



HARNESSING AN INTEGRATED DIGITAL MINING PLATFORM FOR OPERATIONAL DECISION SUPPORT

Abstract

The mining industry is going digital, but to reap the full benefit of this investment in digital technologies, the industry will need to integrate its extensive value chain for insights and decision-making. To begin with, the industry will have to define and implement platform strategies to create integrated environments across equipment, production, supply chain, planning and scheduling, and sales and logistics.

IT and OT integration is the key to a next generation platform. The capabilities of this platform could include integration with ERP/MES at one end, and machine and L2 automation at the other. This platform could be the foundation for all hosted digital applications – including mining insights and decision support, connected assets, integrated scheduling, connected workforce, and others. The insights derived from this integrated platform could help enterprises make informed strategic decisions at every stage of their digitalization journey.



Executive Summary

One of the major challenges in the mining industry is the wide array of operational technology that is clubbed with varying levels of automation across the mining process. This makes it difficult for miners to extract insights from the data in these technology platforms and automation systems and results in delayed decision-making and reduced operational efficiencies.

Complexity in the value chain has been a key concern for mining companies while adapting digital technologies. An integrated mining platform can address this concern by introducing operational visibility and flexibility in operations. It could also offer value to mining clients across two areas:

- *Managing mining cyber-physical systems - including thousands of connected devices to measure mining information such as pressure, temperature, vibration, and more. An integrated platform could enable technology stakeholders to simplify the process of configuring, provisioning, initiating operation and managing daily activities of cyber physical systems*
- *Analysis – providing rich analytics through data filtration and enabling monitoring of this data real-time. Advanced edge analytics can extract hidden patterns and insights from the captured information*

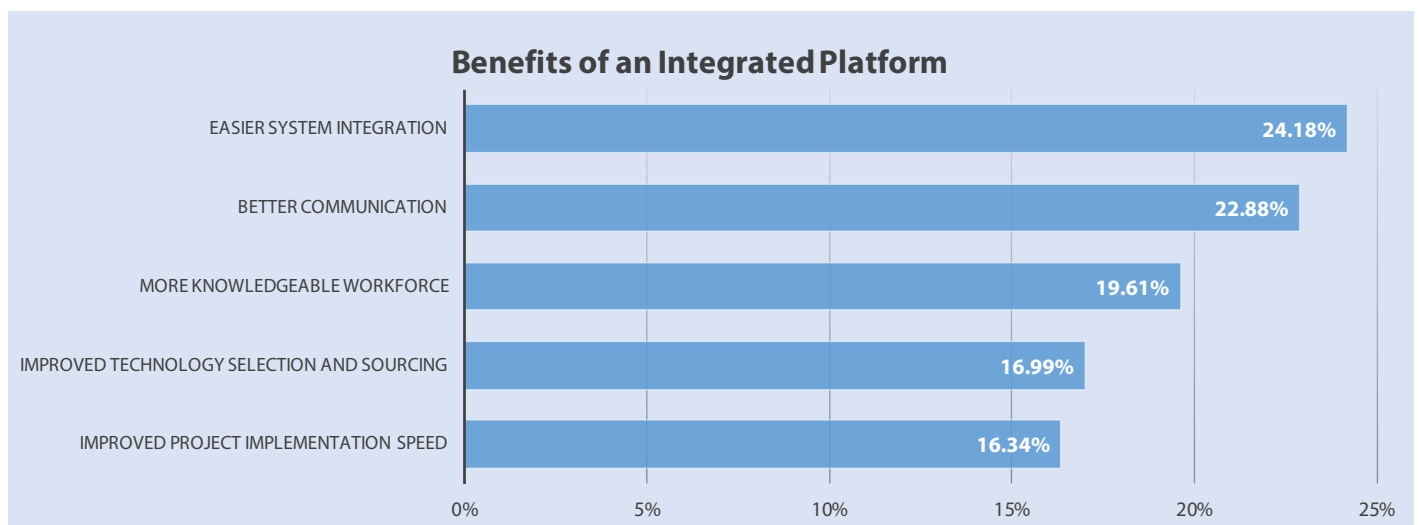
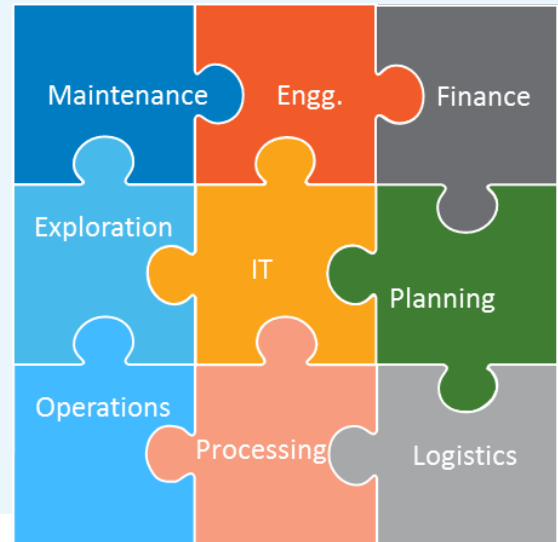
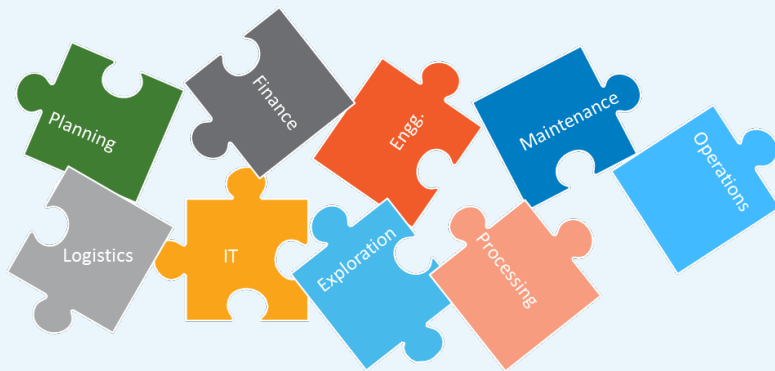
Integration Precedes Clarity

Mining companies have a complex value chain which often restricts them from adopting new technologies. Some of these complexities stem from the fact that data in the enterprise sits in siloes and is therefore inaccessible to all departments. This hinders managers from understanding

processes, and adopting company-wide strategy and targets. Without proper insights, decisions from the processing plants, smelters, other mines, is not connected to the output.

Integration and transparency are important to realize the full potential of digital technologies.

The mining industry is already making significant investment in creating physical infrastructure for implementing digital technologies across its value chain. Adopting an integrated digital mining platform can help companies reap the full benefits of their investment through smart and informed decision-making.



Source: Internal Research

Platform Play in Mining

An integrated platform for mining enables standardization of IT systems which enables data centric computing and streamlined OT for monitoring events, and process which are at the core of operations. In the last decade most industrial system providers embraced core IT technologies such as Ethernet and TCP/IP. However whether they have achieved the full integration of IT and OT remains a question. The Automation World Survey4 notes that less than 10 percent of companies have an integrated platform.

A platform integration implies a complete data and system integration. Recently, many companies have deployed manufacturing systems to send and receive data from their IT systems. This means using a big data analytics platform to process data from the shop floor to provide actionable insights. But this is easier said than done and requires a cultural change so that both the IT and OT teams

collaborate.

In most enterprises, IT and OT systems have independent protocol and governance models. The criticality of the physical world, operational challenges, production impact and safety compliance should be perceived by the IT team so that they can align themselves with the complexity of the mining operation. Successful implementations of an integrated platform require a deep knowledge and understanding of every system involved.

The main issues for the team implementing an in integrated platform however, will be around data integration and cyber security. To address this, personnel need to understand the data that the application handles and how it is linked to other systems.

The major benefit of a platform integration is that the enterprise has improved access to information, which in turn improves collaboration across the value chain. The improved availability of information is

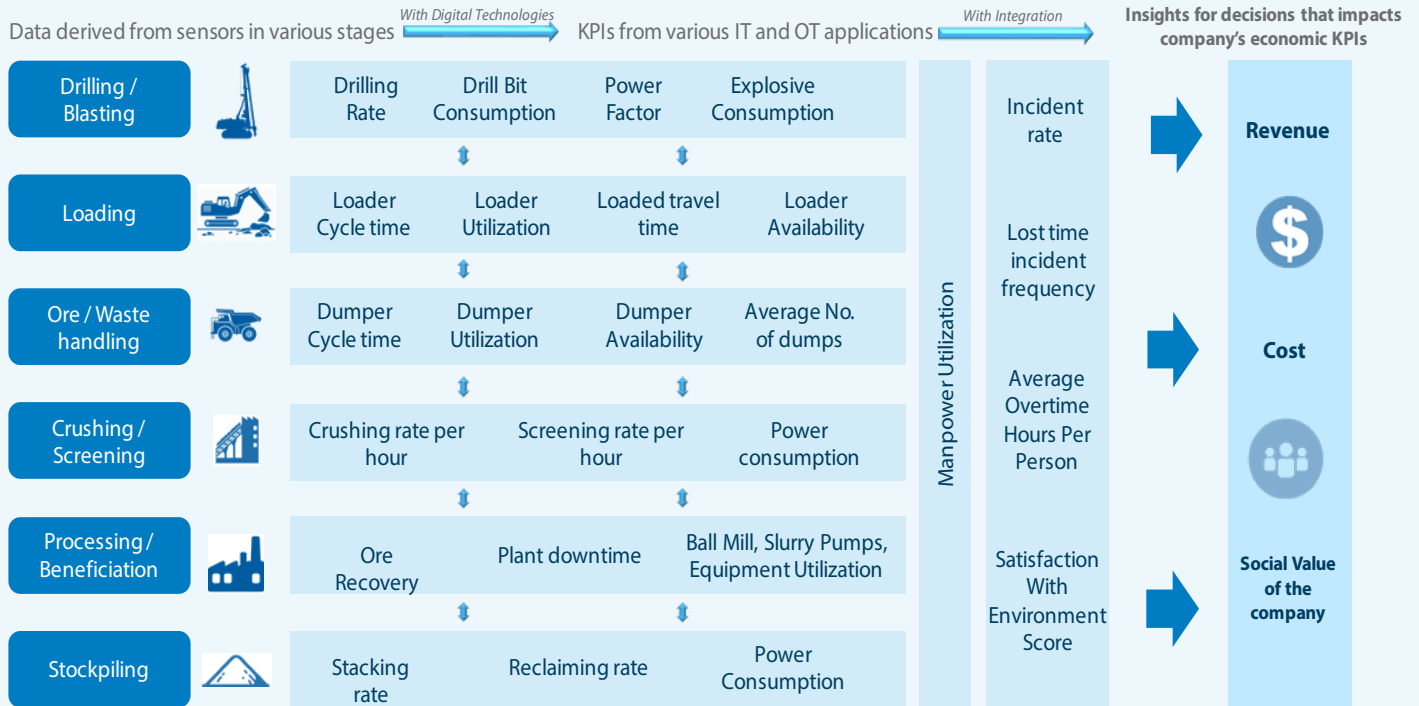
key to achieving operational excellence and taking faster and smarter decisions. Important to note, however, is that the analytics platform is only as good as the data it is fed. It is this data that the company relies on to make strategic decisions. When the siloed data is consolidated, a new set of possibilities and insights are unlocked.

The integration of IT and OT systems impact internal processes and the workforce as well. As shown in the chart, companies that integrate IT and OT notice an improvement in communication and knowledge of the workforce in all areas. This leads to better project implementation.

This integration not only helps in decision-making but also in understanding and implementing strategic initiatives that the company chooses. With all units integrated, enterprises can easily trace areas that are doing well and those that are deviating from strategy, more so as KPIs in all areas are used in the corresponding applications.



Integrated Value Chain – KPI Perspective

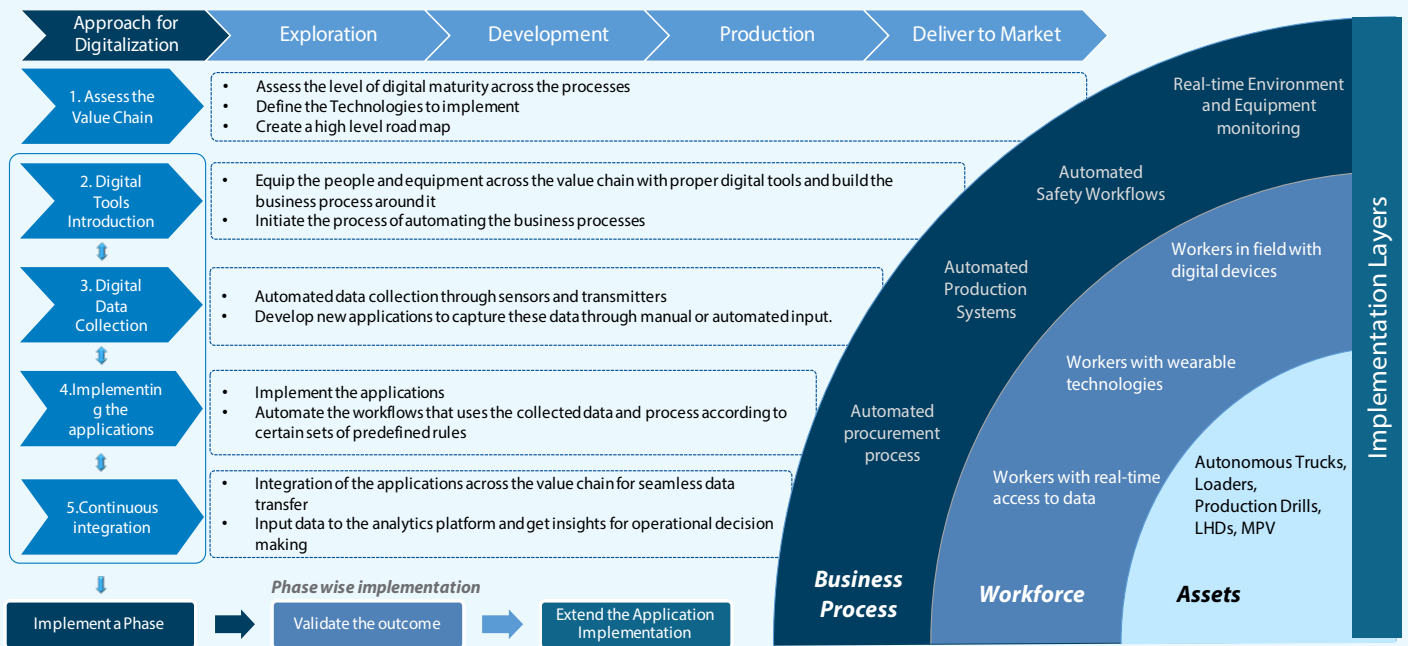


When an enterprise needs information regarding the value chain, it needs to review KPIs in those areas. These KPIs are now generated by a software application. When this information is reviewed department-wise they point out how a particular section can be improved and whether that department is functioning within predetermined parameters. Performance indicators are sometimes connected to KPIs of the downstream or upstream departments and give enterprises detailed information, however, linking these KPIs across the value chain is the challenge the industry faces. Complete platform integration helps mining companies bring together data across the value chain. If this is done, performance indicators that the company

uses to monitor progress and strategy can be linked to KPIs across the value chain. This unlocks insights that can help the management to take engage in better decision making and transform operations. For instance, a breakdown of a dumper will be looked at by the maintenance team as equipment downtime. This is linked to the loss of production for that day. This loss of production can be handled by the operations team by compensating it in the next shift by moving less waste out of the mine so that there won't be shortage of ore for the processing plant. This downtime will not go beyond these two departments. However, when taking all equipment into account the equation gets a bit more intricate. These breakdowns can be because of multiple reasons

such as faulty or worn-out spares, operator fault, maintenance team fault, etc. This links it to the inventory management department and the scheduling application which assigns the operator. Data generated from this scenario can be analyzed and a model can be built to link these KPIs so that the enterprise can peg down the loss caused by unplanned breakdowns, and possible solutions to rectify it. Breakdowns can also be linked to safety which can affect the social value of the company. Unless a link is drawn between KPIs it would be difficult to locate areas of concern and improvement. Platform integration can help in achieving this link.

Integrated Digital Mining Platform – Moving from IT Strategy to Mining Operations



Value Chain Assessment

To begin with platform integration across the company, the leadership needs to finalize a vision. A proper team needs to be set up and the gap between the office environment and field operations needs to be bridged. This will need to be done in phases.

1. The initial phase is to assess the value chain and determine the level of digital maturity of each process
2. Next, technologies to digitalize each area need to be selected
3. A high level road map has to be created to start the digitalization and integration journey

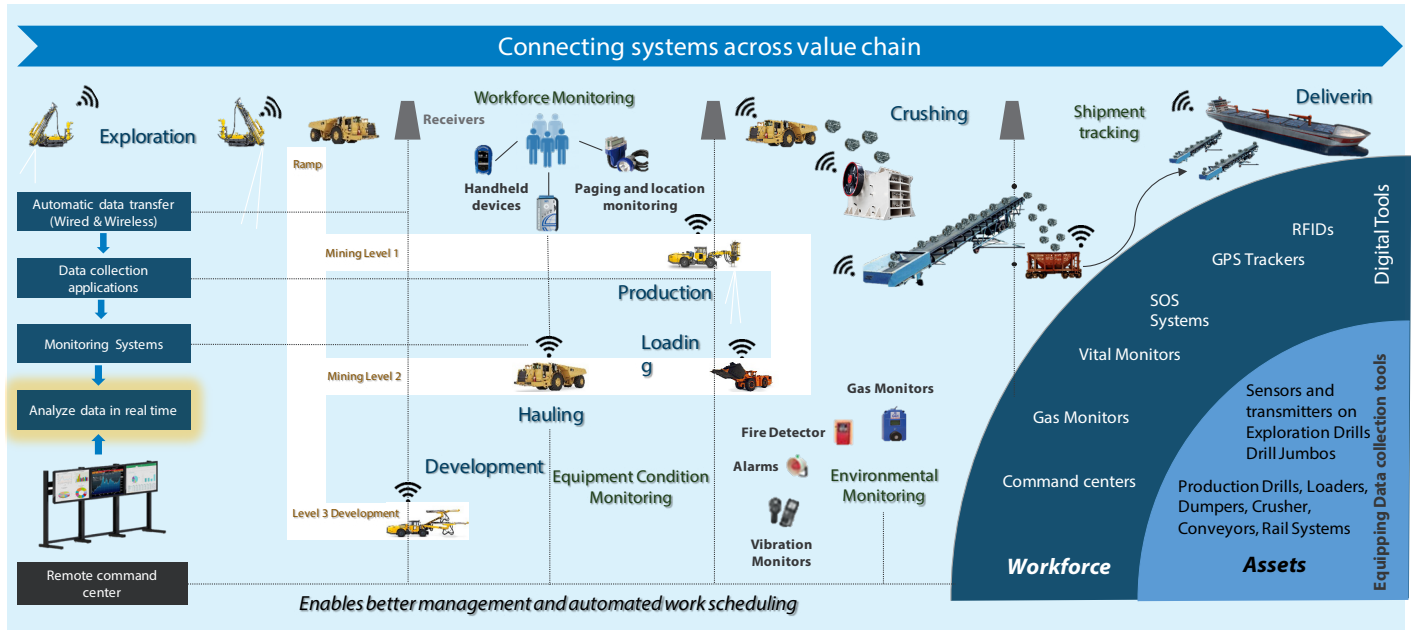
Introducing Digital Tools and Connecting Assets

In this phase enterprises need to adopt equipment this is capable of sending and receiving data, however old equipment will need support. Equipping assets and the workforce with digital tools will smoothen integration. Data collected can be monitored in a remote operations center which can help ensure processes do not deviate from the set process control limits.

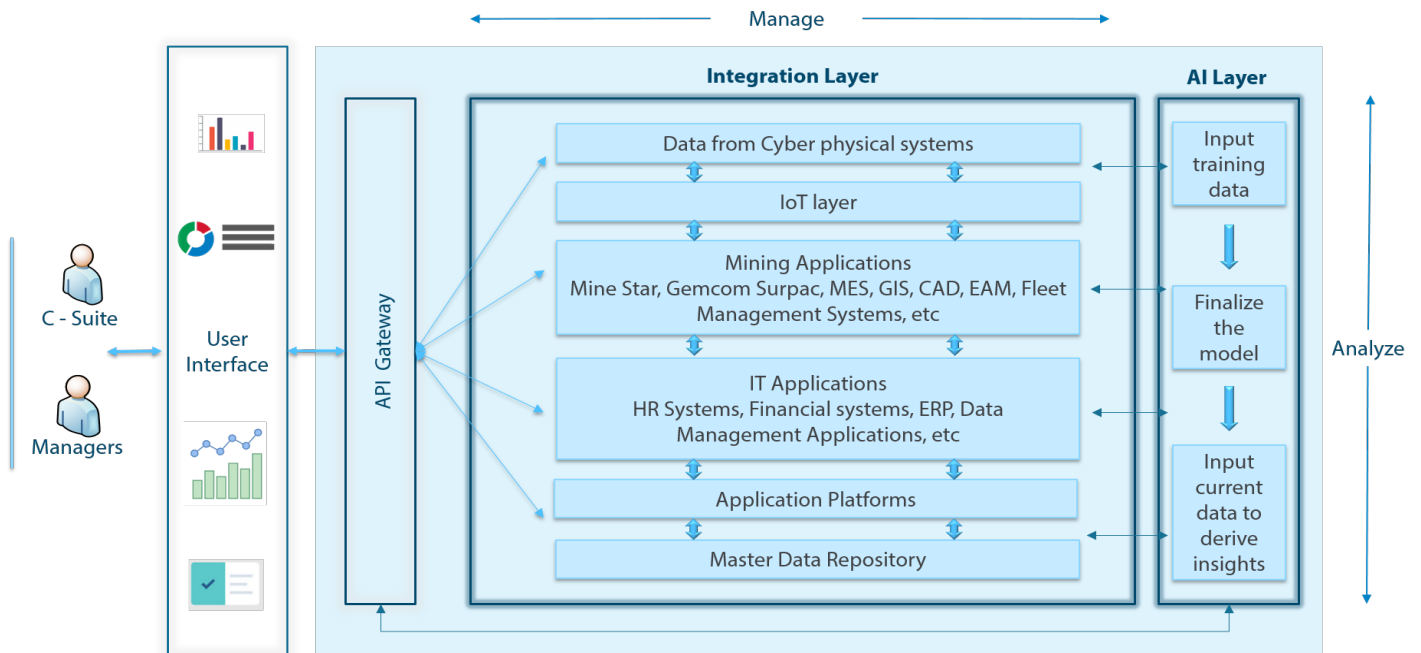
Digital Data Collection and Implementation of Application

Software applications need real time information fed directly into their system. Analysis can determine whether there is a need for the new application to accommodate the automated data collection. Once these applications are implemented on the integrated platform they should be able to seamlessly transfer data between assets and applications. These implementations can be in a phased manner and pilots can be run to validate outcomes and extend implementation to other areas..

Introducing Digital Tools and Connecting Mine Cyber Physical Systems



Visual Representation of an Integrated Digital Mining Platform



Role of AI in the Integrated Digital Mining Platform

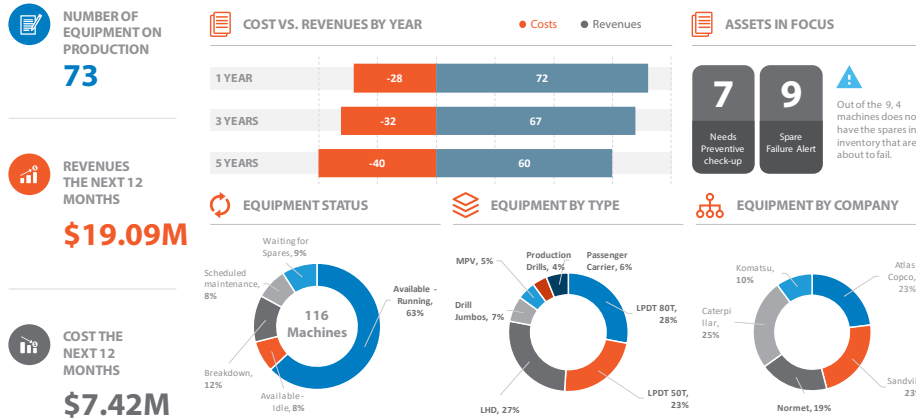
The integrated digital mining platform aims to achieve a complete integration of data and systems. This consists of an integration and an analytics layer where artificial intelligence is leveraged to derive insights. In the integration layer all platforms are integrated to have

seamless data transfer which links the data throughout the value chain. The data from this layer should be fed into the analytics layer for generating insights. The data is fed in predetermined formats and are variables that are required to create a model. It is crucial to feed historic data into the system for training. Insights that are derived from the model can be accurate only if historic data fed into the system is high quality.

Once this model is finalized real time data can be fed into it to receive automated information into the AI layer. Since data is linked across the value chain the model is capable of generating insights by linking all the parameters. This will offer real time insights on operations and progress. These insights and predictions can be used for improved decision-making.

Snapshot of Asset Summary Dashboard

A sample dashboard (for representation purpose only) as below



Users not only see output by way of dashboards but will also have predefined access to data from other departments and a holistic view of processes. Dashboards can be configured based on user

requirement. The integrated digital mining platform provides real time operational decision support to managers and senior members of the company. This allows them a truly integrated mining experience.

Extracting Value from Digitalization

The way in which companies perceive growth has changed drastically in the last decade. Data has become central and many industries have taken initial steps towards digital transformation. Digitalization is being viewed as a journey rather than an executable strategy, and integration is just one aspect of this journey. Yet, analysts report that even after heavy investments in digital, companies continue to struggle to realize RoI at scale. It is here that an integrated digital mining platform can be a determining competitive differentiator.

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