even replace FIFO with sign-in sign-out (SISO) and switched-on switched-off (SOSO) models. SISO can be used to streamline authorization, while SOSO can facilitate interaction with machinery. With such operational excellence initiatives, mining companies will be able to significantly boost overall efficiency and productivity without compromising the HS&E standards.

Conceptual ROC Model

The ROC provides end-to-end integration of core mining operations, marketing, and business enablement services functions, thereby offering a coordinated, integrated and data-driven approach for an optimized operation across the value chain.



The central or the core component of the ROC is the control room. It houses the team that is responsible for the planning, scheduling, execution, and monitoring of operations across various areas.

The main activities of this team involve gathering, validating, managing, and reporting real-time or near real-time operational data, analyzing the data and extracting meaningful information from it, and finally, using it for decision-making for operational excellence across business operations.

Ref : 1Roy hill (http://www.royhill.com.au)

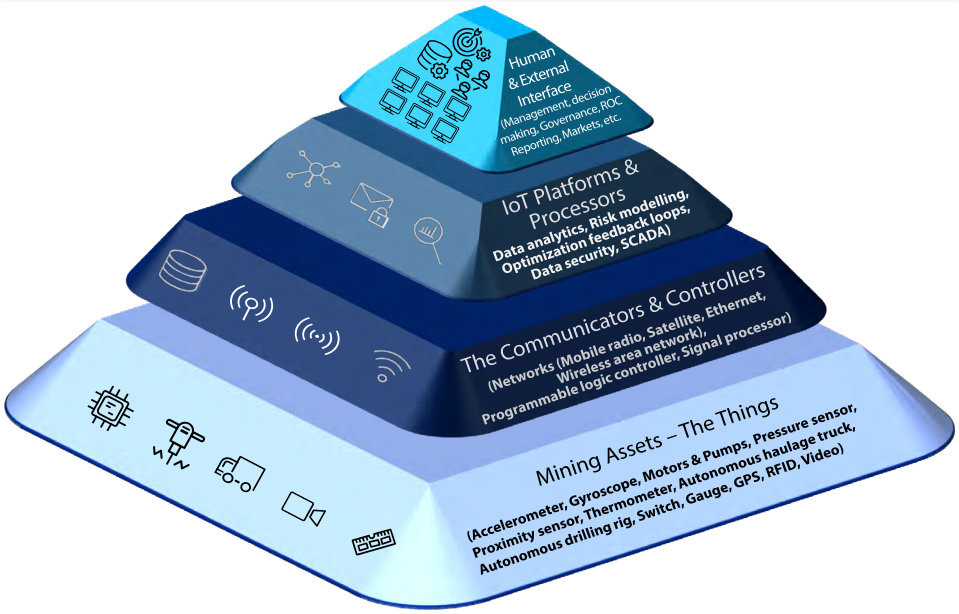
ROCs help organizations to improve business productivity by focusing on how individual functions like core mining operations, marketing, and business enablement services can run collaboratively and effectively. This holistic approach ensures that the business maximizes throughput, conforms to high-quality standards, and manages variations effectively while minimizing operating costs without compromising on safety.

ROC is a platform where operational data is stored, organized, and analyzed for better decision-making and continuous improvement that can eventually support autonomous operations. Through ROCs, operations can be monitored, visualized, analyzed, controlled, predicted and automated.

ROCs can benefit from the latest technologies like 5G for networking across the Internet-of-Things (IoT) ecosystem. 5G technology offers higher bandwidth speeds that can transform IoT platforms by allowing rapid and secure transmission of vast amounts of data in real-time within the IoT ecosystem of connected devices. Similarly, AR/VR technology helps in visualizing and analyzing things more accurately, and real-time monitoring of operations can be performed without being physically present. In the not-too-distant future, ROCs will deliver significant benefits impacting productivity, health, safety, environment, and costs by enabling autonomous mining practices.

Let us examine how data travels within the interconnected layers of the ROC model:

- **Mining Assets** - Devices at the mine site are equipped with sensors, RFID, or other instruments that generate the data on various activities during the mining operations.
- **The Communicators and Controllers** - It consists of network systems, PLCs, and signal processors that transmit data from the mine site and is the backbone of ROC operations.
- **IoT Platforms and Processors** - This layer comprises of SCADA systems and other similar technologies that configure devices to support data processing, data security, feedback loop optimization, and data analysis.
- **Human and External Interface** - A vital layer that allows experts to consume data for better insights. Multiple stakeholders are connected to the system through this layer. They can access the data and insights for various purposes such as business decision-making, analysis, management, and reporting.



Key Consideration for setting up a ROC

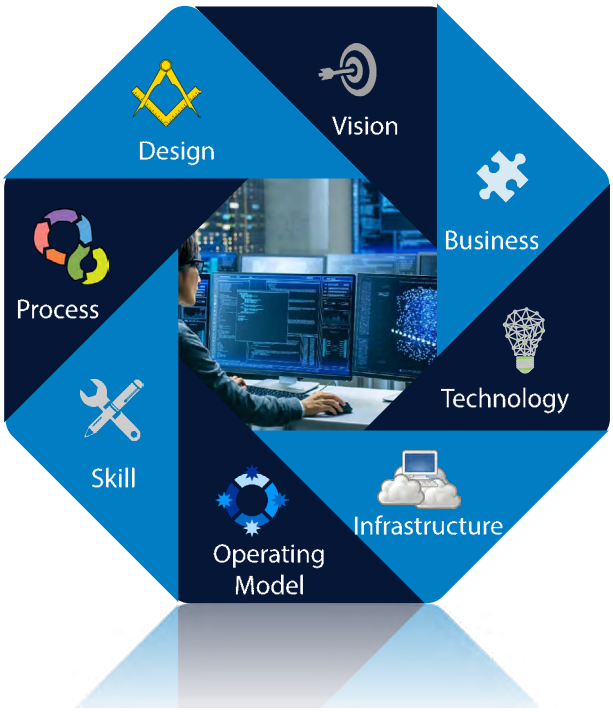
Subject matter experts (SMEs), original equipment manufacturers (OEMs), operation managers, and other vendor stakeholders must work together to establish a model for the ROC aligned to the business need. These stakeholders should decide on the kind of technologies, supporting infrastructure, network architecture, implementation strategies, and other milestones for the ROC.

The success of the ROC also depends on several other elements such as:

- Integrated planning across different project sites, business functions and time horizons
- Connected working environement
- Overall governance, compliance, risks management and mitigation plans
- Streamlined and a defined process workflows within physical operational environment
- Change management programs
- Data analytics to identify and predict bottlenecks, and prescribe revelant solutions
- Culture of continuous learning and improvement

The ROC should be staffed with a dedicated and skilled team that is responsible for analyzing the collected information to generate reports and feedback using the right tools. The ROC team works in collaboration with operations teams at the sites. Insights generated by the ROC team will aid real-time decision-making related to operations-, thereby addressing specific pain points and improving KPIs. Real-time visibility of bottlenecks in a shift like "What, Where, When and How" across the value chain will allow management to make decisions more confidently and focus on improvement. Besides providing central process control and monitoring, the ROC team can also communicate outcomes with the respective stakeholders for any actions to be taken, if necessary.

Many parameters that need to be considered for setting up the ROC based on the business need as described below:



1. **Vision Statement** - A clear vision provides a strong foundation for setting up the ROC and the expected outcomes. The vision statement will define the strategy and helps in developing the roadmap for setting up the ROC by providing a high-level view of business impact.

2. **Business Capability** It is essential to define the business capabilities that will be enabled by the ROC. These can be related to the level of automation, equipment, data transmission across the value chain, infrastructure control, agility, and future-readiness.

3. **Technical Capability** - This consists of defining the scope and scale of technologies required for implementation. Some key areas are IT-OT architecture, AI/ML solutions, mobile application development, blockchain-enabled processes, and system integration.

4. **Infrastructure Capability** - This includes IT infrastructure, OT infrastructure (sensors, actuators, control systems, and network connectivity), dashboard functionalities, collaboration tools, and information display technologies.

5. **Operating Model** - The level of centralization of skills and knowledge, organization structure, RACI matrix, and collaboration of various stakeholders will be defined by the operating model.

6. **Skill Requirement** - This depends on the maturity of the ROC as some may require AI/ML and robotics experts with skills in various ML algorithms or data scientists with expertise in tools like R, Python, and SAS. Further, there may be a need for upskilled domain specialists, change management experts, and network experts.

7. **Process Consideration** - The ROC model will depend on business enablement, corporate and core mining processes like mine planning, geology, exploration, surveying, drilling, blasting, transportation, hoisting, underground/ opencast mining, mineral processing (dry/wet), supply chain, logistics, and asset management.

8. **Design Consideration** - A detailed final design should be prepared based on the business, technical and design requirements like solution architecture, floor design, interaction among different stakeholders, and area utilization. A key design consideration cybersecurity to safeguard valuable data and information against any kind of data breach or cyberattack, which can impact the overall business as well as threaten safety.

Infosys Differentiators

Setting up a ROC can be highly challenging without collaborating with the right integration partner. The ideal partner would be someone with experience in both the mining industry and IT domains, providing skilled resources and a dedicated team.

Being one of the world's leading technology companies and with more than 15 years of experience in the mining industry, Infosys has helped top global mining giants adapt to the digital age with tailored solutions for their specific needs. The Infosys Engineering Services Unit has established a dedicated center of excellence (CoE) for the mining industry that provides industry-specific IoT solutions aimed at making mines more digitally enabled. The CoE offers ROC's, IT-OT integration solutions, AI-enabled predictive maintenance solutions, smart troubleshooting solutions for assets using fault tree analysis, remote monitoring solutions for Plant Control Systems, historian to cloud integration, and many others fit-to-purpose solutions based on the business needs.

The CoE utilizes over 2500 industry specialists trained on both the latest and emerging technologies, and

partners with several world-class organizations for best-in-class technology implementations.

The CoE has successfully delivered several projects, points of view (PoVs) and proofs-of-concept (PoCs) for establishing a ROC for clients .

Infosys Differentiators

- Key benefits expected by setting up ROCs can potentially lead to a reduction in the total cost of operations by 20-30%.
- 10-15 % improvement in safe working conditions due to reduced human and machine interaction.
- Faster maintenance turnaround leading to overall productivity improvement by 15-20% and a reduction in operating costs by 10-20 %.
- Optimized extraction and processing may not only increase the overall recovery by 5% but also helps in increasing the total extractable resources and reserves.
- Significant reduction in travel costs by 8-10% thanks to minimizing of remote site visits.

Our digital milestone-based holistic approach helps clients implement relevant technology solutions so they can "Navigate their Next" and sustain their edge in today's digital era.

Conclusion

Remotely situated mining sites, deep-seated orebodies, volatile commodity prices, and strict regulations are a few of the key challenges are being faced by most mining organizations. It is the need of the hour to look out for all the possible ways to reduce the operational costs, increase productivity, and safety standards. The ROC provides a platform where organizations can use the latest technologies to derive and maintain an integrated and data-driven approach to improve business excellence and optimize overall operations. It can minimize the amount of manpower needed on-site while equipping mining companies with the latest technologies that deliver real-time insights into site operations and processes. Setting up a ROC to provide expected benefits requires a strategic vision, appropriate model, good governance, and the right implementation partner. This approach will ensure that the organization gets access to the right infrastructure, technology, and expertise and gain a competitive edge with higher productivity and safety.

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Amit Choudhury leads the global Industrial IoT portfolio. With over 22 years of experience across multiple geographies, he has successfully helped multiple customers in their digital transformation journeys. His areas of focus include Industry 4.0, smart factory implementation, IT-OT convergence, condition monitoring, predictive maintenance, digital twins, smart trouble shooting for remote assets, IOT Platforms.

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