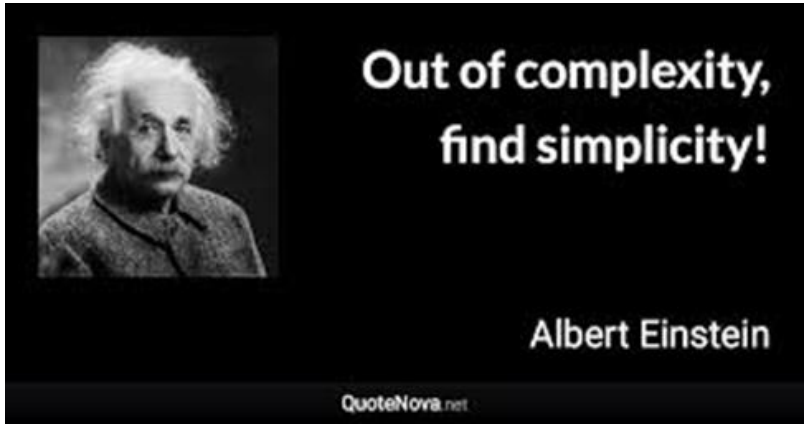
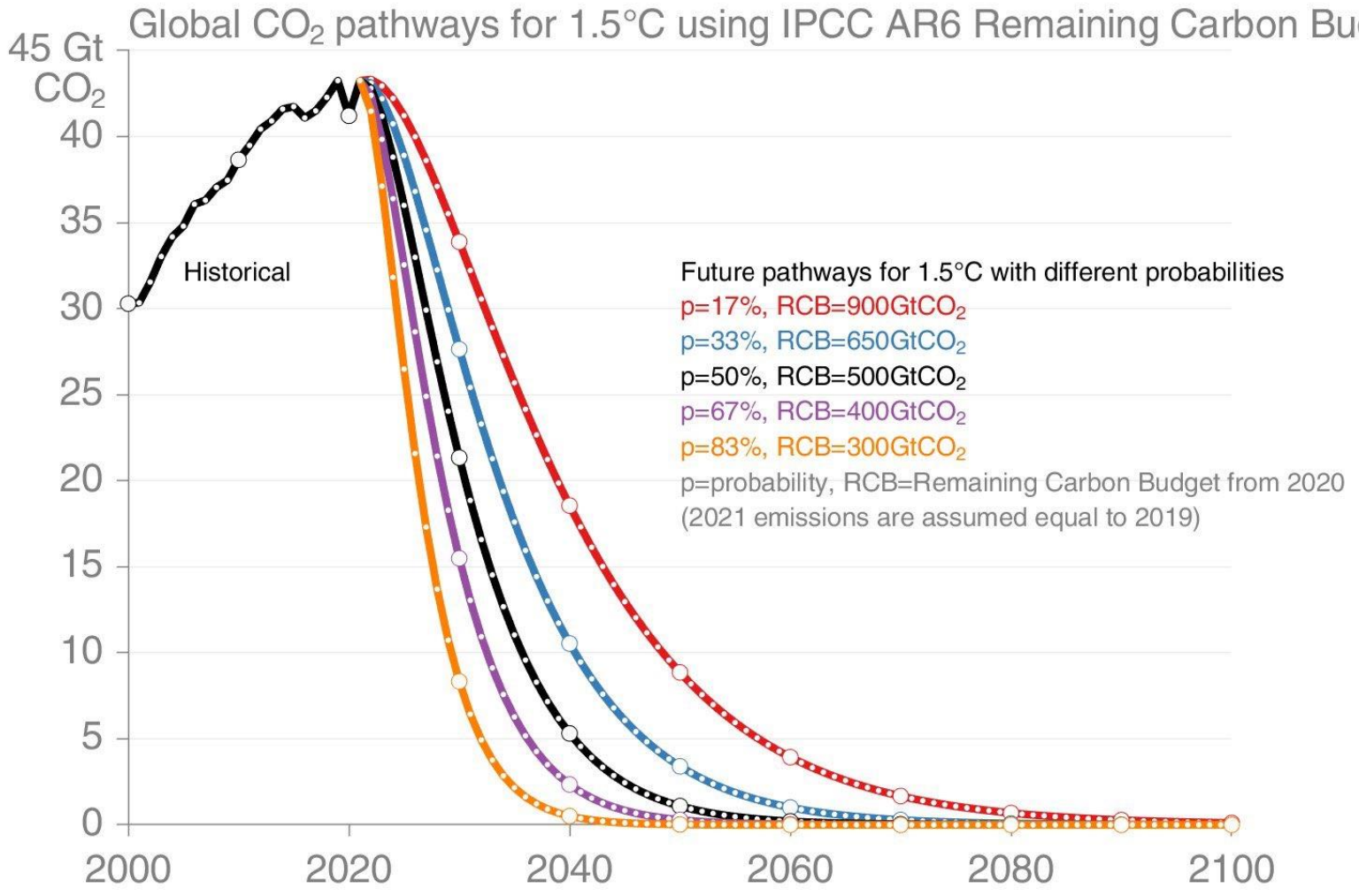
Out of complexity find simplicity



The Carbon budget



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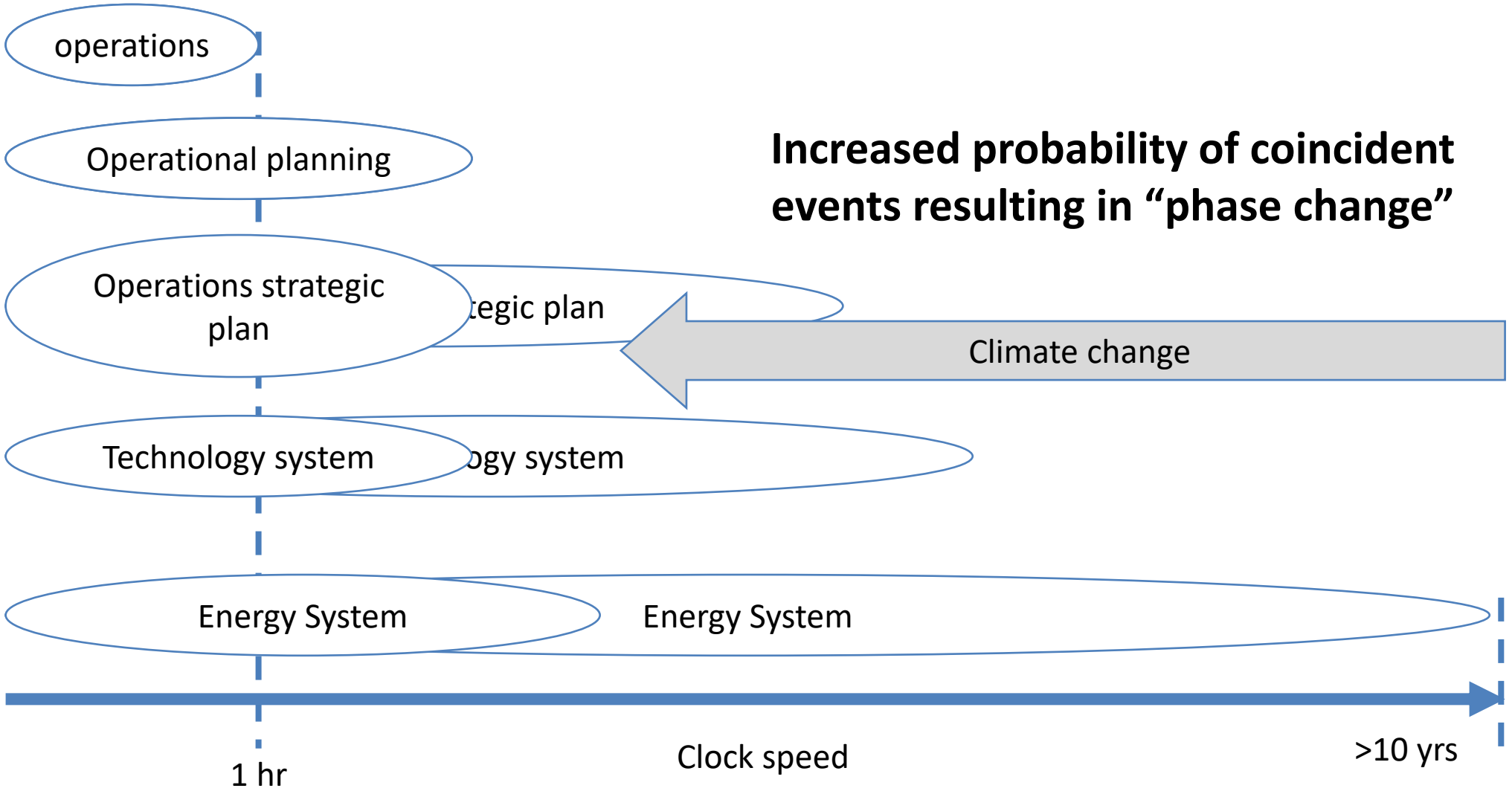
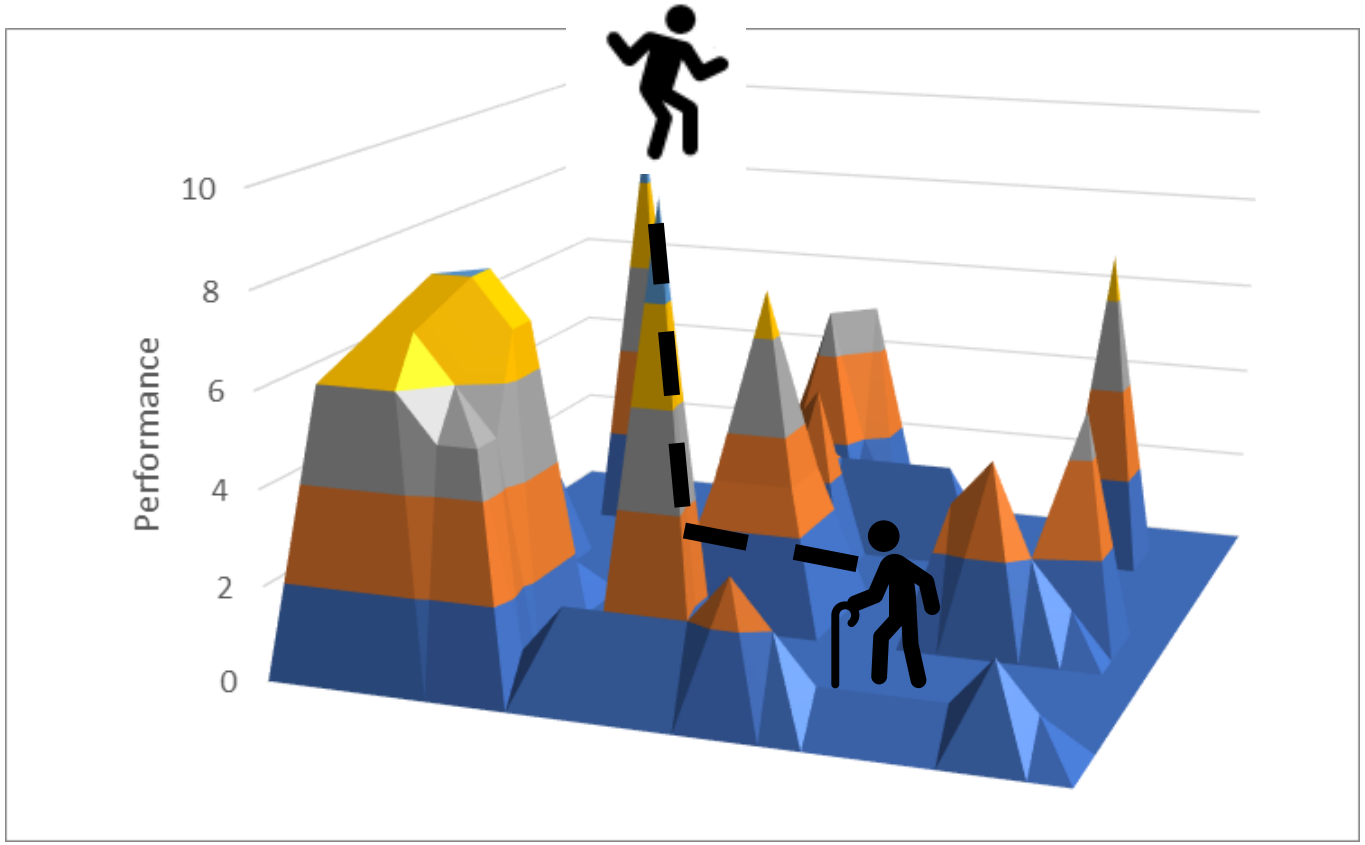
The arrow of time



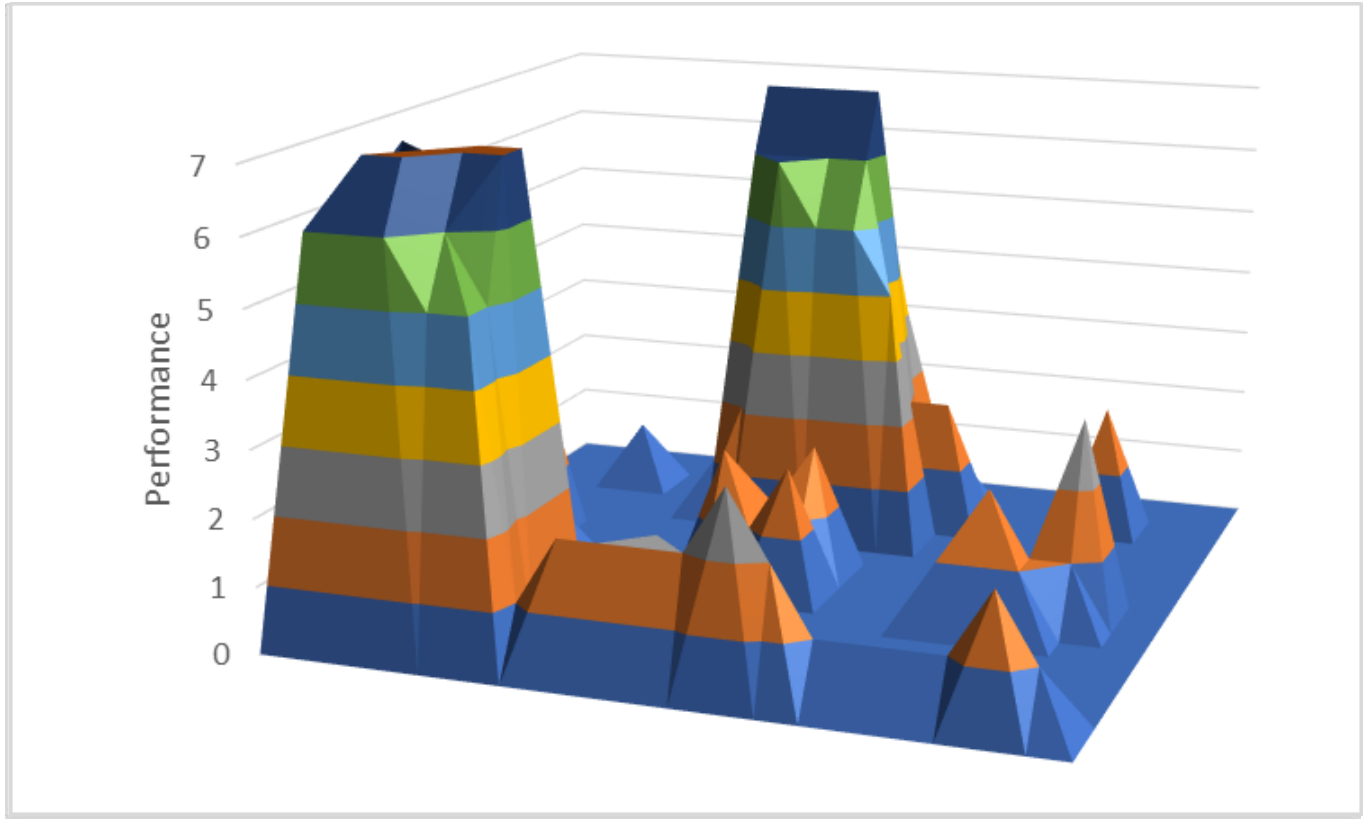
Increased probability of coincident events resulting in “phase change”

Embracing complexity: a new approach?



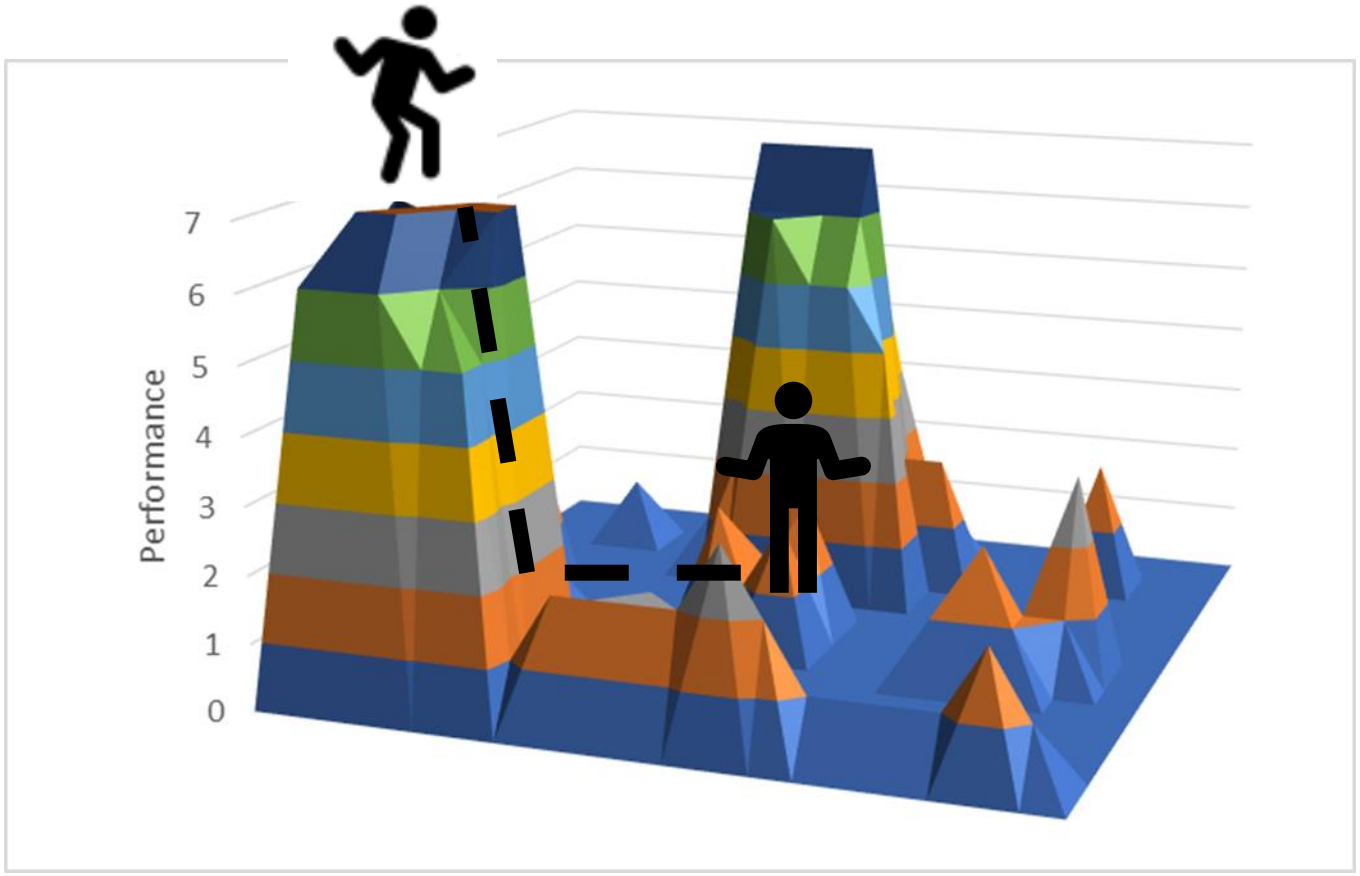
- If we can see the whole landscape it is possible to find the optimum for a given set of parameters
- In this case the optimum is very narrow
  - Small changes mean we can easily find ourselves in the sub-optimal solution

Embracing complexity: a new approach?



- This is a dynamic non-linear system
- The constantly changing sub systems effect each other
- The landscape changes with some peaks collapsing

Embracing complexity: a new approach?



- So the unpredictable dynamics can mean the peak we climb disappears over time
- Leaving us stranded in pool of sub optimal performance

- What we really want to do is identify robust superior performance
- Robust superior performance survives changes to the system and sub-system

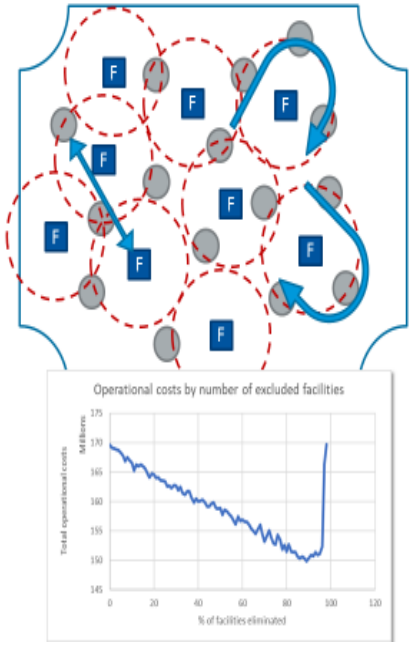
The role of computer models

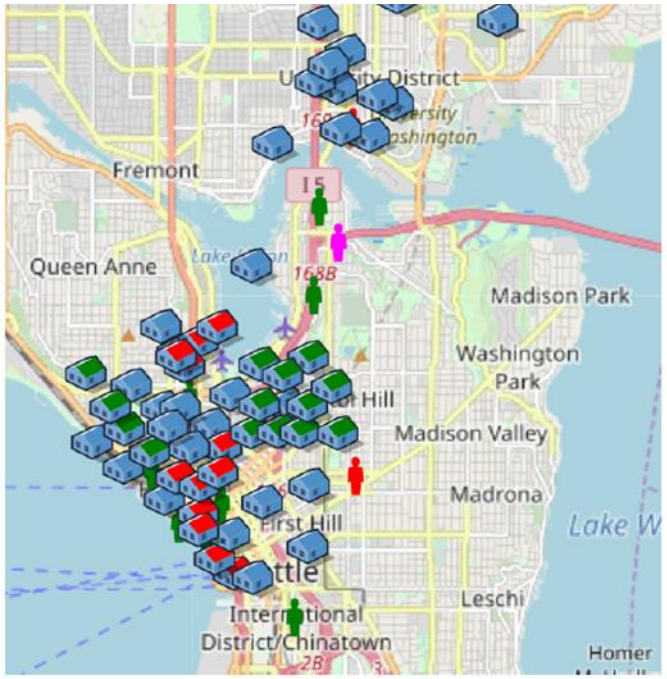
HERIOT WATT UNIVERSITY

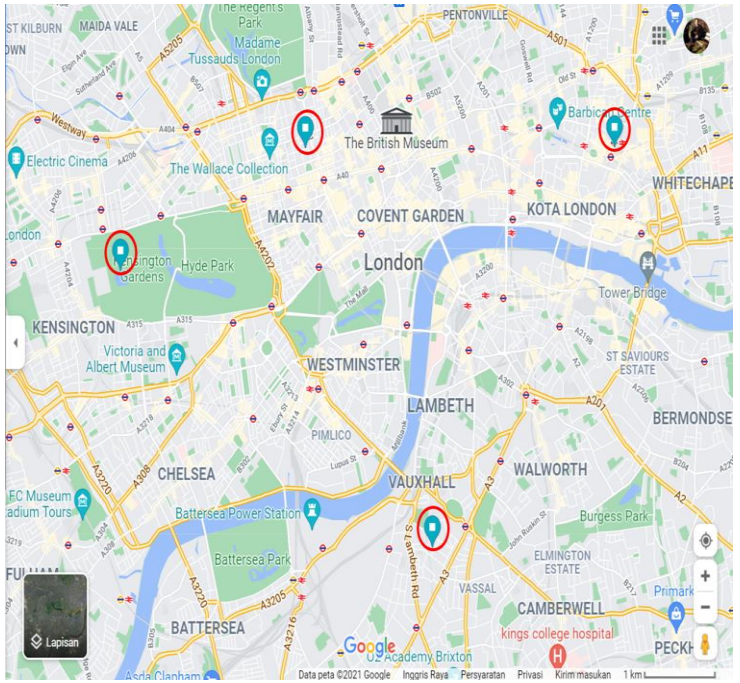
Example: facility exclusion

How many facilities could be economically closed before the cost of travel makes it uneconomical?

1. Initial case
2. Facilities excluded from simulation
3. Too many facilities have been excluded, no longer economical

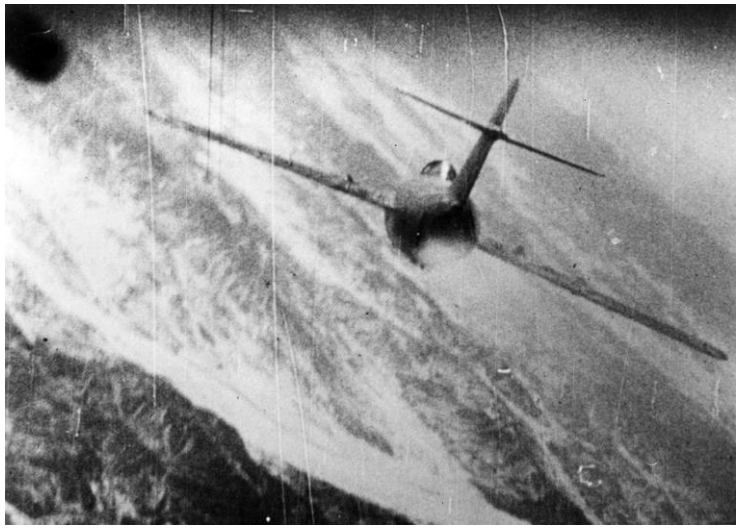




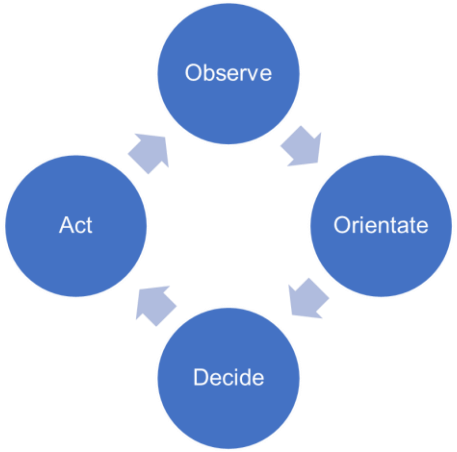


All these models incorporate a system of systems – where actions in one system spill over into the other systems

The story of 40 second Boyd



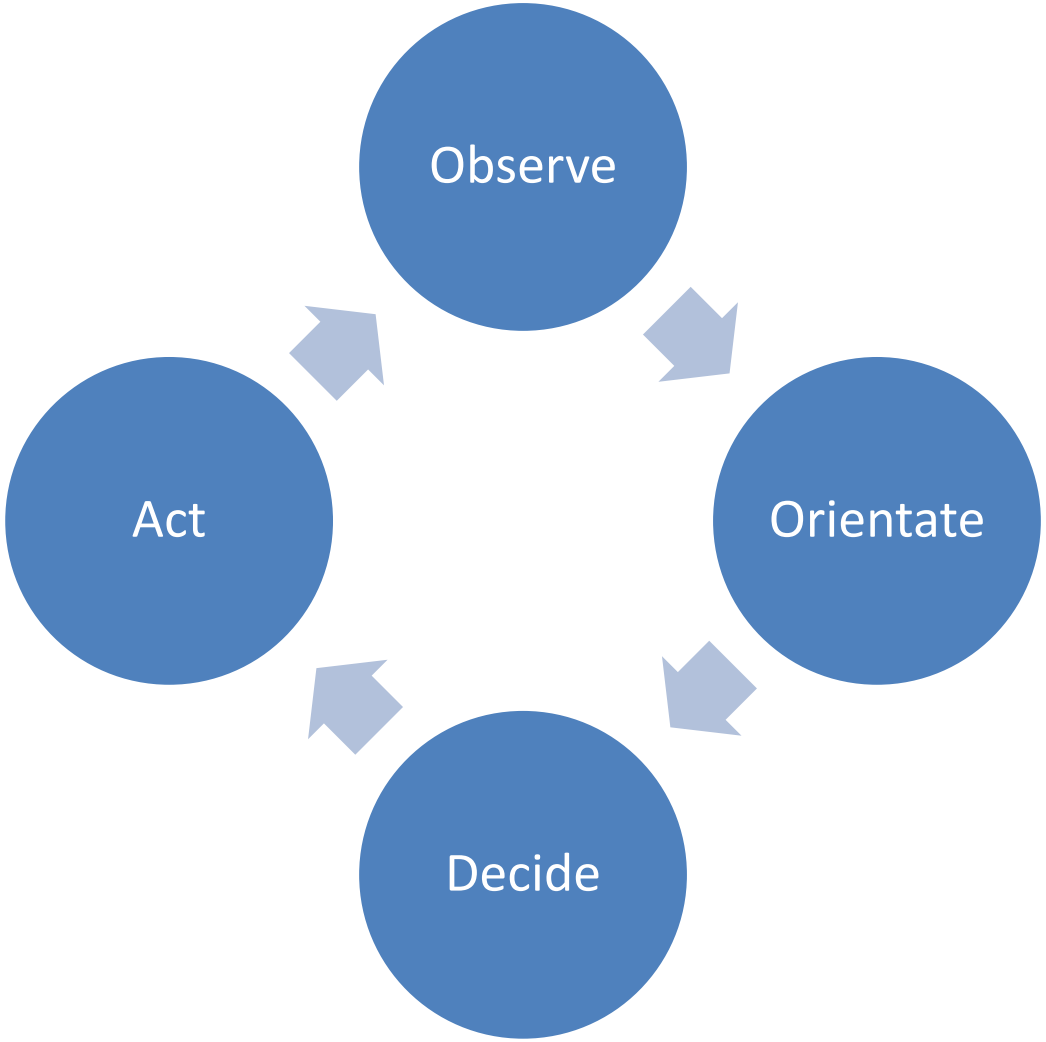
< 40 Seconds



Disadvantage → Advantage

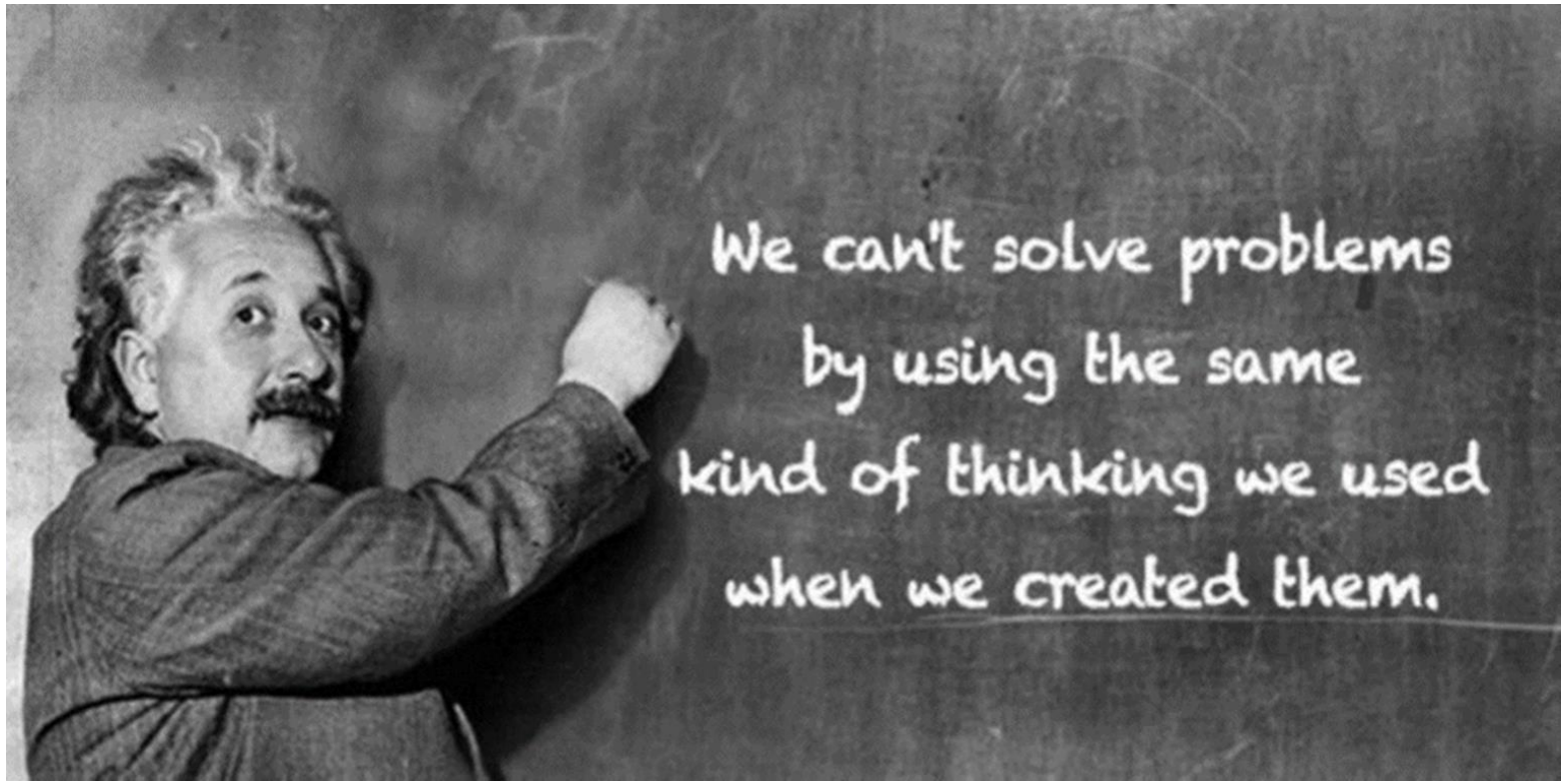
Introducing the OODA loop

- It all has to happen faster
  - How do we observe faster – sensing, dashboards, observatories, war rooms
  - What is the process of orientating – how do increase the drum beat
  - Decisions – how de we reduce inertia – move from a position of unknown unknowns to known unknowns
  - Rewards for fast actions



Summary

- Logistics is a complex system
- There is now an increased probability of an extinction event – irreversible change
- We have tools and approaches appropriate to navigating changes in complex systems
- To make the most of these tools we need more data so that our observation and orientation in the real world can improve


We can't solve problems
by using the same
kind of thinking we used
when we created them.

Thank you