



Driving insight  
from data in the  
mining industry



It is well known that the mining industry today has a wealth of data from operations. This includes data related to equipment performance, orebody (resources, reserves), quality (grade), plant operations (recovery), drill & blast, energy/fuel consumption, and maintenance, to name a few elements. Most mines have implemented some form of daily and monthly reporting and wonder whether this is the right time to dive into proof of concepts on machine learning. Many do, only to later realize that these experimentations are unable to scale, had an ill-defined problem statement, are too complex to manage in the long run, lack data

quality or do not provide the desired benefits. In essence, a structured approach is necessary and application of data analytics technology should progress as the business matures, to derive insights from data for decision making.

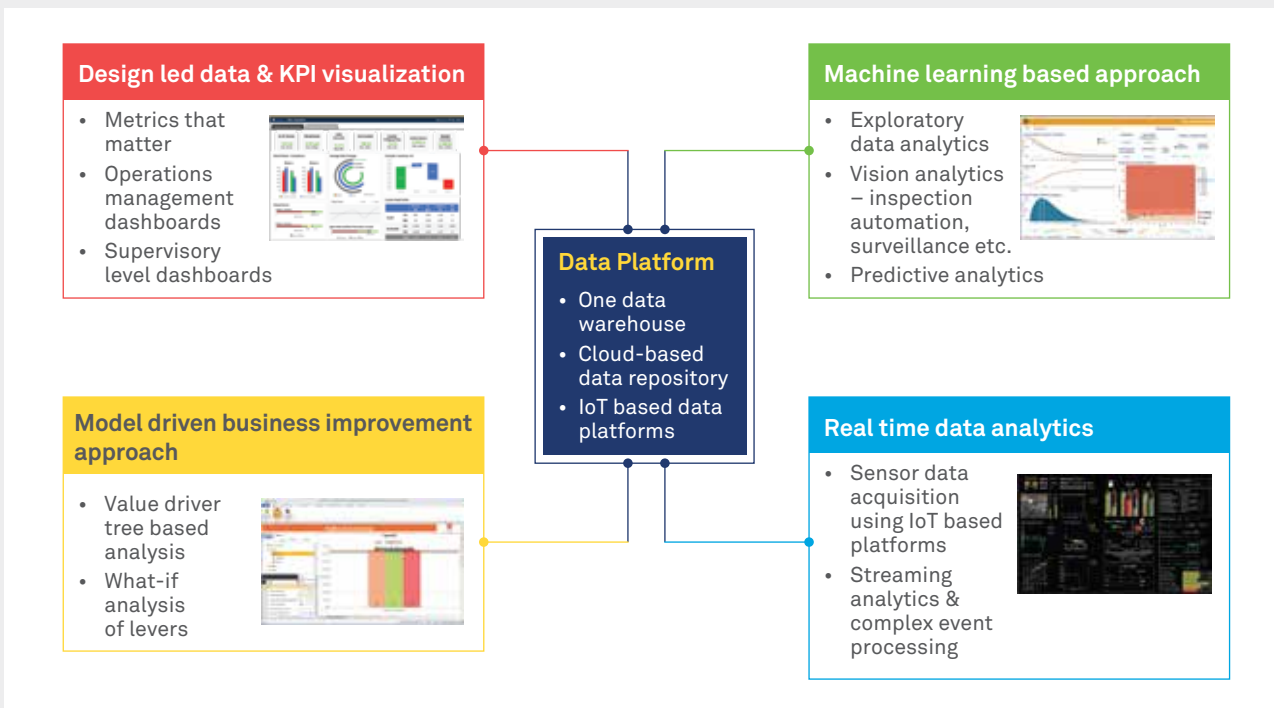
### **Insights from data**

The following section covers some key approaches to adopting data driven strategies in the mining industry and can be applied by miners large or small depending on their maturity.





**Ask the right questions for business improvement and address ill-defined problem statements**



**Design thinking led KPI and data visualization**

Most miners have a good level of reporting in place and have invested in data-warehouses as a central data repository and use business intelligence tools to generate reports. The problem typically is that these reports by themselves do not tell a story (with lack of trends, or relevant KPIs) and are often just a historical statement of figures that are not necessarily useful for management. Many times these reports are not holistic and have a poor visualization that doesn't address real world problems – managing the mine to mill interface, re-handling tons, variations to plans and what is needed to get back to plan. Good visualization of data can trigger management

and supervisors to ask the right questions for business improvement and address ill-defined problem statements.

**Model driven business improvement approach**

Most miners have used value driver trees at some point as a tool but these are mostly Excel based and not dynamic. They usually provide only a point-in-time snapshot into the cost or productivity hierarchy but don't drill down into the underlying technical levers or allow for what-if analysis to plan for short term improvements. Ideally a model driven approach can be adopted to identify bottlenecks which can be improved upon before iterating to the next bottleneck. The levers that are controllable

such as breaks, operator availability, fill factors can be acted upon either using additional technology in the field or operational work practices to guide improvement and achieve scale and sustainability in the long run.

**Real time data analytics:** This is an approach much talked about with the advent of IoT and data platforms. They are really a complement to the operational data sources and are good for decision making at a shift level or a day and could provide additional insight to the information that underlying mining systems provide today (e.g. an inventory view of a silo in real time along with the rate of mining from the pit etc.). They could also help with short interval control approaches for decision making.

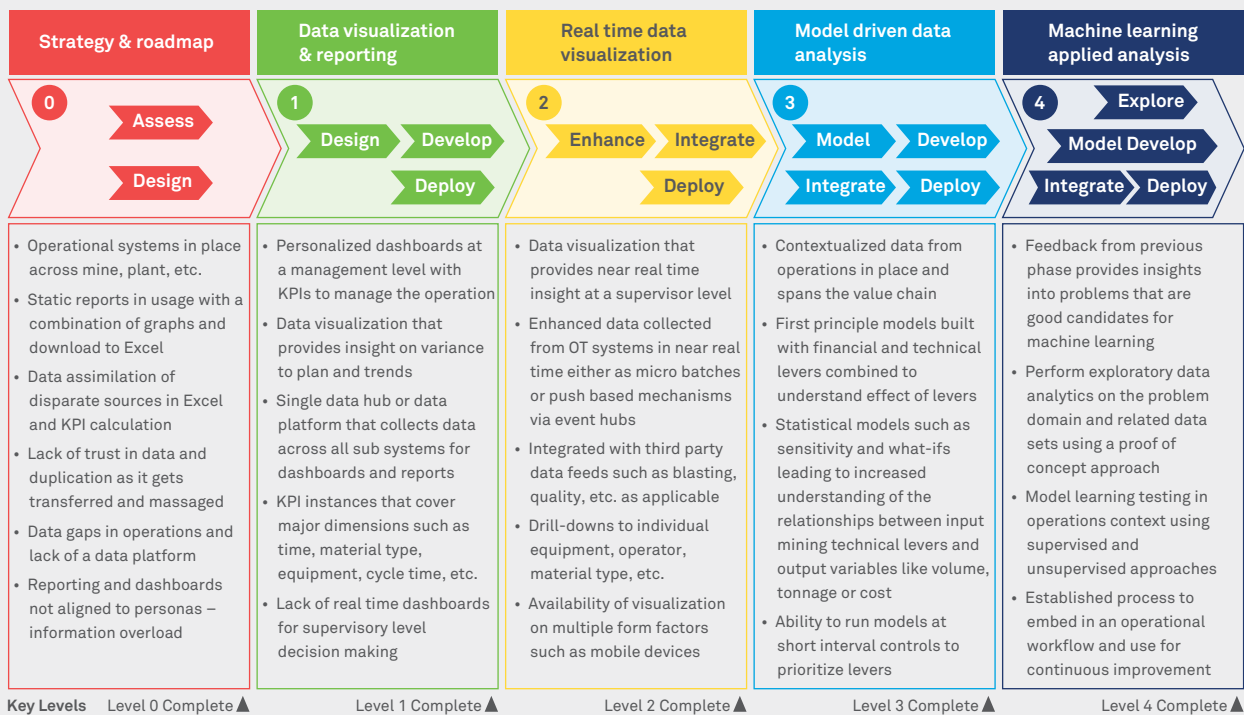
**Machine learning based approach:** Machine learning can provide tremendous business value where there is a well-defined problem statement, with enough granularity from data

exploration on domain variables and possible outcomes and a strategy on how the outcomes can be acted upon. Often the last bit is ignored—a good correlation chart tells the story but either cannot be acted upon or the business process does not include it in the workflow.

There are good examples where predictive maintenance has been successful in identifying issues such as survival analysis of haul trucks, prediction of conveyor failures using decision tree algorithms, etc. However they have lacked a process or approach to make these initiatives sustainable and embed them into the work process.

### Implementation journey

The table below indicates a data driven journey and can be considered as an important guideline for a mining organization:



### Some key considerations

The following points are important guidelines while adopting a data driven strategy.

- Identify operations management stakeholders, not just IT alone. A top-down approach is important to harvest business value. Chief Operations Officer and Mining

General Managers must own such a program to a great degree, not just IT alone.

- Data visualization is important so information presentation using the right graphs and widgets must be debated for readability. Starting with a blank piece of

paper is a bad idea and people often can't tell what they need. Starting with a point of view that is domain led and can offer a debate driven process allows stakeholders to engage in the process to guide and deliver value and promotes ownership.

- Identifying information gaps due to lack of automation is part of the design led thinking process. These need to be prioritized while identifying the building blocks of the analytics journey. For example, it is quite common to see shovels and trucks tracked in a fleet management system but not the graders that do haul road maintenance work.
- The discovery phase will most likely lead you to conclude that the current data platform may be inadequate, so prepare to repurpose or re-transform. You will likely encounter situations where your current platform lacks scalability to deliver the KPIs at the level of granularity and context needed.
- Use an agile approach to ideate, implement and support in each phase. Quick wins are important and there are a number of them in each phase for buy-in so start looking at harvesting existing data warehouses as much as possible.

## Conclusion

The benefits of a structured program in mining is well documented in media. Productivity benefits of 20% or higher is not unheard of, but that just applies to a segment of the value chain. Mature analytics approaches can solve very high profile problems such as productivity, which is again well documented in the media. In the end, for a successful program, a mining company's ability to implement would depend on:

- Use of Agile implementation approaches for design, implementation, test and support
- The value proposition of the use cases being implemented
- The benefits these use case will realize
- Embedding these use cases into the day-to-day operations workflow
- The usability and utility of the apps and technology provided to the users
- The proper change management program being in place and continuous improvement

### About the author

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Sudip Chaudhuri heads the Mining Practice for the Energy, Natural Resources and Utilities business unit at Wipro. With over 20 years of varied information technology experience in mining and mineral processing, Sudip has worked with numerous clients in the mining and minerals industry on transformational and

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