The impact of mine maturity on the selection of initiatives to deliver optimal business alternatives

Paper

MineRP

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Mine Maturity and the focus of Optimization Initiatives

About the Author

Self-described as "born in the shadow of a headgear", Johnny van den Berg has a lifelong association with the mining industry. He joined Vaal Reefs as a sampler in 1979 and progressed to the position of Senior Mineral Resource Manager for AngloGold Ashanti's South African Region. In 2013, after a month of retirement, he joined MineRP as Mining Executive.

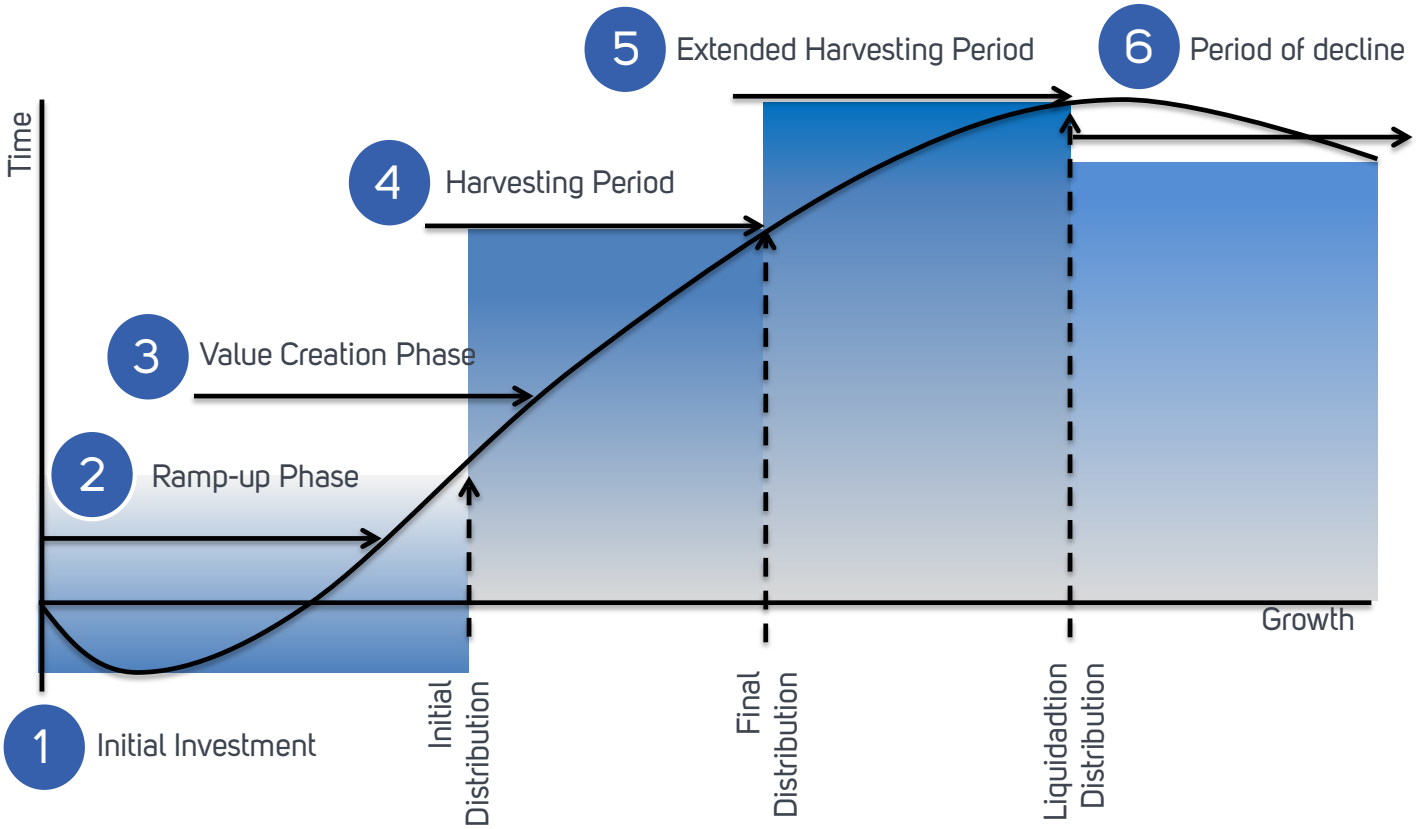
Economic Life-Cycle

In economics, the life-cycle hypothesis (LCH) is a model that aims to demonstrate an individual person's consumption patterns. In the early 1950's, Modigliani (1966: 162-165) and his student, Richard Brumberg, developed a theory, grounded on the observation that people make consumption decisions based both on the resources available to them over their lifetime and on their current stage of life.

They observed that individuals build up assets in the initial stages of their working lives. Later on, during retirement, they make use of their stock of assets. Working people save up for their post-retirement lives and alter their consumption patterns according to their needs at different stages of their lives (Deaton, 2015:2). The same patterns are replicated in business. The typical life-cycle of a company is exemplified in the diagram below:

Diagram 1

Start-up Economic Life-Cycle



Phases in the Economic Life-Cycle

1. The **Initial investment phase** is when the initial investments of capital, both financial and intellectual is contributed by the founders and their partners.

2. During the **ramp-up phase** operations of the company is started. It has not made profits yet and the initial investment is used to fund the day-to-day running of the company. If done successfully, the company reaches a money-neutral position at the end of this stage.

3. The **value creation phase** is when the potential strategic value of the company is unlocked. The company goes into positive cumulative cash-flow and the initial investors are rewarded by an initial dividend.

4. With successful companies this extends into a **harvesting period** when high returns are achieved. Some companies will wrap up and declare their final dividends towards the end of this phase.

5. Any good idea has an "expiry date"; companies that recognise this and rejuvenate the original idea are able to enter an **extended harvesting period**.

6. Once the natural life of a company has been reached or market sentiment changes, a **period of decline** begins. There are many examples of companies that started on a completely different journey; but there are more examples of companies that got it wrong.

Many natural resource companies find themselves in turmoil when internal or external factors impact on their ability to unlock value. Industrial action, changes in legislation, new codes to adhere to, and volatile markets are all examples of factors that could require a company to change its strategic direction. This is where understanding the Value Creation Curve (VCC) becomes critical, as it ensures focus on the right areas. The value creation curve is a graphical representation of the cumulative value added over the total life cycle of any mining unit. The concept has been developed in different formats by various companies in an attempt to understand the maximum potential value of its ore bodies. It also affords a balanced view of all operations across an entire portfolio.

Initially the potential value of an operation is evaluated in broad-brush strokes in terms of the initial scope of the ore body. Once the art of the possible is decided, an operating strategy is formulated and various options and scenarios are tested to ensure optimal extraction of the resource and reserve. Finally the transition is made from theoretical planning to execution planning. This is when the application of industry standards and best practises are explored with a view to enhance and maximise the margins. Ideally, these are restricted to production parameters over which the company has full control. Since this is a lifetime view of an operation it is possible to plot the position of an operation on the curve.

Typical optimization activities that suit mine maturity statuses

A common misconception is that companies, at corporate level, require one single optimization solution and approach for all operations in its portfolio. For example, exploration is critical for new or young operations, but is of little benefit to operations that are close to the end of their life and consist mainly of pillar activities. Similarly new operations will find very little benefit from best practise analyses if the overall extraction strategy has not been decided yet.

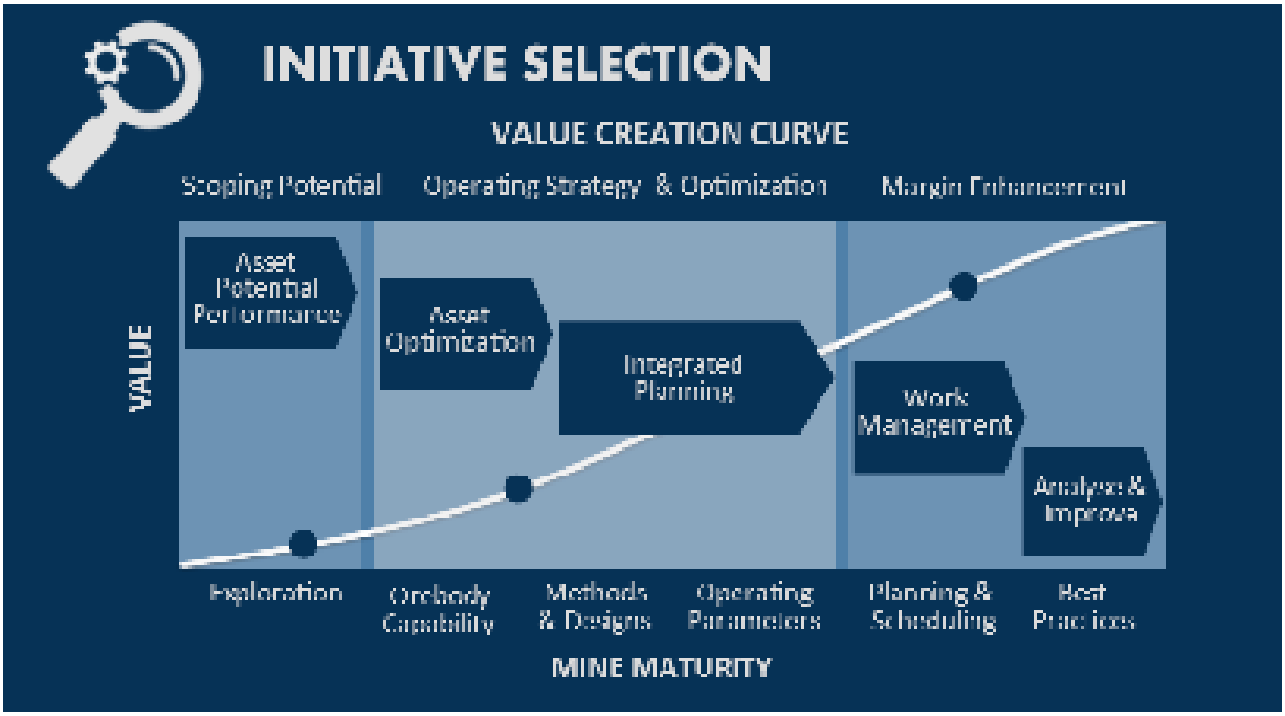
During exploration most decisions regarding an operation, like the position of the shaft or the overall extraction strategy can be reviewed and changed if required. However, once shaft sinking has started, that decision cannot be changed and it therefore does not need revisiting. Decisions like extraction strategy, level spacing, crosscut intervals and pillar configuration should be tested and optimised if and when new information becomes available.

This way capability of the ore body is optimized. Once the mining method and design has been decided there is little value in revisiting exercises that will alter or enhance the capability.
Operations approaching end Life of Mine, will revisit capacities and scale down to suit, as part of a cost saving exercise. After the mining method and design is decided the focus changes from asset optimization to integrated planning.

This does not mean the end of optimization exercises, it merely means that the optimization questions change from long and medium term planning to execution planning. During this stage which will form the basis of the execution plans, the operating parameters are decided. These are short term plans with lots of detail unlike the strategic plans with much less detail.

Diagram 2

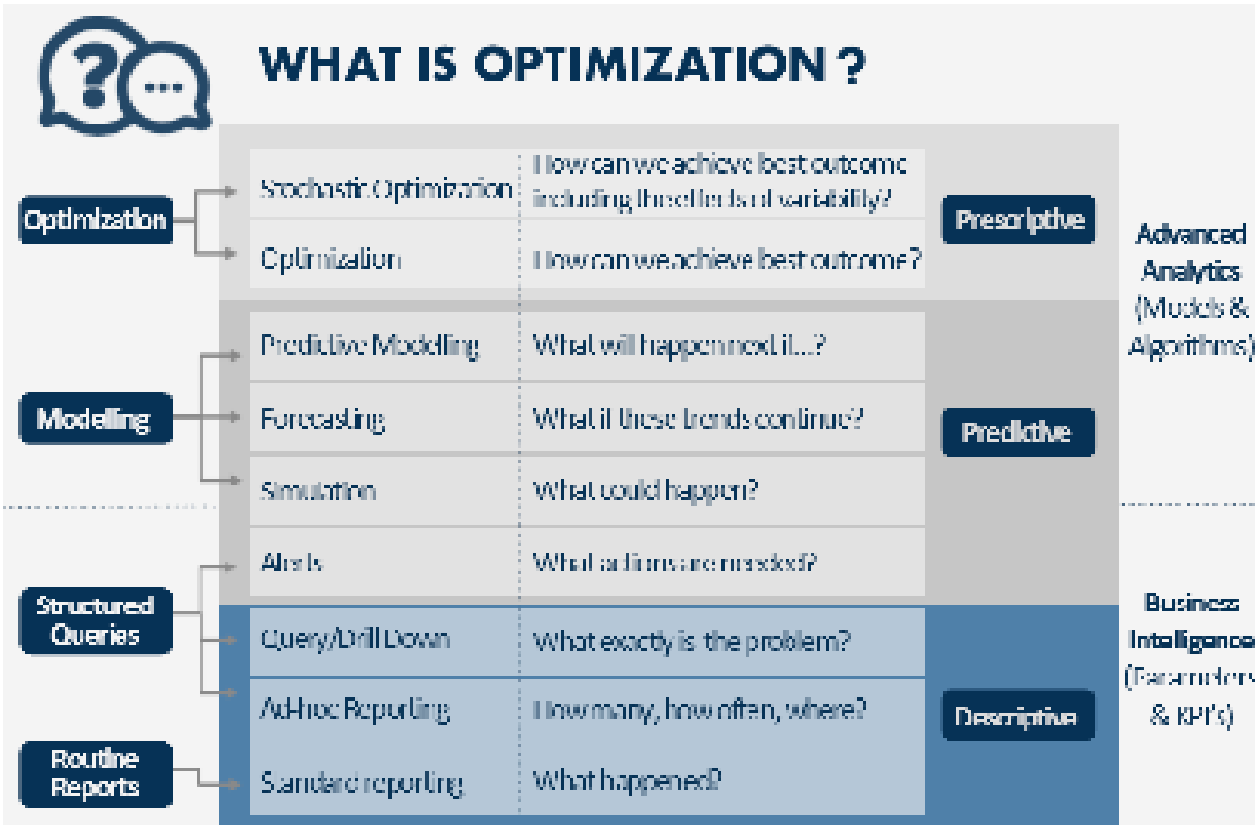
The Value Creation Curve with life span focus areas



MineRP provides solutions to develop optimal business alternatives for all phases in the business life-cycle

The value of any portfolio is not merely the sum total of the individual operations but rather the ability to leverage the synergies of the assets under prevailing market conditions. As an example, capital development curtailment will have a much bigger impact on newer operations than on operations close to their end of life due to their well developed infrastructure. Similarly a reduction in labour will potentially have less of an impact on newer shafts due to the ability to adapt the mining method or mine design. It is therefore of paramount importance to understand the position of individual operations on the Value Creation Curve in order to select the appropriate optimization initiative to arrive at an optimal portfolio.

Diagram 3



"Generate fast, accurate and feasible mine designs and optimized master business schedules. Mines are now able to create optimal business alternatives that can be monitored and adjusted as market conditions change."

MineRP's solutions facilitate the development of optimal business alternatives at every level of the organisation

In order to determine the impact of individual operations on the total portfolio it is necessary to have an enterprise-wide perspective of the portfolio. This view is build up over all the stratigraphic layers in the organisation. If the lowest level is not optimized it will not be possible to optimise the next level up.

Often optimization is a top-down process, which potentially ignores the constraints or opportunities on the lower levels. The mining value chain can only be optimized if all the disciplines that impact on it has reached some level of optimization and the feedback loop is well managed.

Developing appropriate strategic business options throughout enterprise, portfolio and operational levels and persisting these business options as feasible execution plans requires the input of various technical specialist and systems.
Mines are subjected to variability and optionality in each phase of the mining process driven by internal as well as external business demands.

Diagram 4

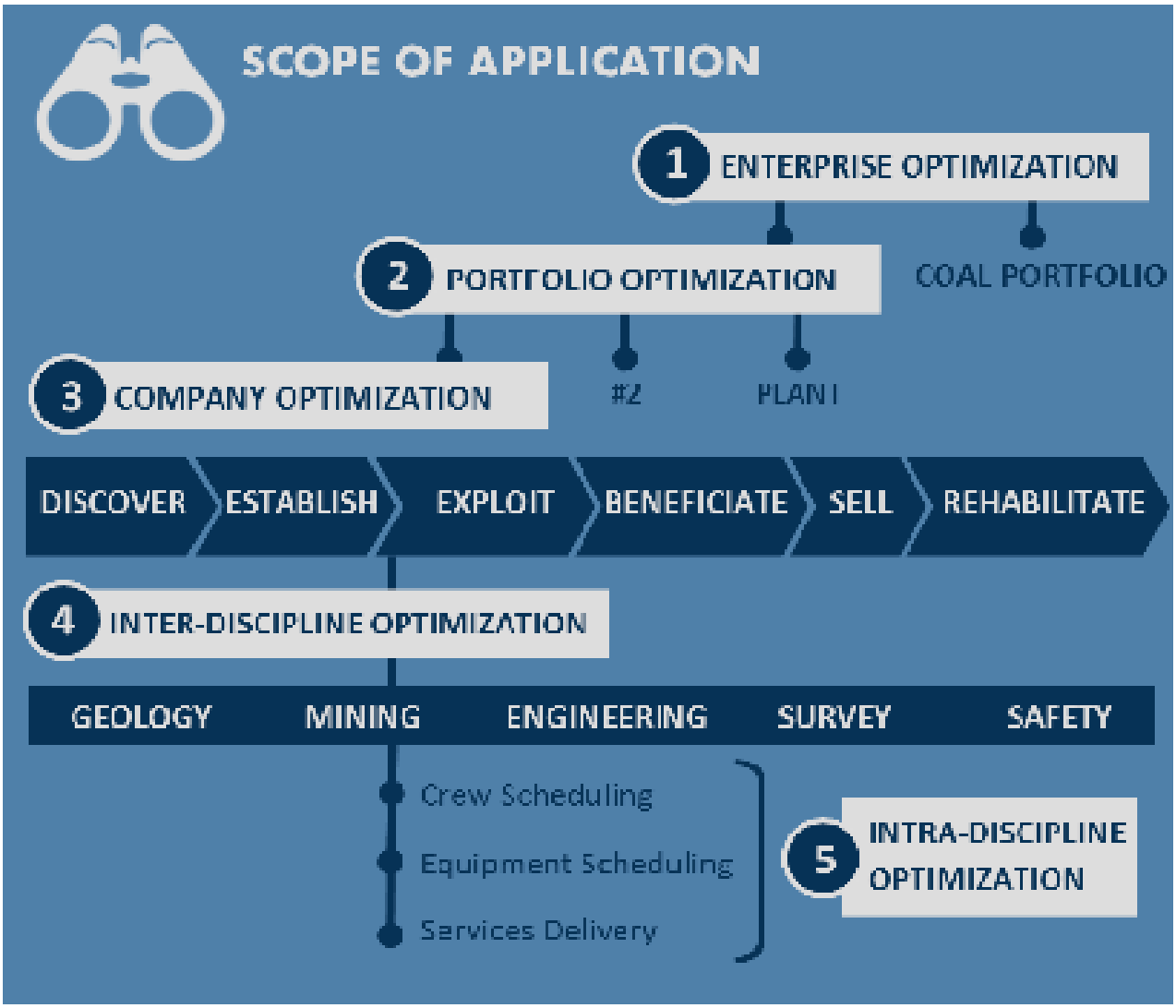
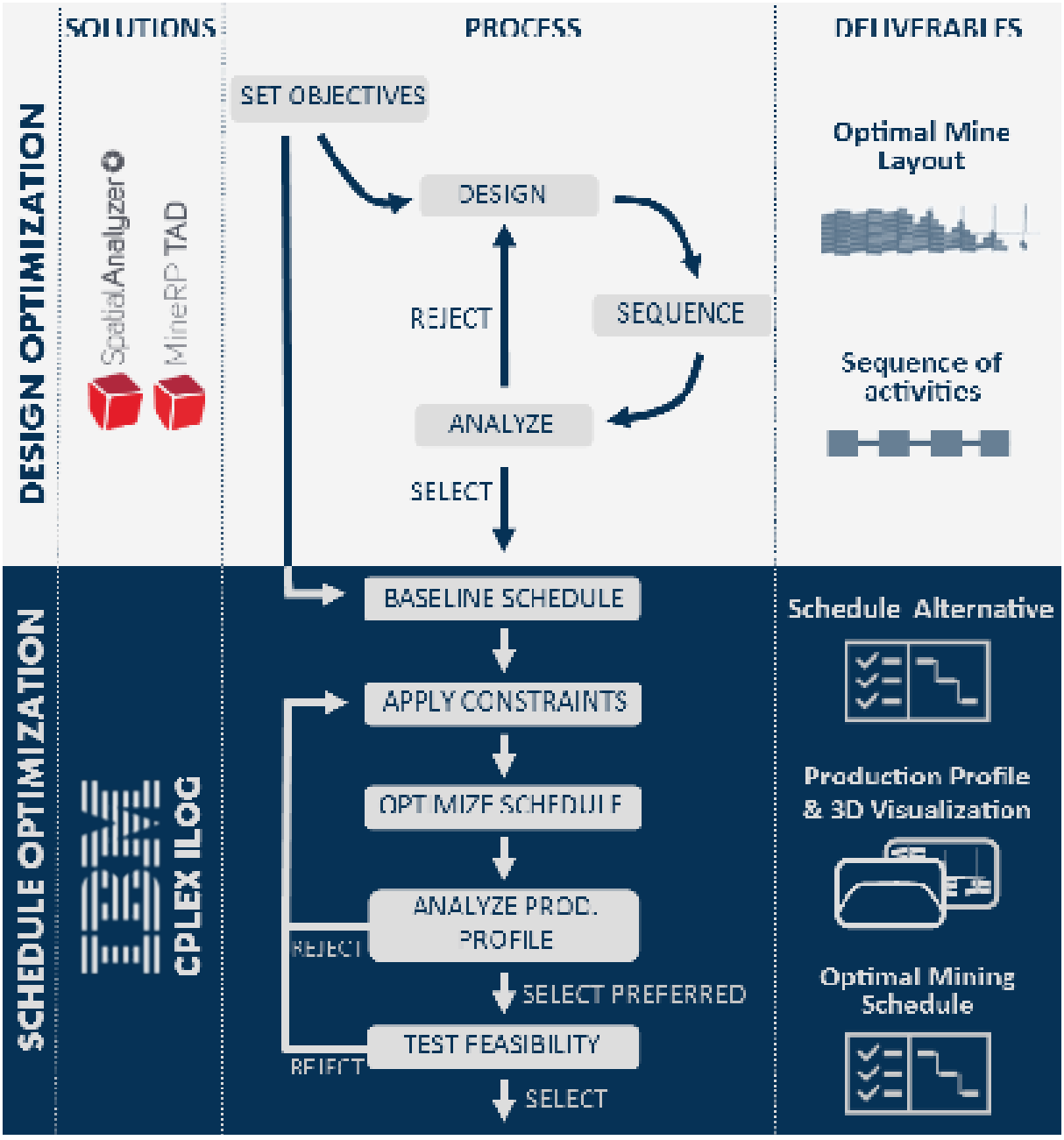


Diagram 3

MineRP's design and schedule optimization solutions



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