

Simulating innovative and disruptive business strategies

AnyLogic Conference 2016

Lyle Wallis, Analytics Director, PwC

November 16-17 2016

Innovation in products, markets, and business models is the fuel for business growth

- Innovative and disruptive strategies radically change the value network.
- When managing innovation firms must decide what investment to make in new products for markets that don't exist with business models that haven't been tried.

Leaders consistently miss big opportunities when faced with disruption of the value network

"There is no reason anyone would want a computer in their home." – Ken Olsen (1977), CEO of DEC

"I predict the Internet will soon go spectacularly supernova and in 1996 catastrophically collapse." – Robert Metcalfe (1995)

"There's no chance that the iPhone is going to get any significant market share. No chance." – Tech Company CEO

"By 2013, 84% of US households have a home computer." – Pew Research Center

"Fulfilling his promise columnist Bob Metcalfe dines on his own words." – Sandy Reed, InfoWorld, April 28, 1997,

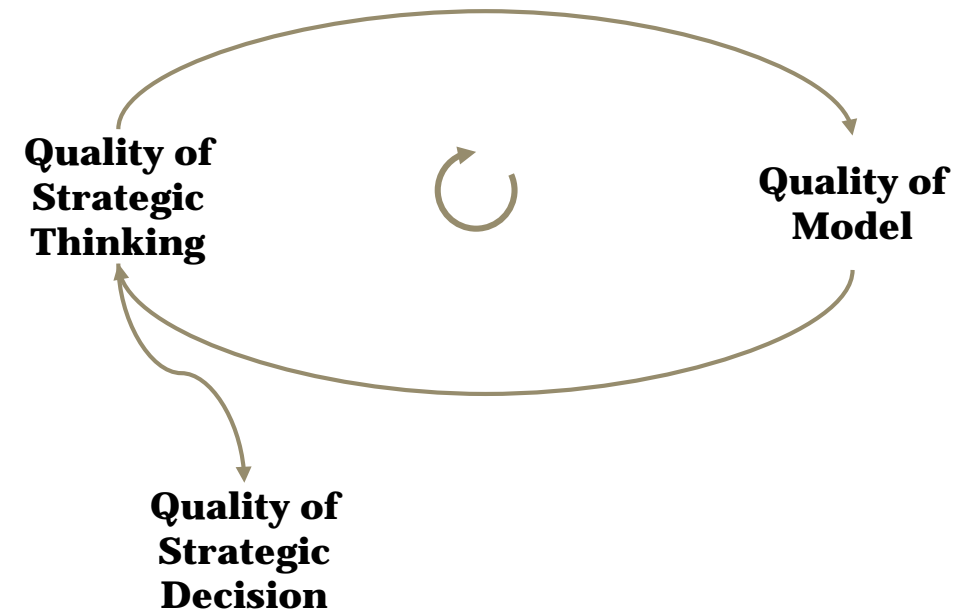
"Apple iPhones accounted for 40% of U.S. smartphone market in 2015" – Parks Associates, Feb 10, 2016

Much of this problem is because traditional approaches to thinking about and analyzing innovation are inadequate

- Qualitative scenario analysis approaches are too subjective and general.
- Data-driven techniques are useful when the future is like the past.
- By definition, innovative businesses are different from the past.

Although they are commonly used, spreadsheet models are inadequate to describe innovative new business systems

- Spreadsheet models are a popular approach.
- All business systems have feedback, non-linearity, and delay. Spreadsheets cannot describe these structure adequately.
- Spreadsheet models do not support high quality strategic thinking.



Spreadsheet models focus on accounting relationships instead of causal mechanisms

A spreadsheet model for valuing Uber provides a recent example:

Author's mental model of the Uber's opportunity

$$\text{Market opportunity} = \text{TAM} * \% \text{ Share}$$

TAM (Total Addressable Market) estimated from existing Taxi and Limo service market size. If the future is different than the past then the TAM will be different

Limited by regulatory restriction and competition

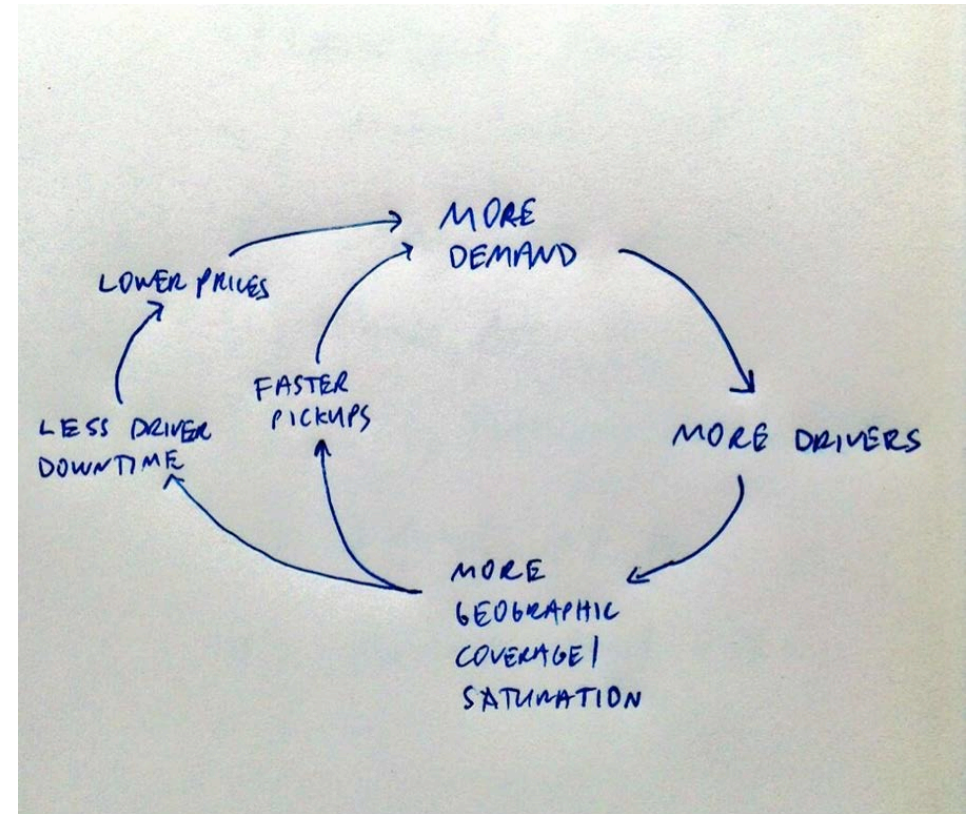
Spreadsheet Representation

TAM	%Share	Market opportunity
\$100B	3%	~\$3B
\$100B	5%	~\$5B
\$100B	10%	~\$10B

* Damodaran "Musings on Markets" June 2014, [Link](#)

In contrast, simulation models focus on the dynamics of market development and the “new economics” of the value network created by innovation

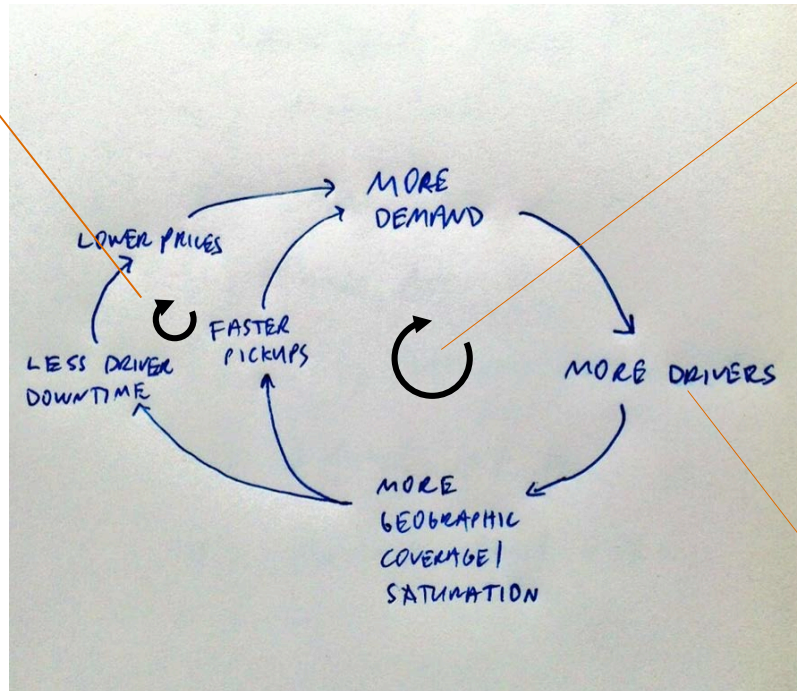
By virtue of feedback, this story produces a market opportunity that is 25x (~\$250B) the spreadsheet version.



Source: Bill Gurley “Above The Crowd” July 2014, ([Link](#))

A qualitative mental mode is great, but simulation is required to quantify the effects

This positive loop generates a larger market and a competitive cost advantage, but simulation and perhaps market research are necessary to quantify the effect



Positive feedback loop is an engine of rapid growth, but simulation is needed to test its potential magnitude

The mental model leaves out important growth limiting negative feedbacks like competition for customers and drivers

Source: Bill Gurley "Above The Crowd" July 2014, ([Link](#))

AnyLogic platform develops strategic simulation models using its multi-method capabilities, extensibility, and optimization

Evaluate complex interaction among many system components

Uncertain view of the future

Longer evaluation time horizons

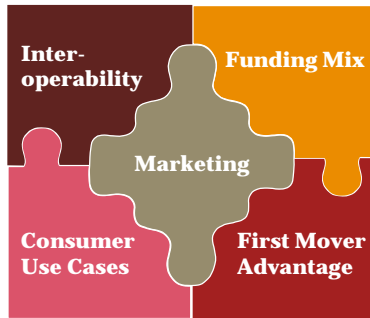
Profitable strategies hidden within a large search space

Business strategy simulation

- More and better strategies
- Multi-method modeling is essential
- Optimization is required
- Building the model is only one component of the analysis

Building the simulation model is only one component of analyzing innovation

Innovation analysis process



Model development

Model structure captures business system dynamics (e.g. customer adoption, competitor response, asset utilization).



Performance metrics

Performance metrics extends those that are traditionally used by stakeholders to evaluate strategic decisions.



Visualizations

Choosing between strategic alternatives involves weighing complex tradeoff's in investment levels, opportunity creation and risk.

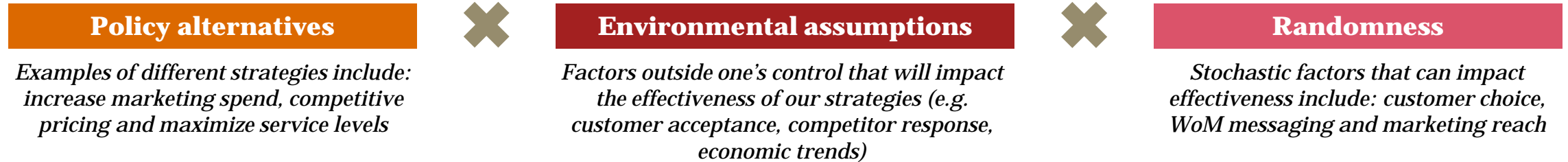


Scenario analysis

The model is used to test thousands of strategy variations and scenarios that also capture uncertainty.

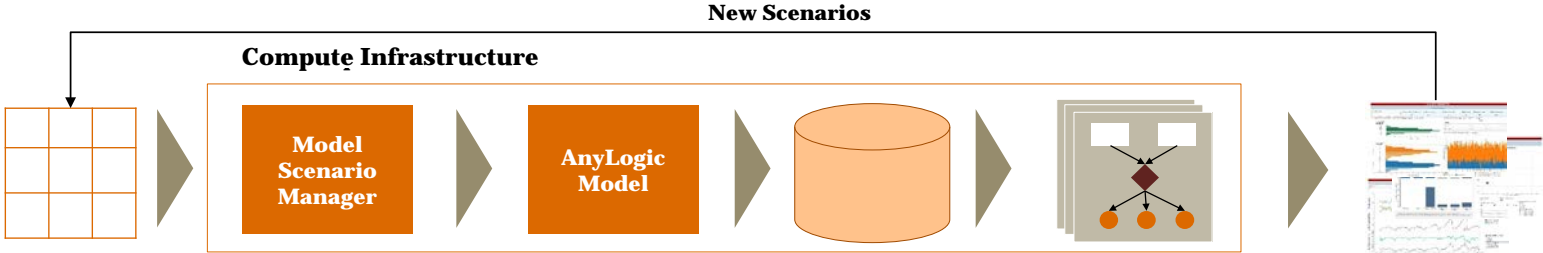
Each strategy alternative has to be evaluated across the entire range of realistic conditions and then compared against all of the other alternatives

This requires running thousands of simulations. Overall, a strategy analysis may require ~500K simulations

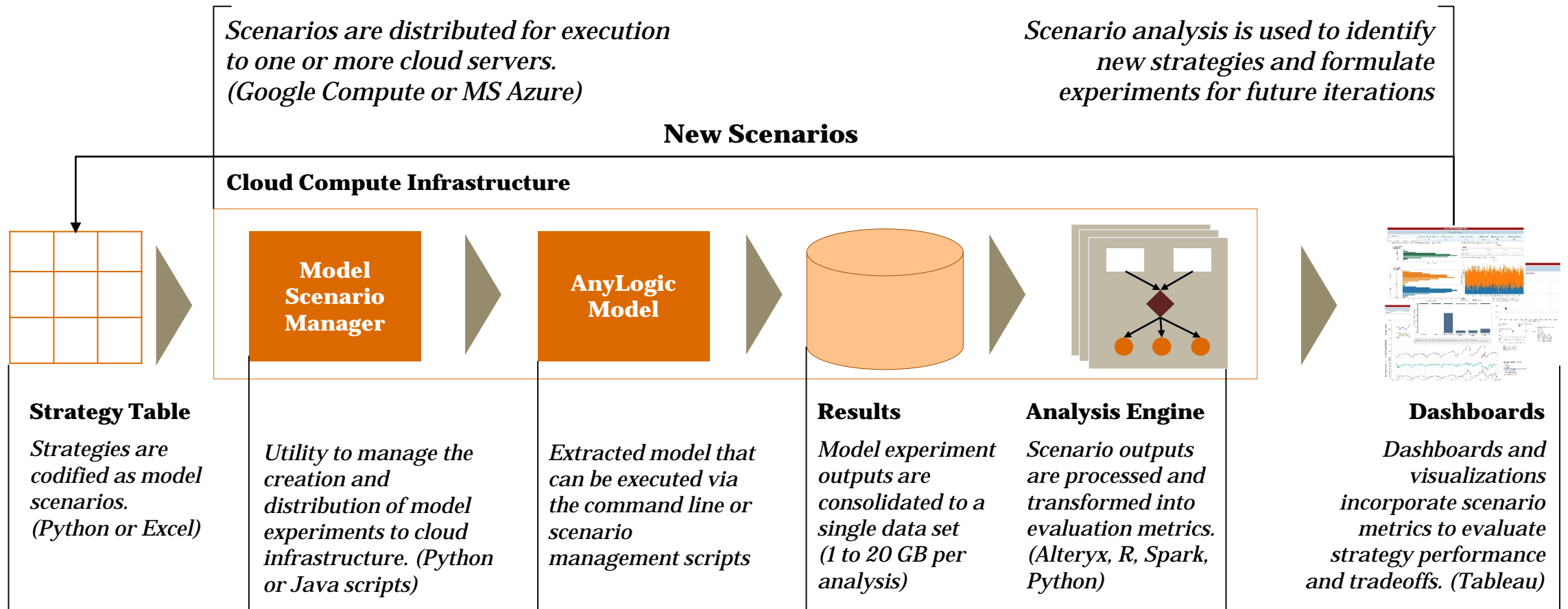


~1,000 - ~10,000 scenarios for evaluation

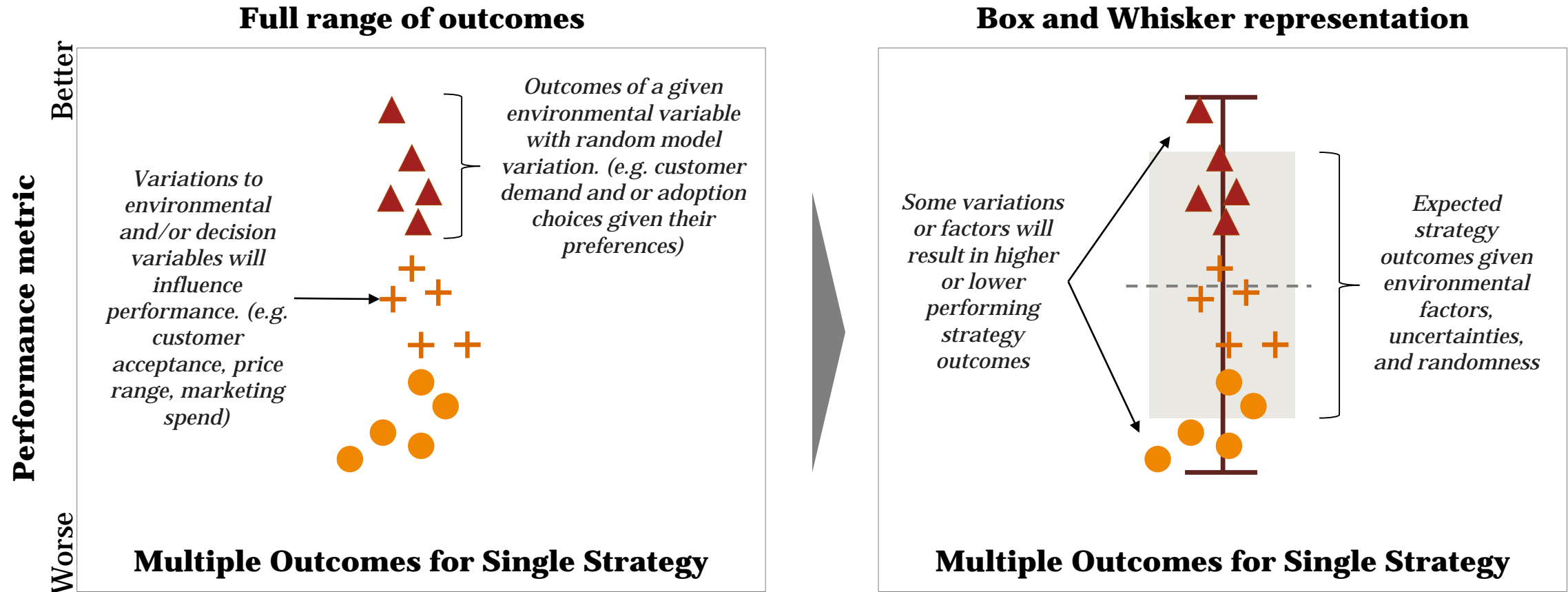
Scenario execution pipeline



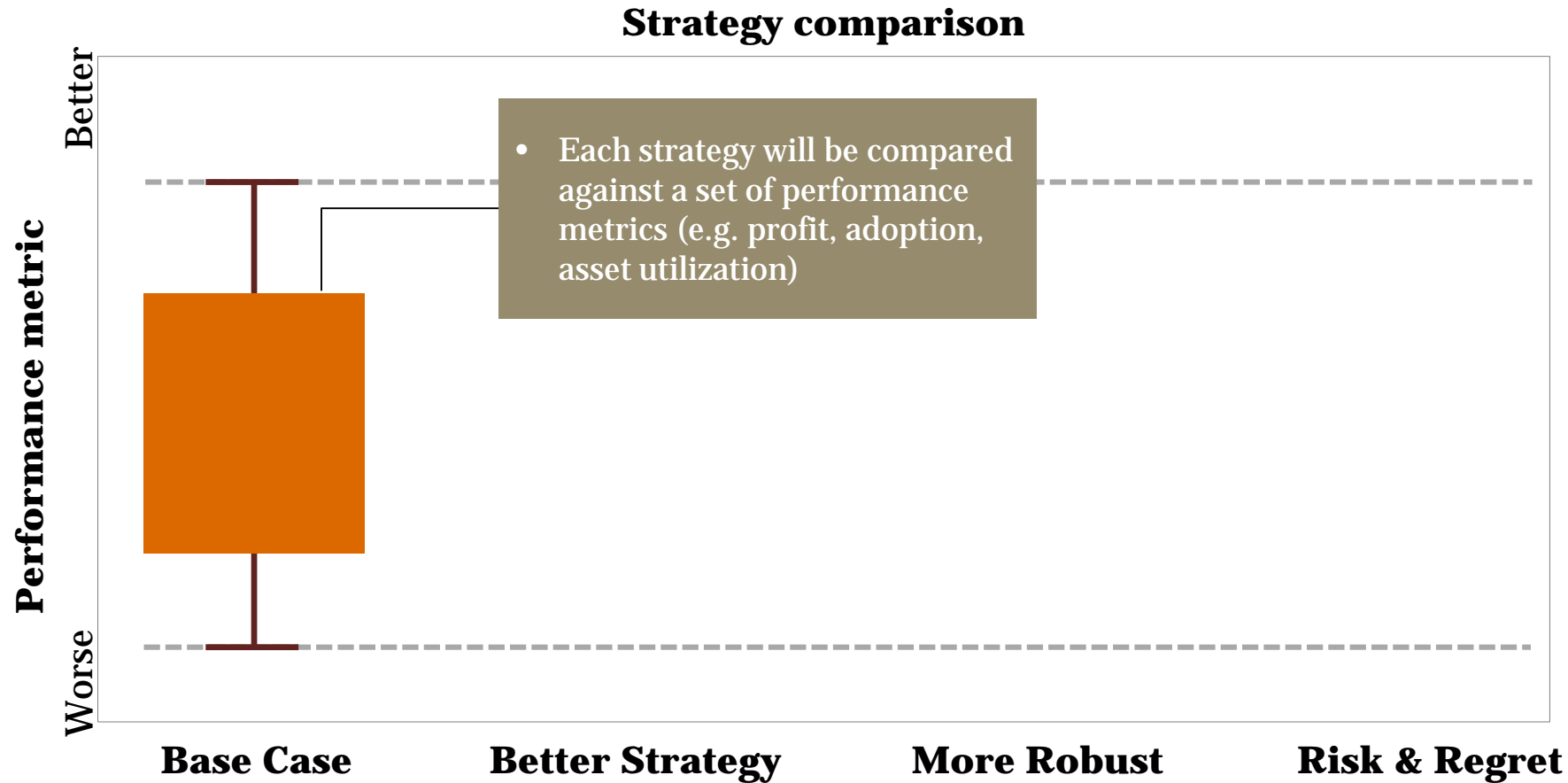
To make this practical, we build a cloud-based analysis pipeline that allows us to iteratively generate new strategies and explore results



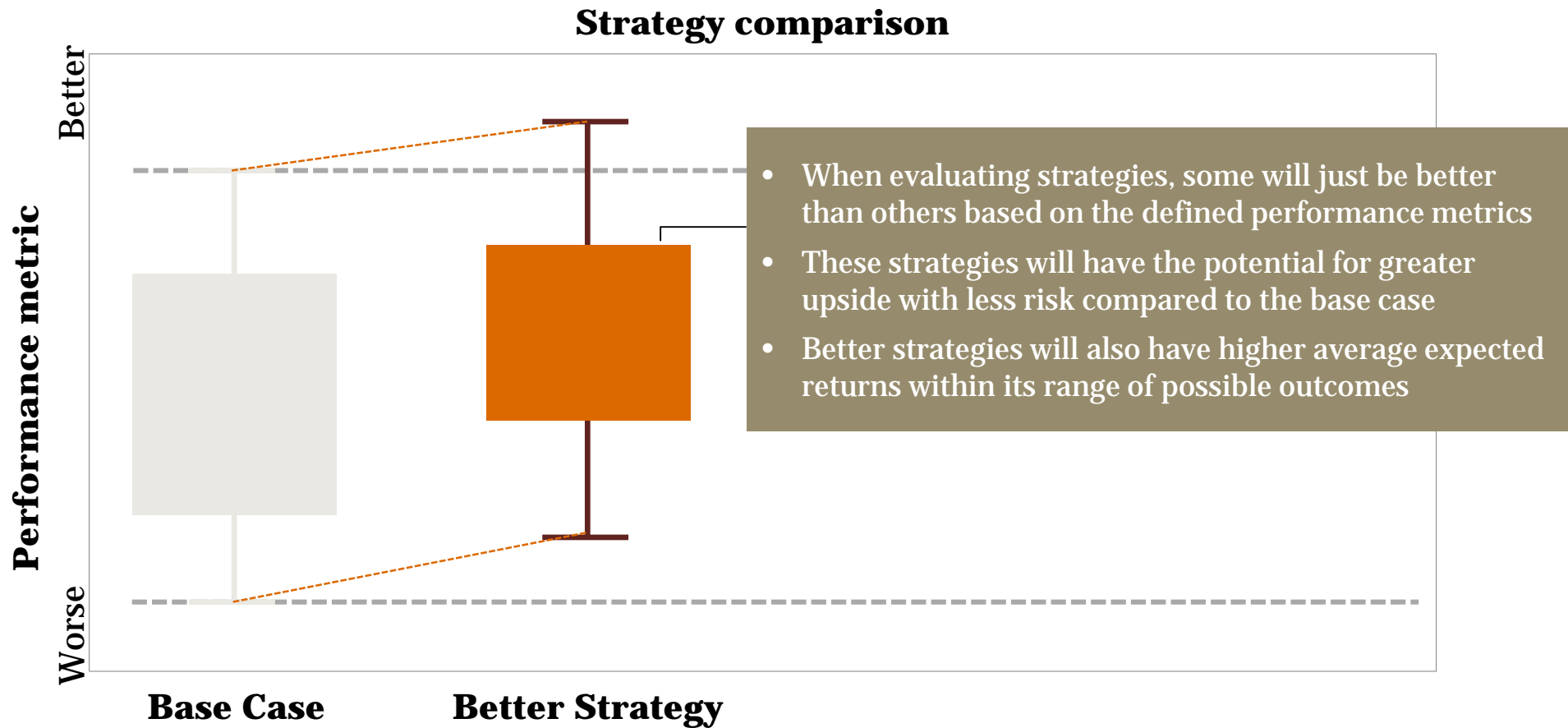
Because of deep uncertainties in the environment and random variation, each strategy alternative produces a range of outcomes. One way to summarize these for easy comparison is a Box and Whisker plot



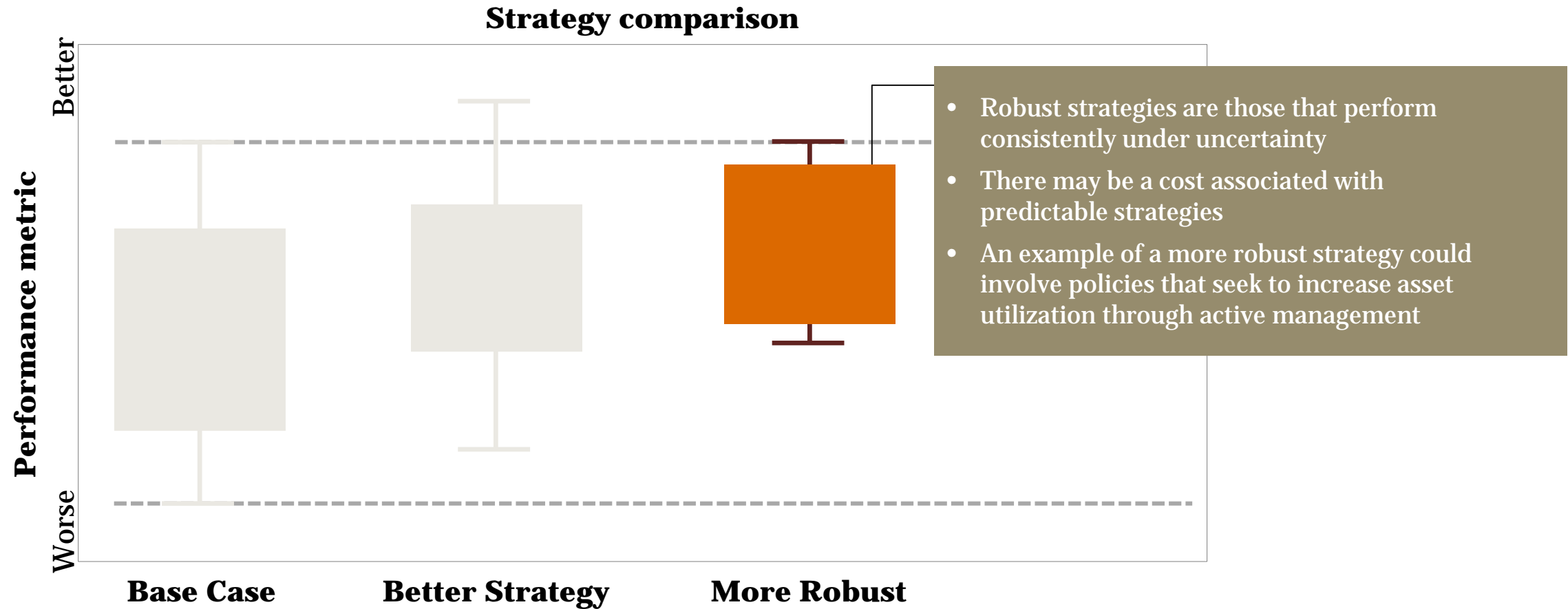
Distribution of outcomes for each strategy can be compared to determine performance, robustness and risk associated with each decision



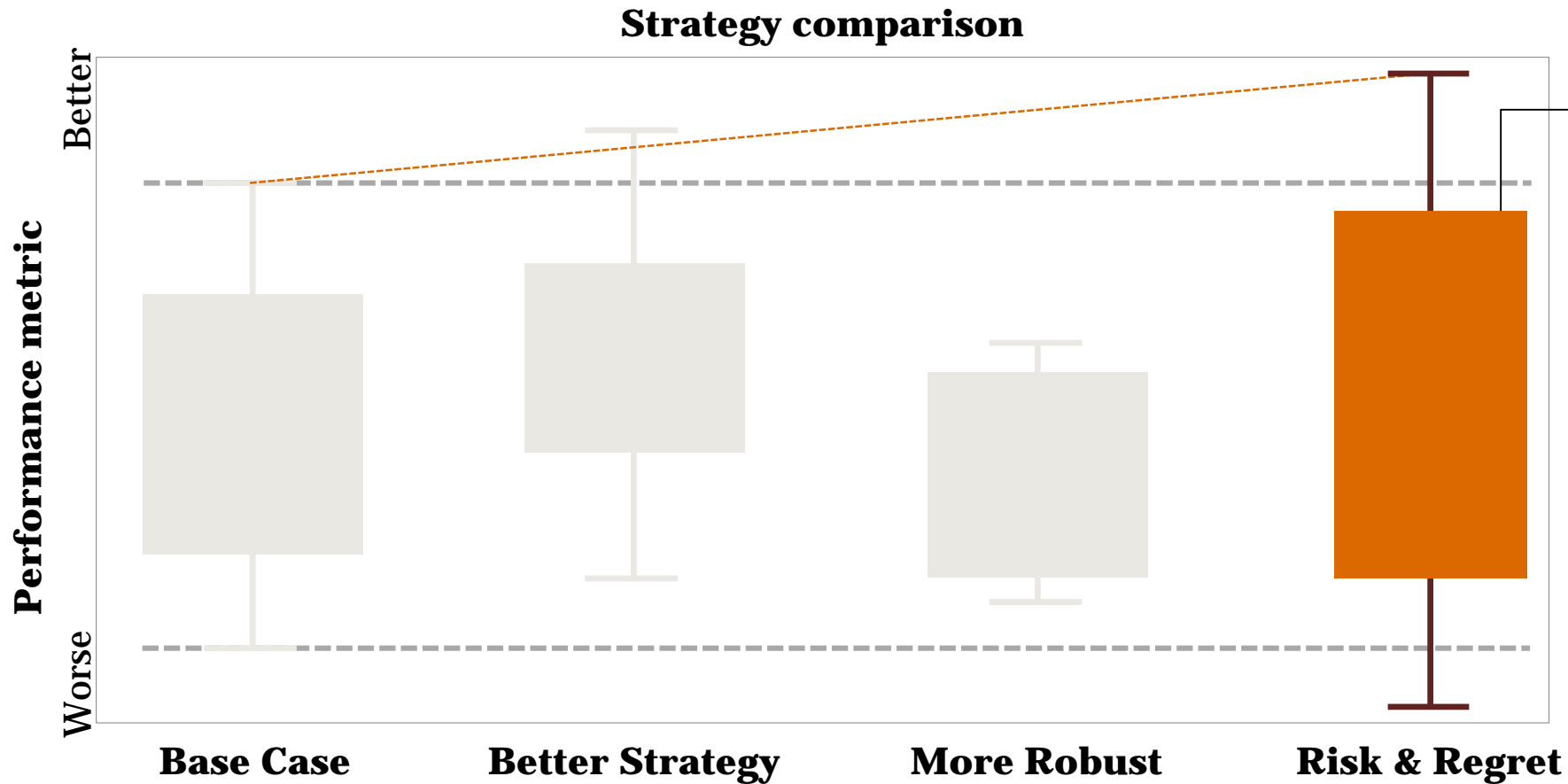
Strategy comparison - performance



Strategy comparison - robustness



Strategy comparison – risk and regret



- Good strategies have disproportionate upside potential
- Large upsides are driven by strong positive feedback loops and nonlinearity

Why not just use the AnyLogic optimizer to find the “optimal” solution?

- Optimization is a central tool in model development and calibration.
- However, strategy choices by stakeholder groups cannot be reduced to a single objective function.

Simulation at scale is a powerful analytic tool to create and evaluate innovative and disruptive business strategies

- Innovation disrupts existing value networks creating a new economic reality
- Spreadsheets are an inadequate tool to understand this process
- Dynamic simulation complements the fundamentally creative process of creating new businesses
- Dynamic simulation is an integral part of a rigorous process for quantifying and managing the inherent uncertainty of developing new business models and strategies
- The AnyLogic platform supports strategic simulation models through its multi-method capabilities, extensibility, and optimization.

Thank you



Lyle Wallis

Analytics Director, PwC

Tel: +1-720-931-7404

Email: lyle.e.wallis@pwc.com

