

Complex Projects

What are they and how can we manage them more effectively?

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Complexity

In quantum physics the **Heisenberg uncertainty principle** states that locating a particle in a small region of space makes the momentum of the particle uncertain; and conversely, that measuring the momentum of a particle precisely makes the position uncertain.



Complexity

Managing complexity is the most important challenge we face this century

“Uncertainty is not just an important feature of the monetary policy landscape; it is the defining characteristic of that landscape.”

Chairman Alan Greenspan,
Monetary Policy under Uncertainty (2003)

Christopher Hart of the Sunday Times writes “for all its importance and reputation you feel that HBS neither understands the complexity nor acknowledges the chaotic unpredictability of the world economy any better than anyone else.”

Harvard Business Review Guide to Complexity and Uncertainty (2008)

Complex Projects

What are they and how can we manage them more effectively?



Complex, complicated or just difficult?

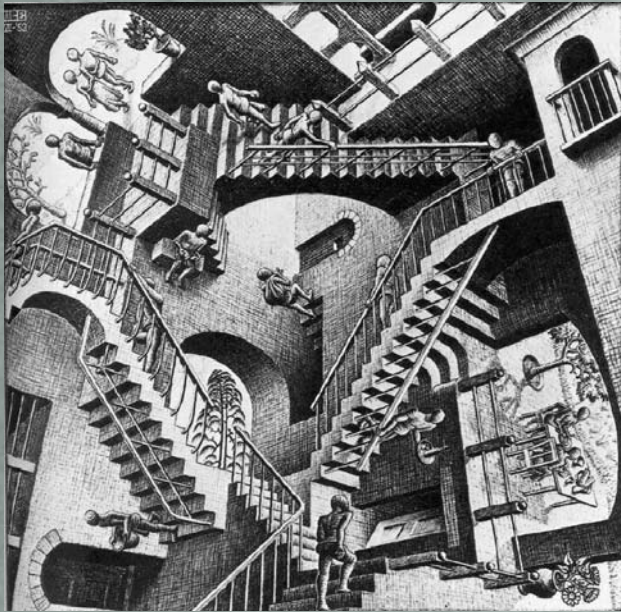
Perceptions of difficulty might depend on experience and knowledge.

Complex projects are qualitatively different from difficult or complicated projects



Complex Projects

What are they and how can we manage them more effectively?



Escher

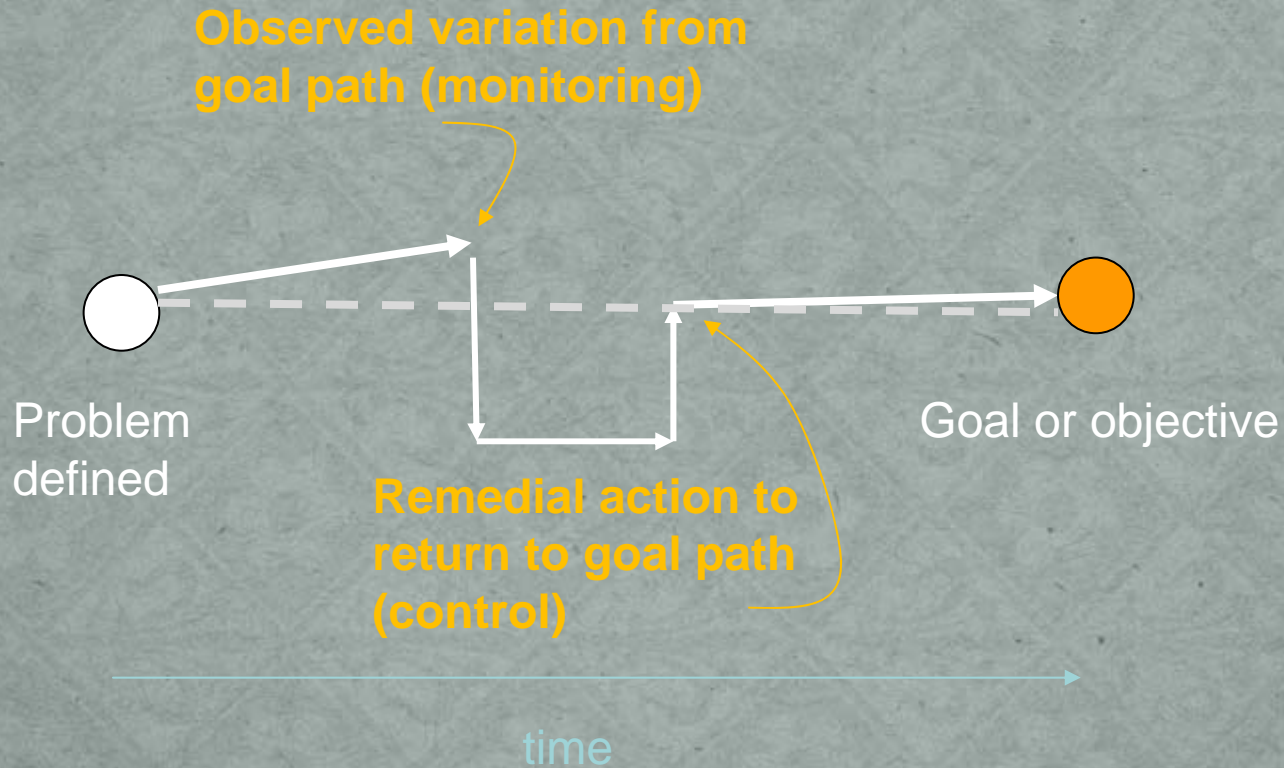
Complex projects behave differently

Complex project behave like complex adaptive systems

Difficult or complicated projects can often be managed as more simple systems

Simple systems

Most project processes are based on simple systems



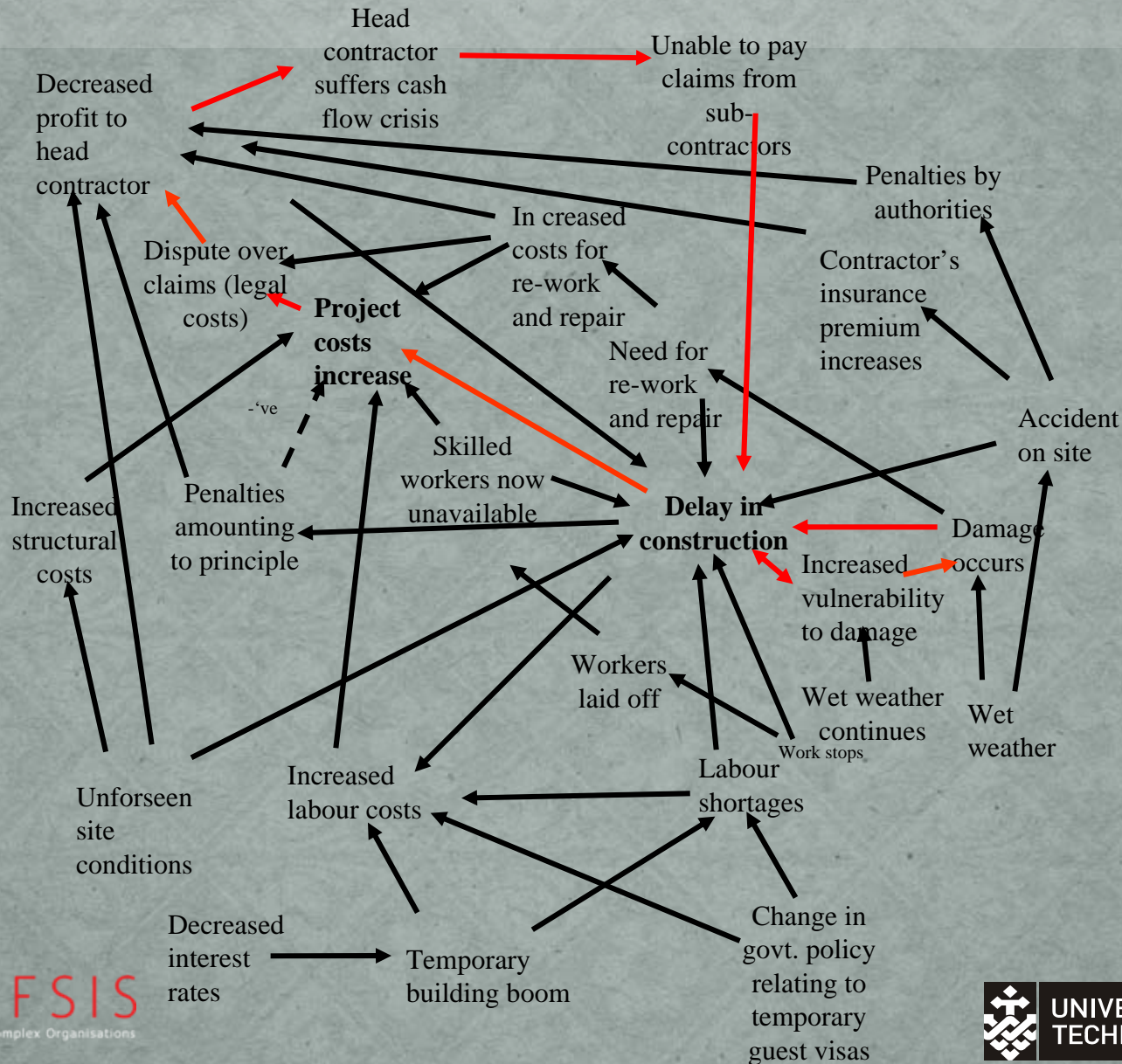
Complex Projects

Like complex adaptive systems exhibit:

Non-linearity

- causal links are not obvious
- causal links are distant in time and space
- positive feedback exacerbates effects

Non-linearity example



Complex Projects

Like complex adaptive systems exhibit:

- Non-linearity
 - causal links are not obvious; distant in time and space
 - positive feedback exacerbates effects
- Adaptiveness
 - system is capable of self-organisation
- Sensitive dependence on initial conditions
 - a small change, or initial difference, might have a big effect
- Emergence
 - new unexpected pathways result from the other conditions
- Phase transition (not the same as project phases)
 - often rapidly (unexpected) shifting states

Where does complexity come from?

Like complex adaptive systems exhibit:

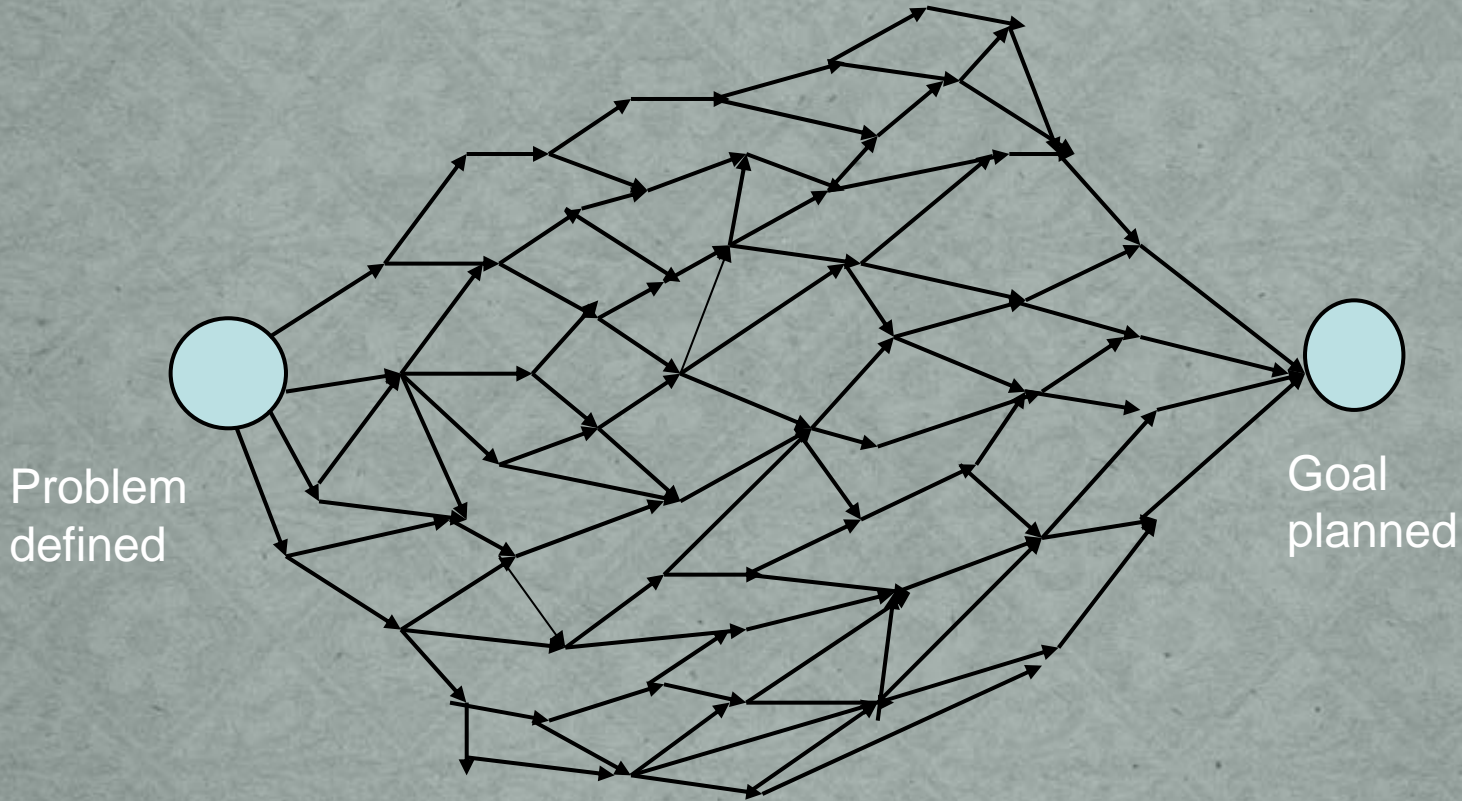
- **Earlier work** (Williams, 2002; Baccarini, 1998; Turner, 1993)

Classification of types of complexity based on the source of complexity (Remington & Pollack, 2007)

- **Structural**
 - from multiple connections leading to ambiguity
- **Technical**
 - from uncertainty about how to make it
- **Directional**
 - from uncertainty/ambiguity about goals
- **Temporal**
 - from uncertainty of change over time

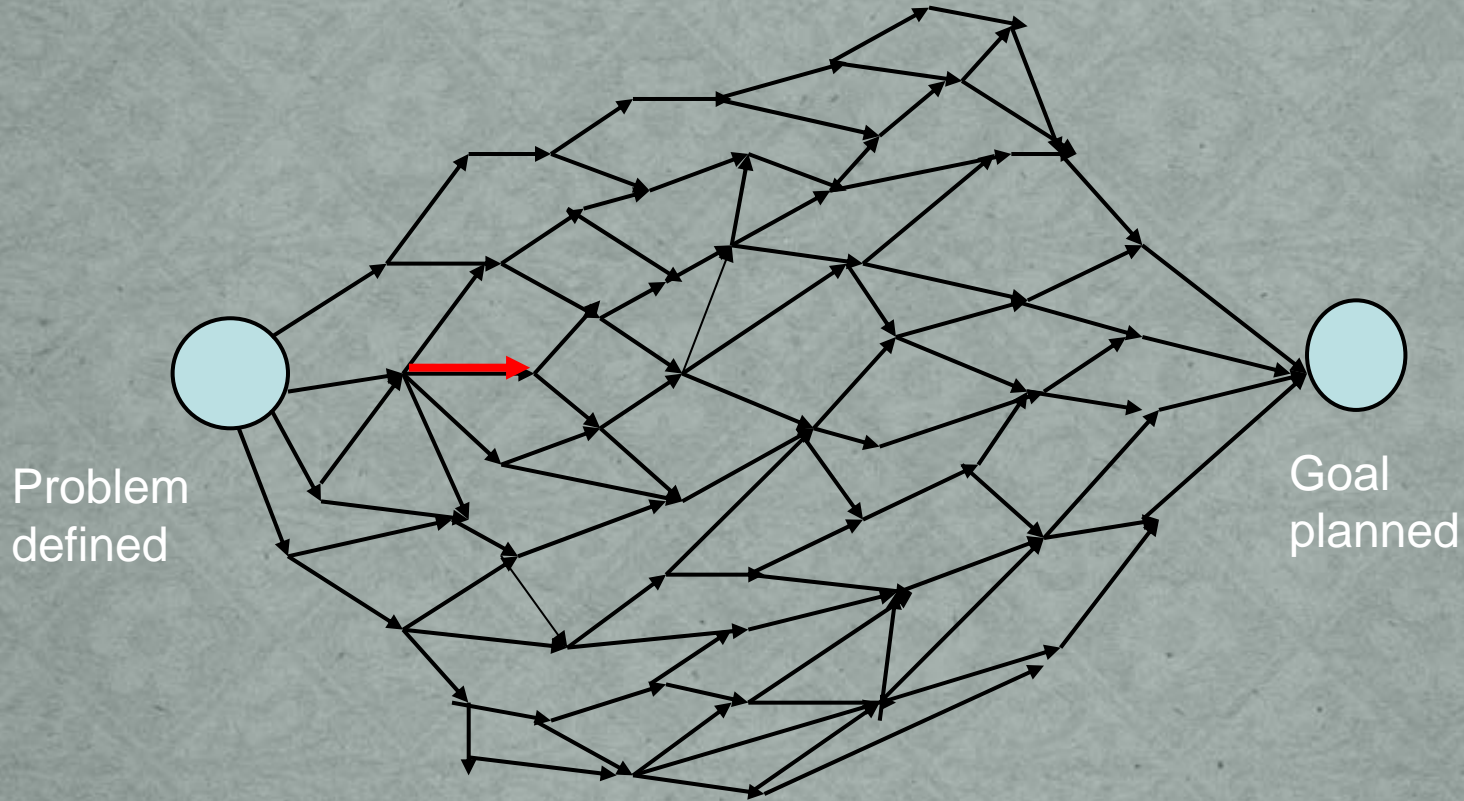
Structural complexity

Caused largely by interconnectedness of multiple events



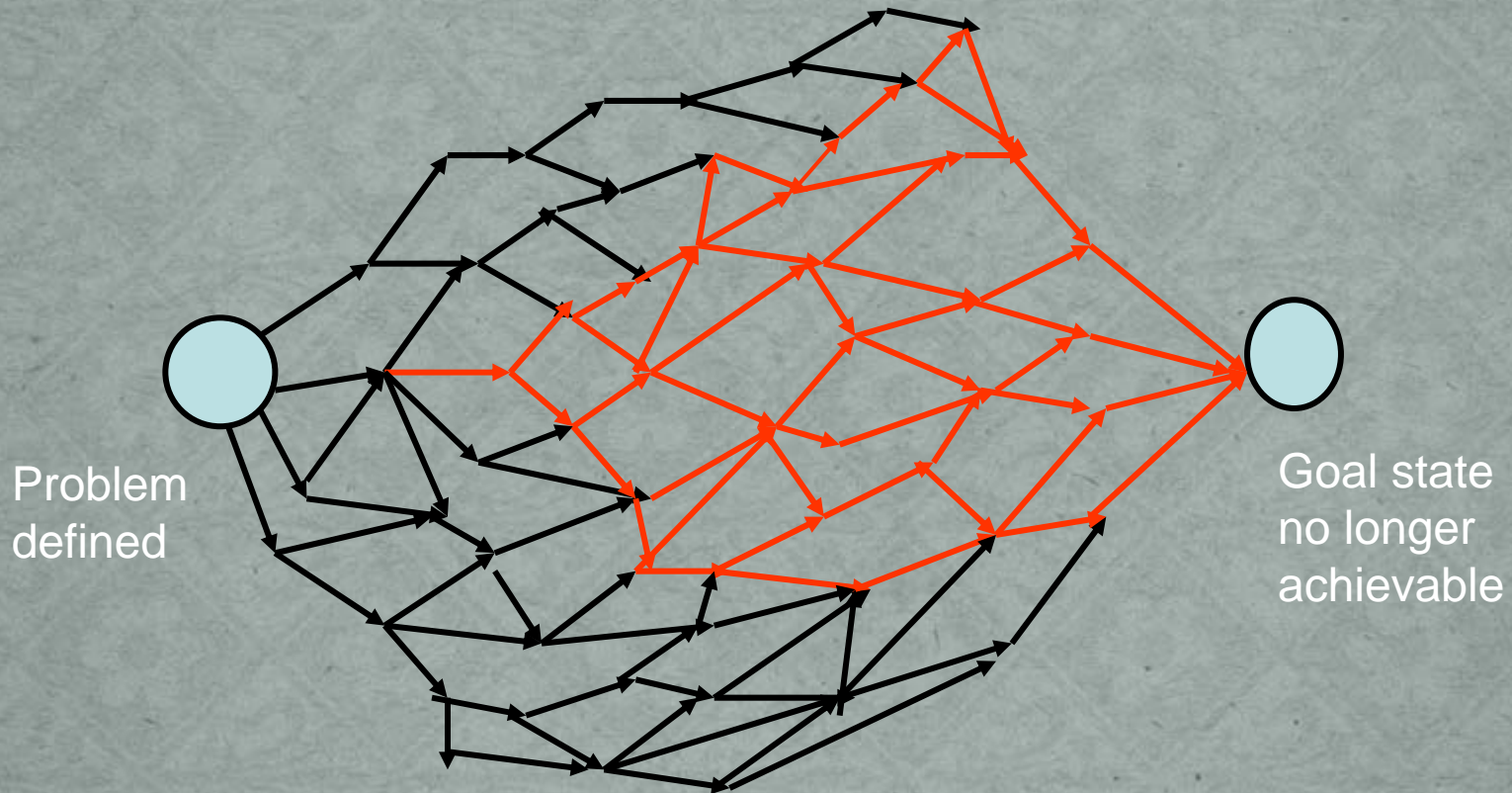
Structural complexity

Caused largely by interconnectedness of multiple events



Structural complexity

The knock-on effects of a risk triggered in one activity can have a profound effect



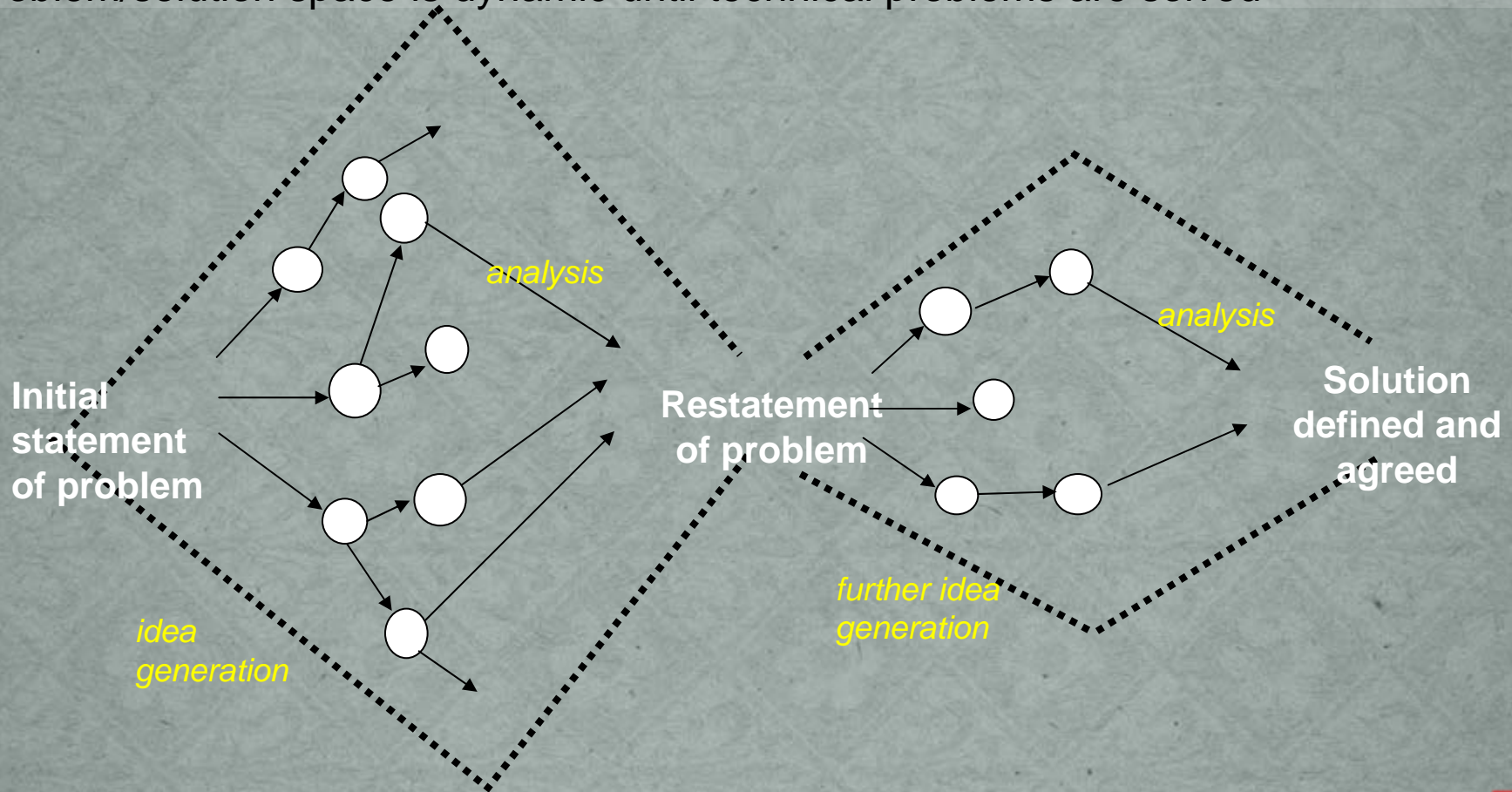
Uncertainty or ambiguity

- Classification of complexity based on the sources of complexity (Remington & Pollack, 2007)
 - Structural (from multiple connections leading to uncertainty)
 - Technical (from uncertainty about how to make it)
 - Directional (from uncertainty/ambiguity about goals)
 - Temporal (from uncertainty of change over time)

Technical complexity

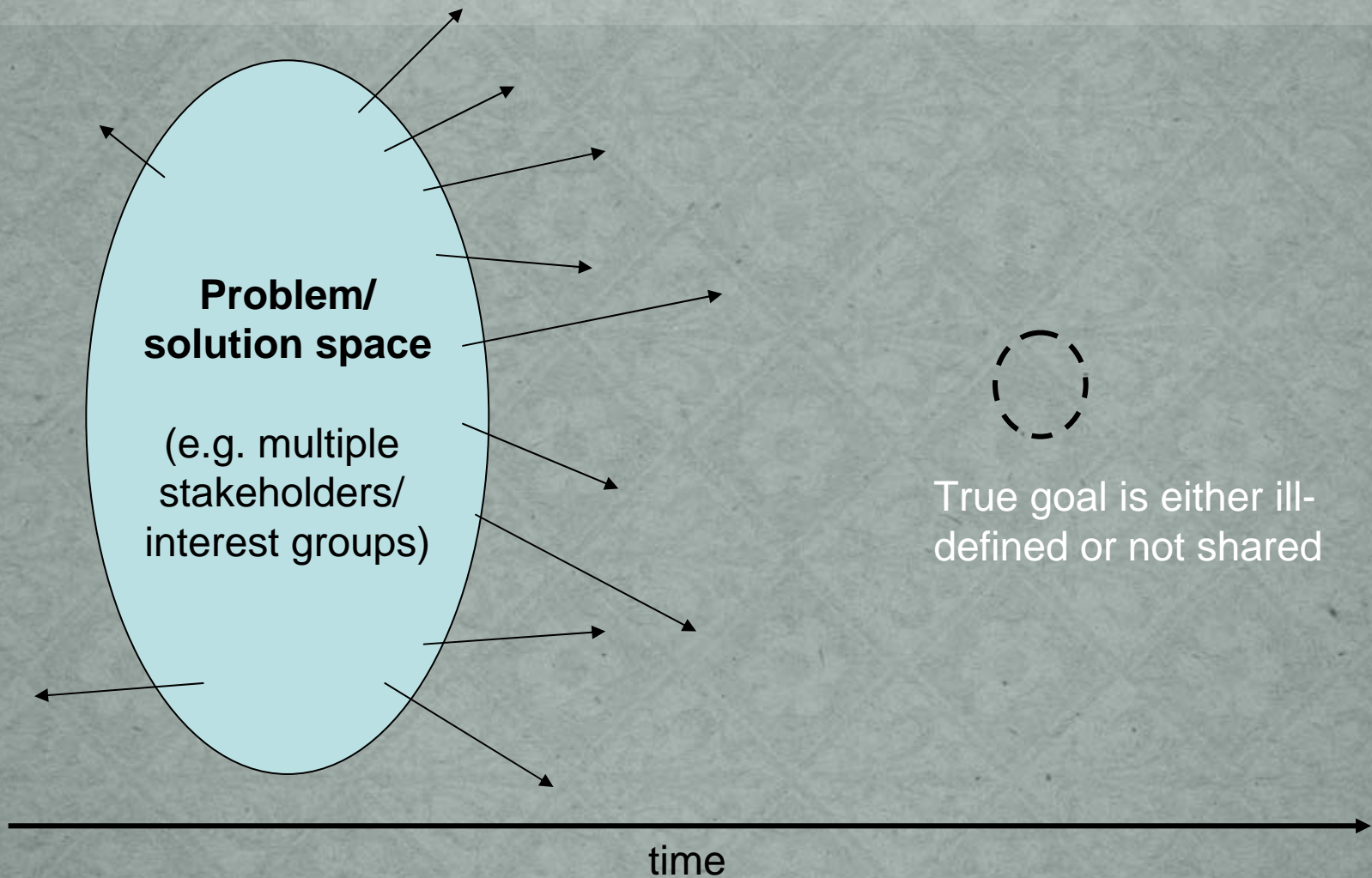
Caused uncertainty about how to build or make it

Problem/solution space is dynamic until technical problems are solved



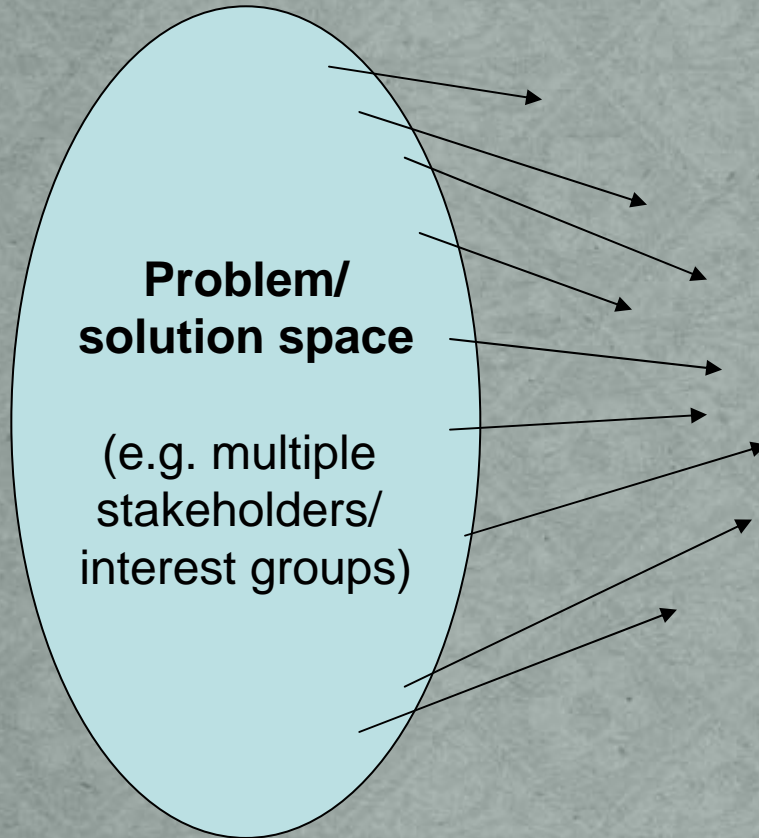
Directional complexity

Caused by uncertainty or lack of agreement about what to do



Directional complexity

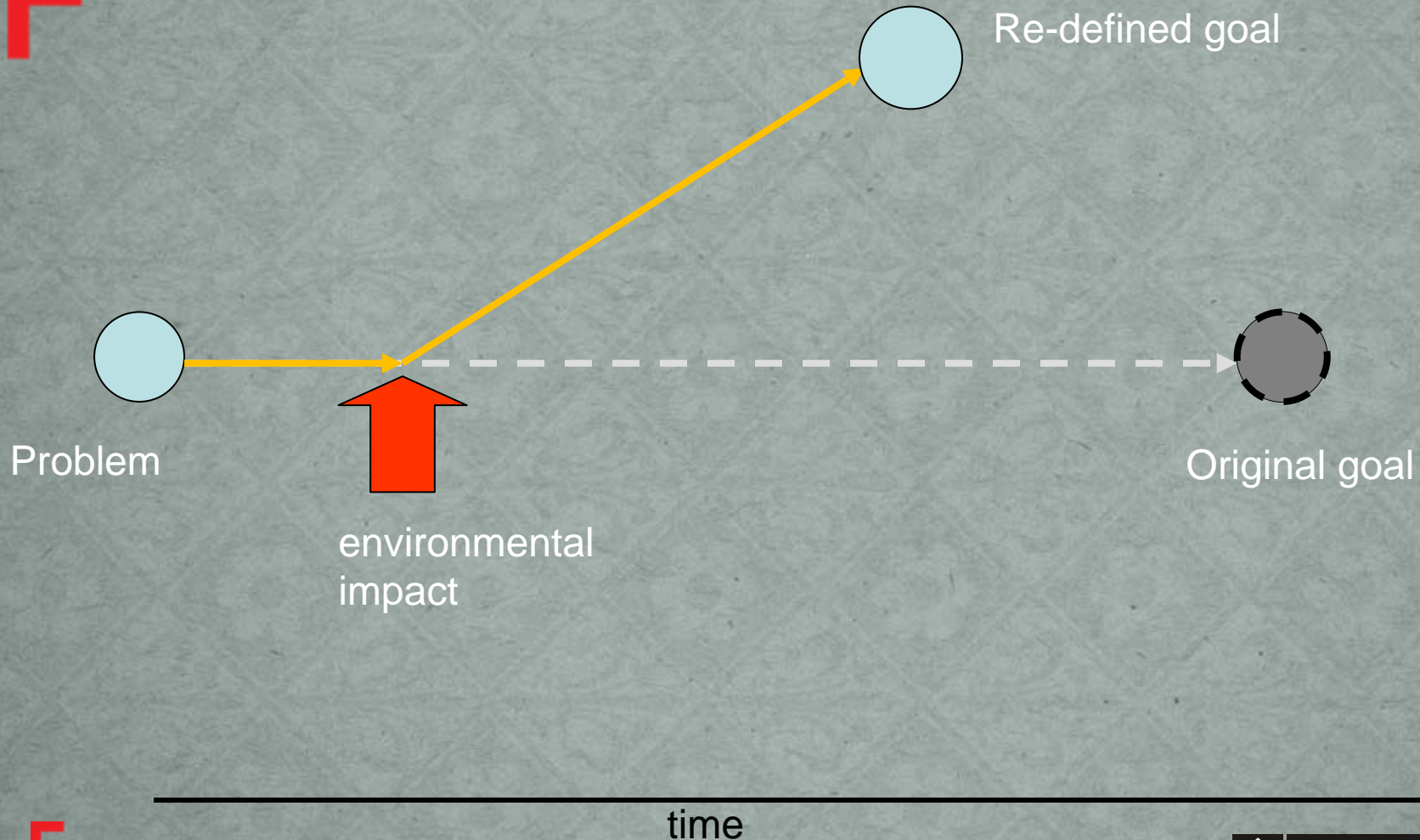
Caused by uncertainty or lack of agreement about what to do



Most effort is spent in aligning requirements and getting to an agreed goal so that work can start

Temporal complexity

Caused by uncertainty over time



How can we manage complexity?

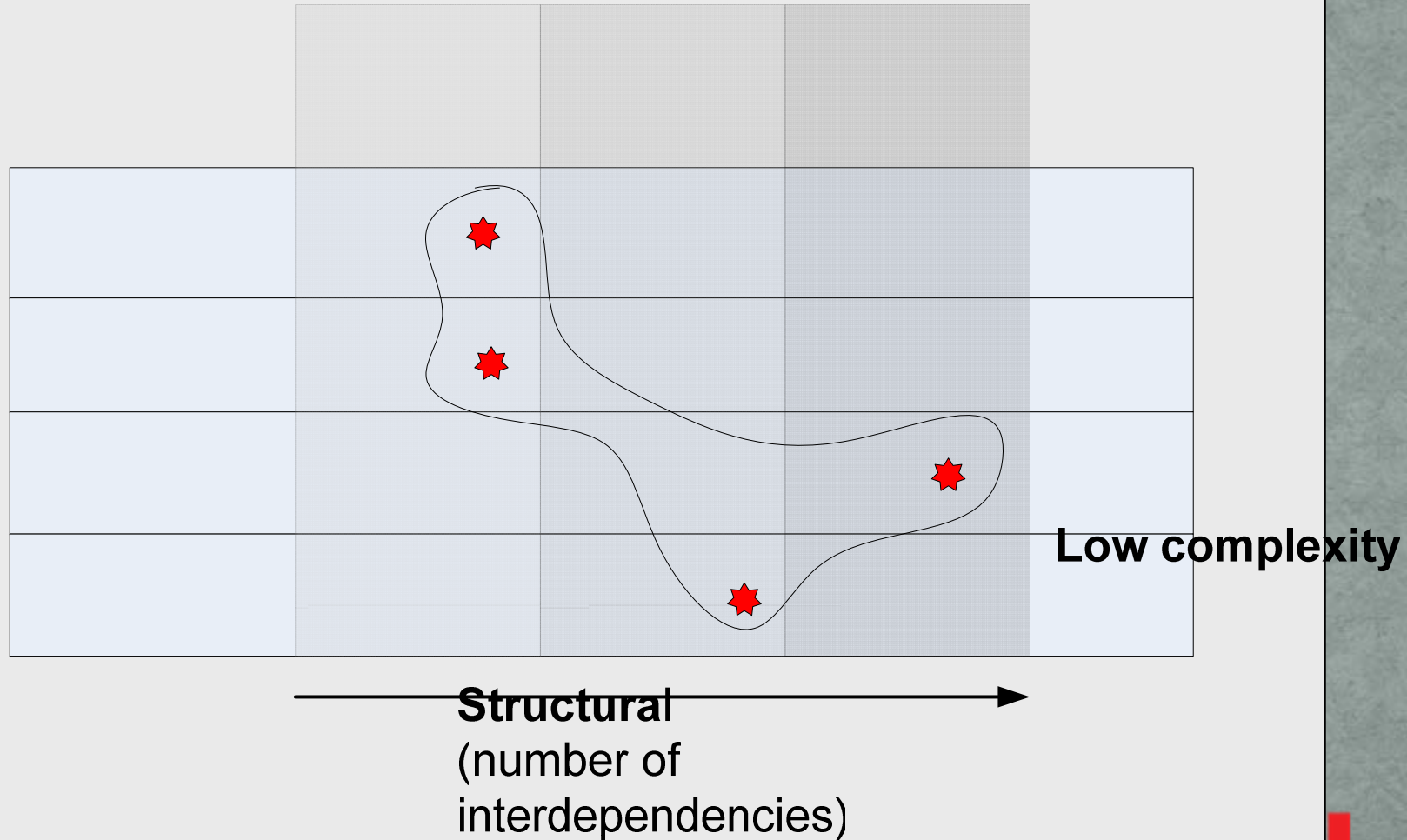
1. Recognise when complexity is present

- Allows you to make appropriate decisions re:
 - Personnel – not all PM's or teams work effectively with each type of complexity
 - Governance and sponsorship - critical
 - Risk management

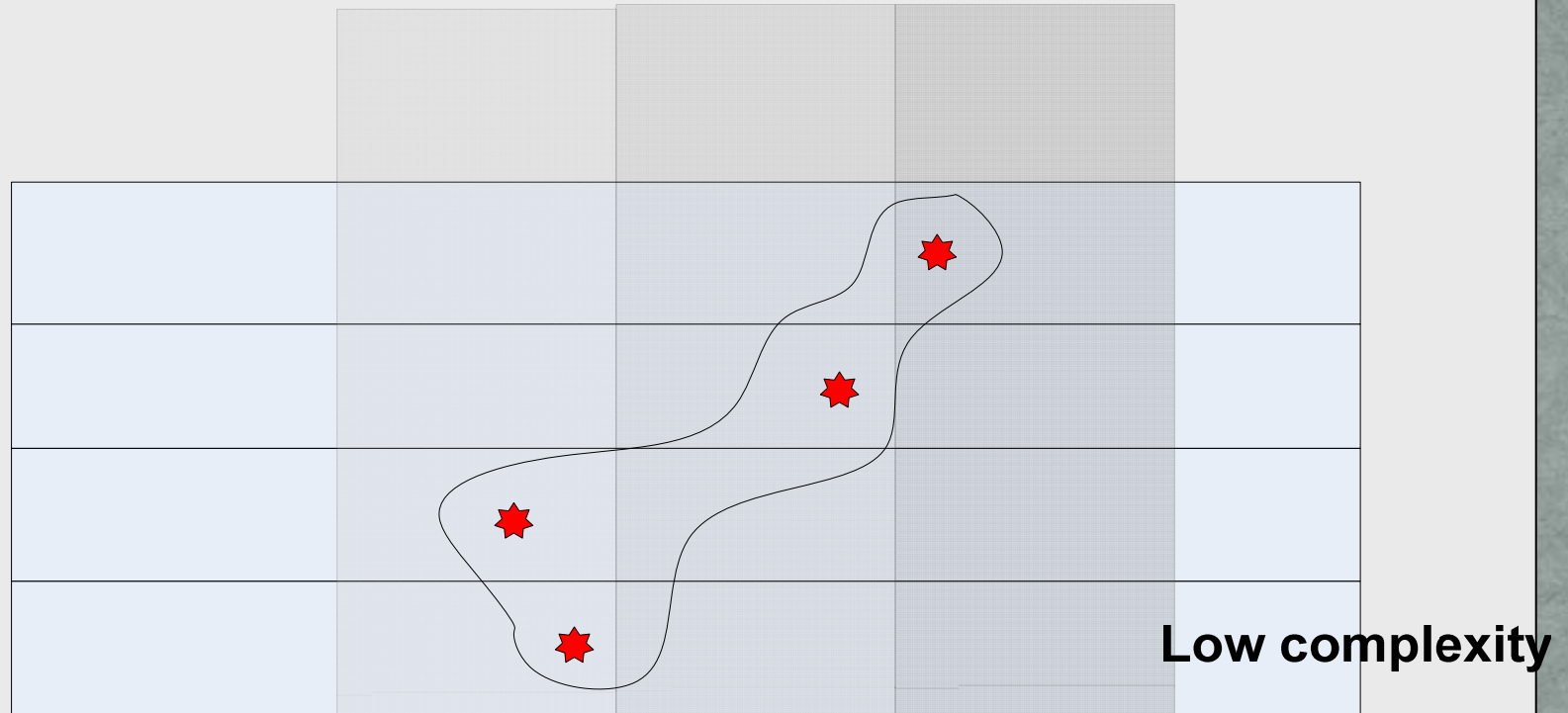
2. Make use of multiple paradigms

- Be prepared to use very different tools and approaches

Tool – Mapping the complexity



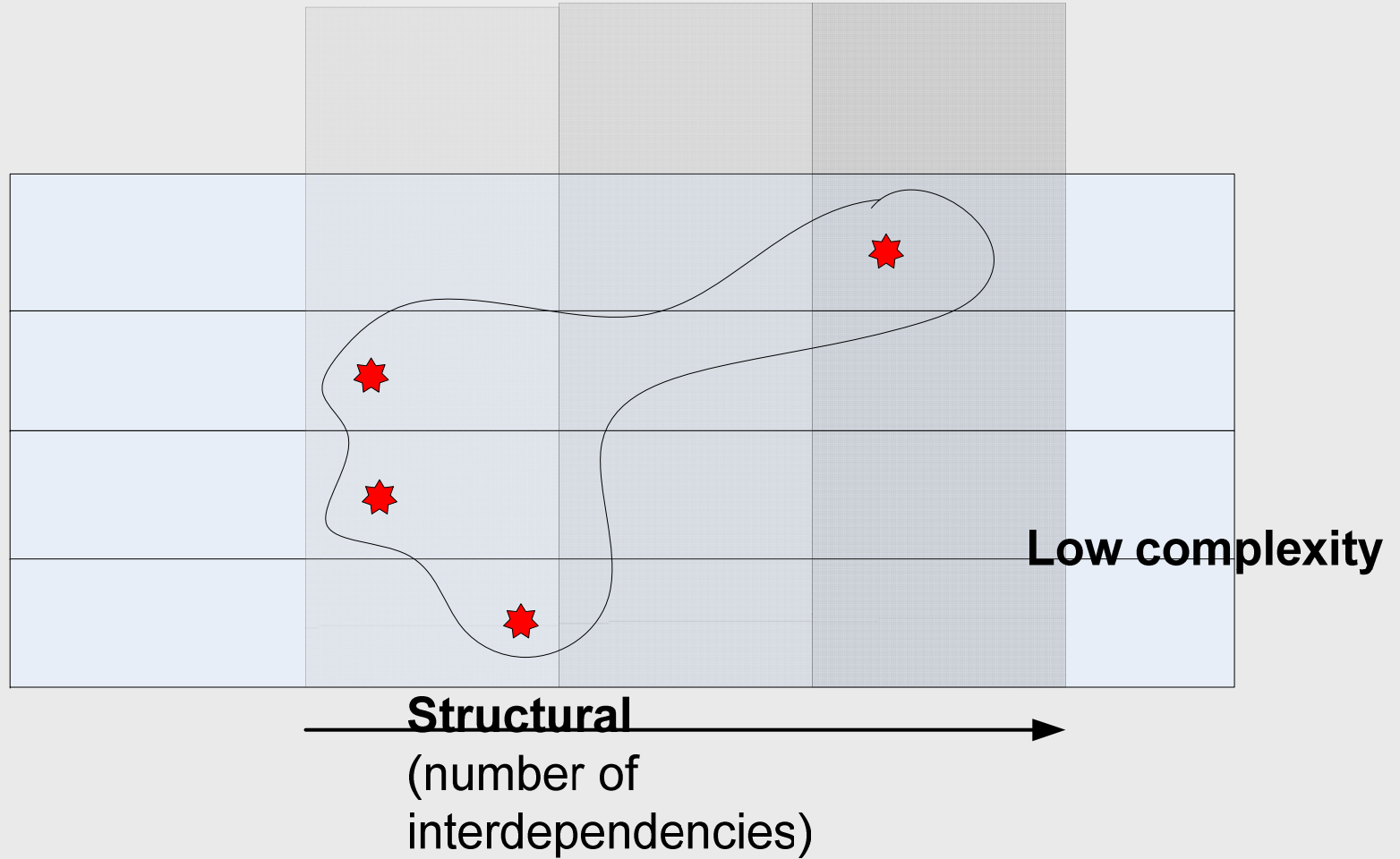
Tool – Mapping the complexity



Structural
(number of
interdependencies)

Technical

Mapping the complexity



Type of complexity expected

has implications for design and selection of

- Project governance
- Personnel
 - Sponsor
 - PM
 - Team
- Project organisation and reporting
- Risk and procurement management
- Schedule and cost management

Multiple management paradigms

- Standard PM tools and techniques are suitable for simple systems
- More advanced PM tools help somewhat with structural complexity
 - Earned value management
 - TOC
 - Limitations with some techniques, such as Monte Carlo analysis (Williams)

Multiple management paradigms

- We need to expand our range of tools and techniques to deal with:
 - **Technical complexity**
Design management and R&D management
Partnering, alliances
 - **Directional complexity**
Soft systems thinking
 - **Temporal complexity**
Soft OR, theatrical projects, entrepreneurship

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QUESTIONS?



Caravaggio



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