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How to optimise asset investment strategies to maximise value

What is the benefit of optimising investment decisions? And what does value mean to your organisation? Copperleaf explains more

For energy companies managing critical infrastructure, asset management can resemble a game of multi-dimensional chess. Talented asset managers will not simply react to changing circumstances, but will craft a strategic plan that anticipates future shifts.

That said, without the right tools and systems in place to support them, asset managers may find that decision-making at their organisations more closely resembles a roll of the dice.

Canadian decision analytics software company Copperleaf has devised a game to demonstrate how difficult it can be to make optimal decisions, even with very few options. The game aims to help asset managers visualise the advantages of optimising, rather just ranking or prioritising, investment opportunities.

The objective is to identify an investment portfolio that achieves the maximum return with a fixed annual budget. The sample portfolio includes a total of four investment options that span multiple years. Each investment has a different cost and achieves a different return.

For added complexity, some of the investments may be shifted into future years but yield progressively less benefit over time. This illustrates the fact that in an asset-intensive world, the value of an investment changes as it is deferred, due to fluctuations in both its associated costs and benefits.

Copperleaf explains that because some assets deteriorate more quickly than others, some investments may lose relatively more value as they are deferred from year to year as they expose the organisation to more and more risk.

How to rank a utility project

There are of course various ways of ranking the options. For example, an asset manager could rank them by value, until first-year resources are consumed. Other projects should then be deferred into future years to 'fill' leftover budget capacity and produce higher yield.

Asset managers could alternately rank projects by a value/cost ratio, where the goal is to get the most 'bang for your buck'. In the game, selecting the projects with the highest value/cost ratio and deferring the others to fill budget produces a still higher return.

However, neither of these ranking approaches result in the highest-value portfolio. This is due to the fact that the investment with the highest value and the one with the highest cost/benefit ratio can be deferred without any impact on value. In other words, they are important investments, but not urgent ones. The optimal solution therefore involves starting one of the lower-value but more urgent investments in the first year, and doesn't actually include the highest scoring individual investment.

The game is somewhat rigged, however, to demonstrate that using manual methods to evaluate the various options will rarely produce a winning formula. The best solutions to even the most simple problems can often be counter-intuitive.

Asset management in the real world

Games aside, asset-rich organisations such as power utilities are faced with a seemingly far more intractable problem when it comes to optimising potential investments within a limited budget, notes Copperleaf.

A modest portfolio of 20 investments that could each be launched in any month over a two-year period has over 10,000 possible combinations. Real-life cases are typically much more complex, with portfolios subject to dozens of financial, labour, service level, and timing constraints.

With so many moving parts, companies require a mathematical optimisation technique to analyse the problem and determine the optimal solution.

Optimisation iterates through every possible combination of investment options, then selects the highest-value solution that honours all constraints. It accommodates any dependencies, time horizons, financial constraints, resource constraints, and incorporates various alternatives and start dates and their impact on value for each potential investment project.

But what is 'value'?

We have established that the goal of optimisation is to maximise the value that a given investment portfolio can deliver to the organisation. However, defining what 'value' means can often pose the largest challenge. Organisations must develop a consistent and holistic way of evaluating potential investment decisions.

At the heart of that process is a 'value framework'.

With a value framework, the various benefits of every investment are evaluated on a normalised currency-neutral scale. This scale will often include both tangible and intangible benefits, such as financial savings or reputation, employee morale, safety and environmental risks.

While the overall objective is to maximise the value of the portfolio, every organisation will have its own unique view of what value means. 'Value' is ultimately defined by an

organisation’s stakeholders, which might include shareholders, workers and unions, regulatory and government bodies, customers, consumers and the community.

The value framework is built by compiling the strategic objectives of these diverse stakeholder groups, then identifying more granular metrics that can be used to evaluate the contribution of a given investment to those objectives.

For example, a ‘healthy environment’ goal could be valued in terms of reductions in CO2 and energy usage, and avoidance of environmental risk. Each investment will contribute to one or more of these numerical measures, providing a better understanding of the value of a given investment.

Over time, an organisation may decide to change its value framework to reflect shifting objectives or changing regulatory expectations. The value framework should be easily reconfigurable to facilitate sensitivity analyses or more permanent changes.

Executing optimisation

To conclude on the benefits of defining value and optimising investment decisions, Copperleaf references a MSc research project completed with the Centre for Operational Research, Management Science and Information Science of the University of Southampton in the UK.

Simulated tests of a traditional prioritisation algorithm compared to a mixed integer linear programming (MILP) optimisation model showed that the latter always yields higher portfolio value for the same monetary constraints - consistently in the range of 7% to 20%.

In a blog summarising the study, Copperleaf's Stefan Sadnicki states: "7% to 20% of increased value is a significant amount - especially given the size of typical investment plans in asset-intensive industries. Hopefully this gets you thinking about whether investment portfolio optimisation could be relevant for your organisation."