Since 2008, the majority of mining companies have failed to create shareholder value. Capital projects have overrun schedules and budgets. Operating costs have continued to rise as commodity prices have fallen. Signs of overcapacity are emerging in some commodities, while many large projects are being downsized, deferred or cancelled altogether. As a result, investor and executive attention in mining has shifted from greenfield growth to boosting returns from existing operations. Productivity improvement has become the imperative for value creation in mining.

Productivity directly links to shareholder value. It drives profit by increasing production and reducing unit costs. It ensures a disciplined approach to cash flow management by focusing on no- or low-CAPEX solutions for operational improvements and reducing the sustaining capital required for fleet renewals. It also has a positive influence on valuation multiples by reassuring investors that scarce capital resources will be used efficiently.

The productivity challenge
Yet mining companies often struggle to boost the productivity of their operations. Running a mine – meeting safety obligations, hitting daily production targets and managing day-to-day operational issues, often in a harsh physical environment – is complex. Leading a major effort on top of that, with scarce resources and competing priorities, is a real challenge. It requires a strategic, mine-to-port view and a level of co-ordination across areas that most mine teams are not set up for. It involves multiple interest groups and must occur against an employee relations, legal and regulatory background that is often in flux. The pressure to continuously improve is unrelenting.

Less than a third of transformation programmes across industries succeed in the long term (Figure 1). More typically, they either fail to achieve a step-change in results, or they see short-term gains fall away once management attention is diverted to the next pressing issue. Productivity improvement programmes in mining are no exception.

Often the change does not even start. Without a clear asset strategy and concrete operational targets, managers lack the impetus to find improvements. Without a good understanding of the bottlenecks and value drivers for their mine, improvement teams waste effort on marginal ideas that do not make much difference. Without full and visible support from head office and senior mine management, section heads and superintendents see their own participation as voluntary, instead concentrating on defending the status quo (they certainly do not volunteer their best people for the programme). By focusing on issues within a production step, projects often fail to address interfaces where inefficiencies most often occur. In less mature operations, there can also be an over-reliance on technological solutions to counteract poor operating behaviours.

Other times, mines enjoy a temporary uplift in performance, but the improvements are not sustained. By not emphasising quick wins, the skepticism of line management is confirmed by a perceived lack of results and the programme loses momentum. Or, by not focusing on the skills development of both project staff and the front line, the programme becomes a series of one-offs and interventions rather than encouraging a culture of continuous improvement.

Introducing MOST
How can mines address the productivity challenge?
Mine Operations Systems Transformation (MOST) is a holistic approach used to tackle these common pitfalls, designed to flip the odds of success.

- Maturity-based diagnostic of current capabilities and performance.
- Optimised across the three dimensions of operating systems.
- Sustainable: emphasis on culture, training and behaviours to enable and sustain improvements.
- Transformative: strategic perspective to drive a step-change in operational performance.

MOST starts with an understanding of how advanced the mine is across key operations dimensions, because, in general, it is the least mature element within a mining operation that tends to limit overall performance. A maturity diagnostic identifies hot spots against the three dimensions of operating systems:

- **Management systems**: effectively plan, organise, steer and control the deployment of resources within and across company boundaries.
- **Efficient end-to-end physical processes**: understand, design, operate, maintain and improve physical assets – from mine to port.
- **People excellence**: employ, develop and engage the right people.

Based on the results, MOST then suggests targeted interventions, focusing on the limiting performance element (see Figure 2 for details of the framework). Under management systems, for example, this could include better integrating plans across functions and time horizons, standardising work management, and driving process stability through rigorous short-term interval control. Physical processes could involve a reconfiguration of the physical layout of mine and plant equipment, as well as using traditional concepts of debottlenecking and lean, to increase throughput and decrease costs. People excellence could include aligning operator incentives with business goals, as well as training supervisors on frontline leadership and consequence management.

Programmes that succeed tend to emphasise culture and behaviours that enable and sustain improvements. Although clear targets, accountabilities and metrics for the programme must come from the top, it is all for nought unless behaviours ultimately change in the pit or underground, at the workshop and in the plant. What is needed is a visible and activist management to set the tone: to promote and drive the programme, resolve issues as they occur and share lessons across the organisation. They track progress, know when initiatives are at risk of falling behind schedule and take corrective action. Management is supported by a dedicated team who focus solely on making and sustaining the change. Throughout the programme, they communicate with head office, site leadership, superintendents and (especially) the coal face to maintain confidence and to solicit feedback. This is supported by a formal training programme for project and line staff to

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Figure 2. Mine Operations System Transformation (MOST) comprises twelve performance elements. Source: BCG experience.
reinforce key messages, improve skills and reinforce the desired operating culture. In fact, a substantial uplift in productivity can become a new source of competitive advantage for mining companies. For already-high-performing operations, technology-enabled programmes have the potential to deliver such a productivity uplift, through a combination of step-changes to physical process – such as automation, remote control and co-ordination – the use of real-time information, and sophisticated decision-making. Many industries have already gone through similar technology-enabled transformations. Mining is next.

This holistic approach can create throughput increases of up to 20% and cost base reductions of 15 – 20%, resulting in potential unit cost reductions of up to 20 – 30% – sometimes much more – while promoting a safer working environment. The approach works equally well for mature players, who are looking to cutting-edge concepts, such as remote and automated operations, big data and new mining methods, as well as for operations seeking to implement more standard practices.

Case study: RFID tagging in a Polish coal mine

Jastrzębska Spółka Węglowa S.A. (JSW) is a leading metallurgical coal producer in Europe with coal production of about 14 million tpa across four underground coal mines in southern Poland. The Polish mining sector in general operates in very difficult geological conditions due to the substantial depth of its coal deposits and a high risk mining environment. To manage this risk, a (sizeable) team of dispatchers would manually record movements of all people underground.

To improve safety and efficiency, JSW launched a pilot in the Pniówek mine in 2011 to implement radio frequency identification (RFID) tracking in an underground environment. This pilot aimed to precisely monitor the position and direction of movement of mining crews underground – issues arising from historical mine rescues in Poland – as well as track selected equipment and material flows. The system covers 6000 people, including contractors and visitors, and is based on personalised RFID transmitters built into the lamp of every miner (each lamp has a unique ID number linked to a specific person), which are monitored by a chain of detectors installed across the mine. It can also send warning messages to every single miner via SMS displayed on an LCD screen mounted on the personal lamp or via display banners mounted in the underground sections. There is also a dedicated control room that enables full monitoring.

Although the primary focus for this initiative was technology, the implementation also touched on five other elements of the MOST performance framework:

- Risk management.
- Data management.
- Continuous improvement.
- Organisation.
- Culture and engagement

As can be expected, the implementation met with some initial reservations from crews about the level of transparency and control, but a structured communications programme highlighted the intent of the initiative and the improvements to safety and efficiency, helping the crews understand and accept the technology.

The benefits to JSW have been substantial. Foremost, the technology has improved safety and risk management at the Pniówek mine by enabling faster and more accurate responses to life threatening situations, unplanned breakdowns and delays. It provides the control room with much more granular and real-time data about the location and movements of crews underground, and offers HR systems, such as shift registration, payroll and contractor management, with reliable data, reducing costs. This increased transparency in turn enables continuous improvement: unproductive time of mining crews (e.g. idle and waiting time) and lower value-added tasks have been reduced substantially and equipment inventory management has improved via count, control and location capabilities. The organisation has been simplified, removing the need for a large team to track and record data. Superintendants also report an improvement in discipline amongst the crews.

Based on the success of this pilot, JSW is now planning to roll out similar solutions across its network of mines, to further improve safety and efficiency across the whole group.

A call to action for coal mining companies

To address the productivity challenge, mining executives should ask themselves these questions:

- How mature are my mining operations? Which element of MOST (management systems, physical processes or people) is limiting overall performance?
- What are the key drivers to boost mine productivity? Is my business agenda aligned around these?
- What initiatives are currently underway or planned? Are we covering all of the available improvement levers?
- How engaged and enabled are my employees? Have they bought into the change? Is my programme set up for sustainable success?
- What could a comprehensive programme be worth to my company?

As margins come under increasing pressure and access to capital becomes increasingly scarce, coal miners cannot afford to ignore the potential for productivity improvements to strengthen their business’ bottom line. Where traditional, narrowly focused approaches are unlikely to be sustainable or deliver substantial rewards, a holistic, systemic change programme will.