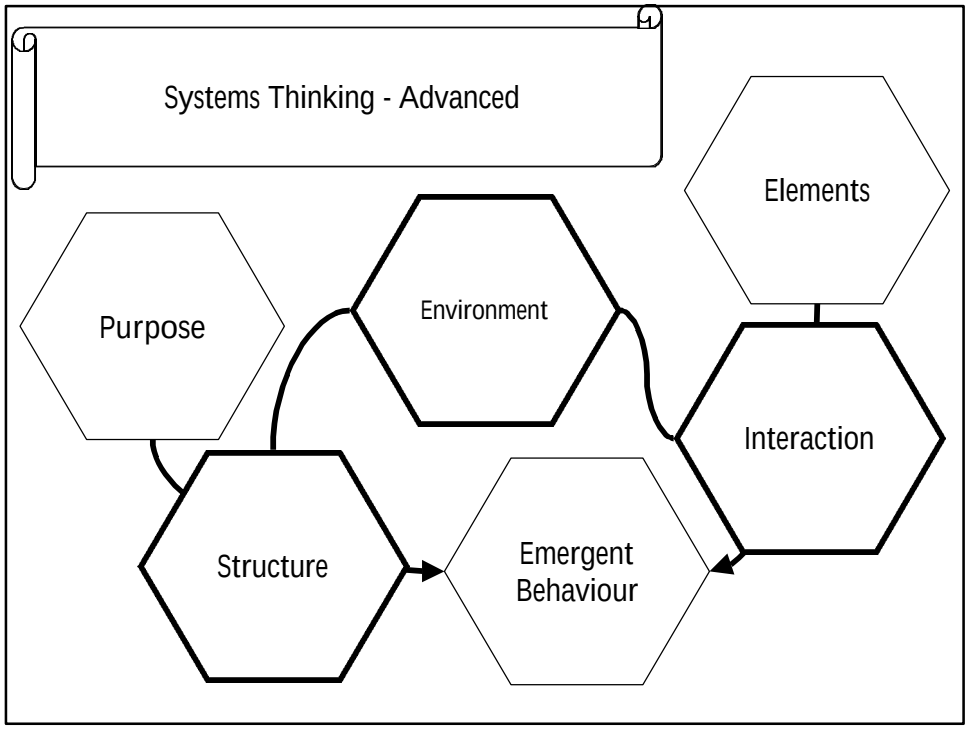

Systems (recap)

- What is a system?
  - Systems are everywhere.
  - We often talk about systems as if they were familiar objects.
  - A system is anything we happen to draw a boundary around.
  - Difficulties of systems thinking: identity, scope, purpose and perspective.
- All complex systems have to be decomposed somehow, to make them manageable.
  - Wholes and parts are vitally connected.
- All systems are sociotechnical systems.
- People perceive systems differently.
  - Systems have many stakeholders.
  - A system may itself be a stakeholder.
  - Stakeholders have many intentions.
  - Stakeholders attach intentions to systems. Stakeholders make demands of systems.
  - People evaluate systems relative to a set of intentions. People identify and scope systems relative to a set of intentions.
- Systems change
  - In any systems intervention, scoping is a highly charged and significant process.

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System & Environment (recap)

- **Social System**: Two or more social actors engaged in a more or less stable interaction within a bounded environment (Talcot Parsons)
  - Social systems are **homeostatic** - they tend towards equilibrium over time.
  - Social systems maintain their own **boundaries**
  - Social systems can be regarded **cybernetically**, as information systems or input-output systems.
  - Social systems involve **symbolic exchanges**, e.g. of language, money, influence or commitment.

- According to Parsons, social systems are goal-directed, problem-solving entities with four sub-systems
  - Adaptation (A)
  - Goal-Attainment (G)
  - Integration (I)
  - Pattern Maintenance or Latency (L)
- Many critics argue that Parson's version of systems theory has several weaknesses:
  - Cannot deal adequately with conflict and change
  - Makes conservative assumptions about equilibrium and social stability.
- However, alternative versions of social systems theory have been proposed, which don't share Parson's ideological premises. These draw on such thinkers as Marx and Habermas.

Problems with First Order Cybernetics

- Early attempts at systems thinking concentrated on **goal-directed behaviour**, using concepts of (first-order) cybernetics. More recently, Maturana developed these concepts to include **autopoiesis**, where the autonomy of a system can be understood with reference to its own epistemology (second-order cybernetic).

- Following Gregory Bateson, modern systems thinkers tend to problematize the second-order cybernetic approach in one of three ways.
- Epistemological
  - draws attention to the problem of the **observer** and the **observation process**
- Ecological
  - draws attention to the recursive interaction with the **environment**. Tends to broaden the scope of the system under consideration - from the person to the family, from the individual to the species, from the species to the pond or wood, from the firm to the market.
- Ethical
  - draws attention to the ownership of goals by **stakeholders**.

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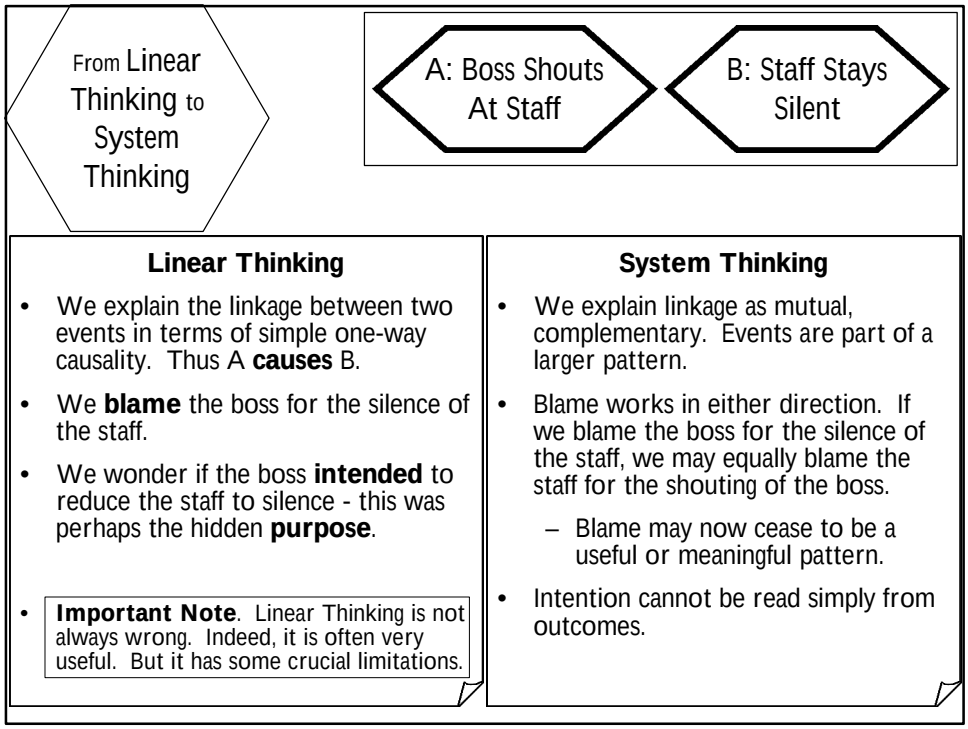

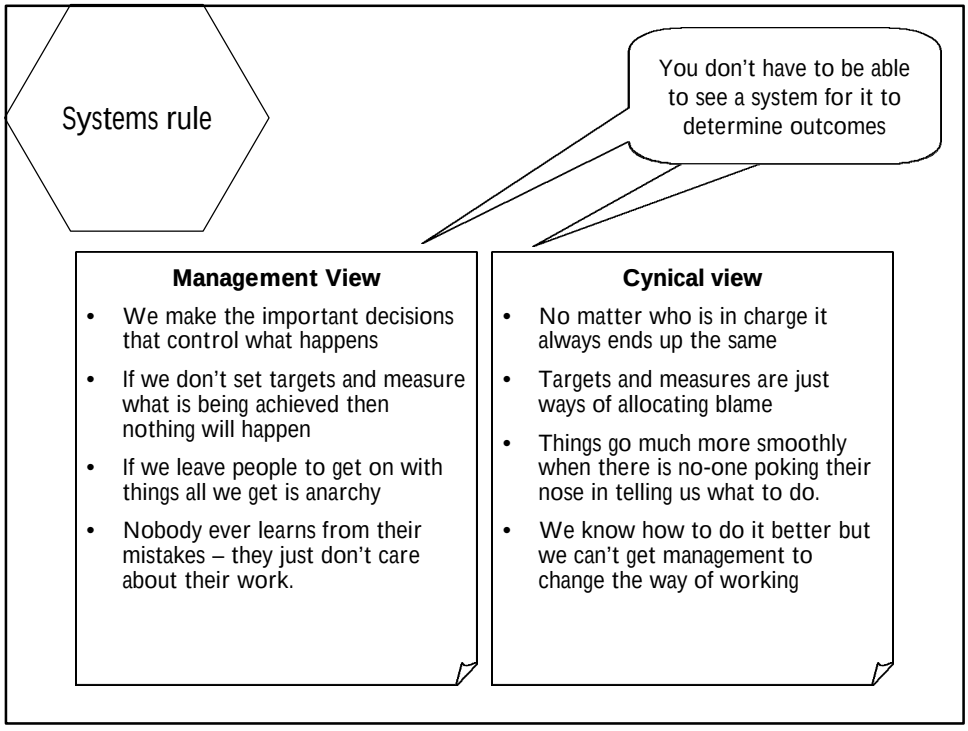

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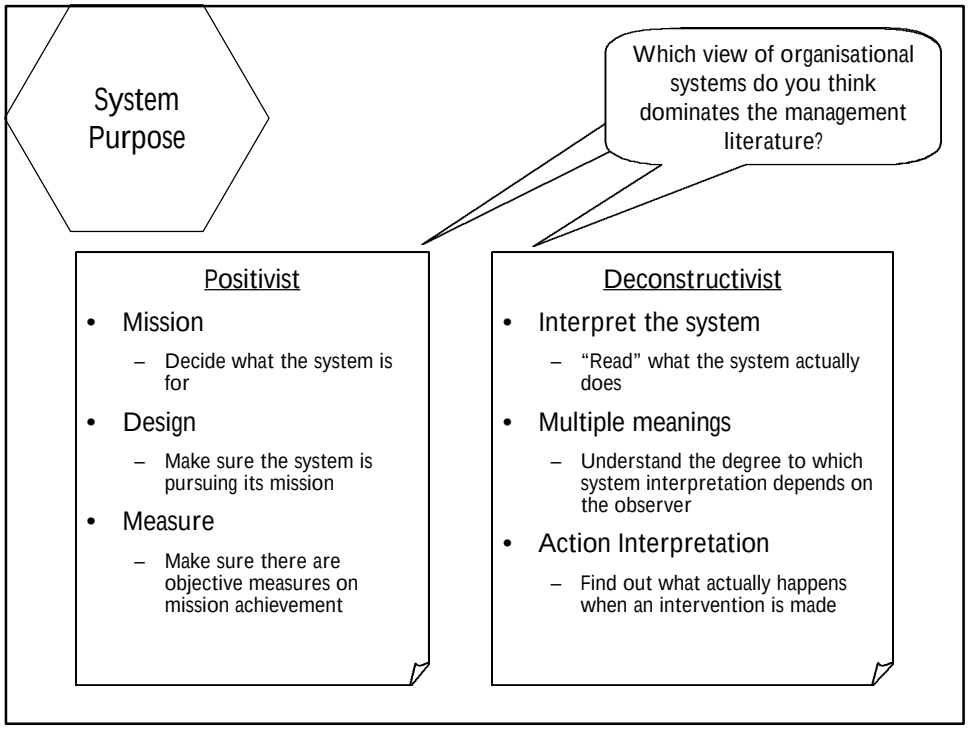

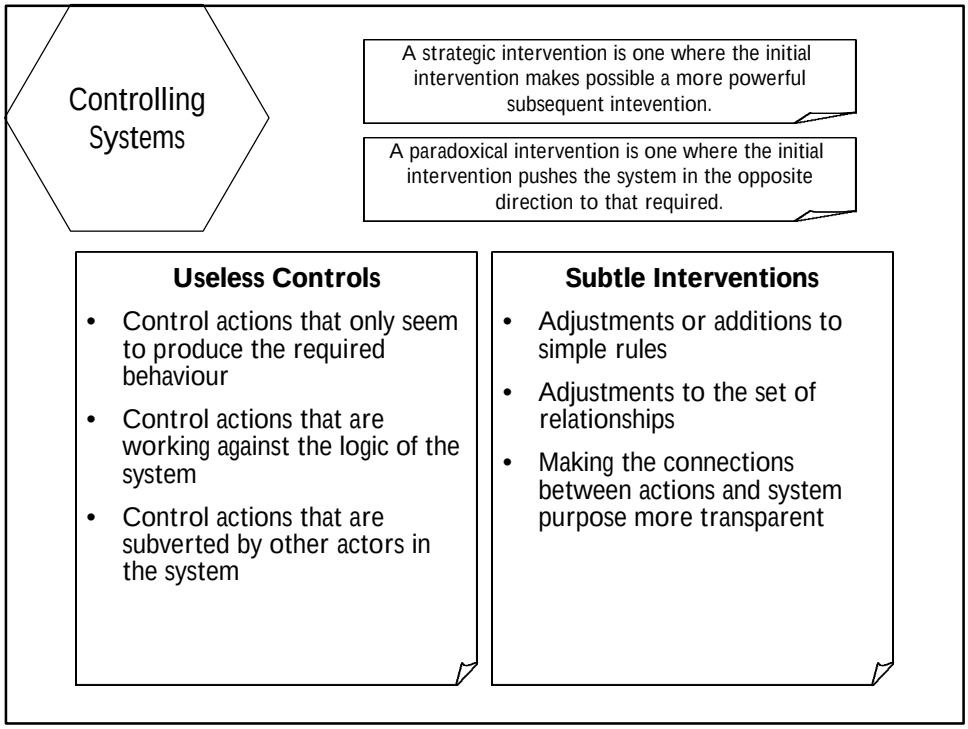

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Ecologies

Behaviour of ecologies

- Populations of different species inhabiting same environment
- Each population specialises the environment for each other species
- Over time species adapt to their environment, as specialised by other species, thus changing the environment
- Reaction to this change by other species results in co-evolution of species in a mutual dance

Systems insights

- Each system has enclosing and interlocking systems
- Change changes itself
- Mechanisms of interaction can be infinitely subtle
- Systems are dynamically stable

Self-organisation

Order for Free

- Systems generate increasing levels of order without external control
- Information is produced and shared
- Maximum rates of generation at the “edge of chaos”
- No organisation was ever created to match a blueprint: people always self-organise

Examples

- Auto-catalytic chemistry
- Cloud formations
- Mind
- Social animals such as bees

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Bureaucratic systems

Design

- Perfect (hierarchical) decomposition of the job into discrete roles and tasks
- No need for roles to understand other roles
- Can deliver a result without people understanding the significance of their work
- Self-stabilising and self-preserving: it is in everyone's interest to preserve the status quo

Energy

- System consumes all its energy on maintaining internal control
- System has no way of understanding its interaction with the environment
- System is predictable and therefore vulnerable to attack and subversion
- System cannot digest radical change – the perestroika question

Measuring performance

Measuring contribution

- Desired output must be specified: some of the mix is easier to measure than other parts
- The cost of measuring must be taken into account is understanding how to measure and control contribution
- Cost factors distort what is measured and therefore what is produces and the system becomes inefficient

Internal motivation

- People work out what the job requires and how to be effective
- Job satisfaction is at its maximum when the mix of actions is at its most effective
- The system is efficient but only under control via the internal motivation of the workers

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Types of Uncertainty

Types of Uncertainty
Source: Ralph Stacey, Strategic Management and Organisational Dynamics

	Cause and effect are clear to players	**Cause and effect are unclear to players**
Objectives are conflicted between players	**Compromise and Negotiation**	**Unprogrammable: "outcomes" rather than "solutions"**
Objectives are shared and agreed between players	**Rational and logical planning**	**Judgement about feasibility: will it work?**

Complex adaptive systems (Gell-Mann)

- Organisations are webs of feedback loops
- Stable and unstable equilibrium
- Organisations are paradoxes
- Sustainability implies "edge of chaos"
- Irregular cycles and discontinuous trends
- Agents within the system cannot be in control
- Systems self-organise in the long term
- Managers both create and discover their environment

- Consists of large numbers of agents interrrelated in a non-linear way, that is, in which each action of one agent can provoke more than one response from other agents
- Interacts with other complex adaptive systems and together they constitute the environment to which each must respond
- Acquires information about the systems constituting its environment and information about the consequences of its own interaction with those systems. In other words complex adaptive systems employ feedback.
- Identifies regularities in the feedback information it acquires and then condenses those regularities into a schemea or model, in effect selecting one of a number of competing models which might explain the regularities
- Acts in relation to the systems that are in its environment on the basis of the schema it has developed
- Observes the responses its actions provoke, as well as the consequences of those responses and uses this information to revise its schema, in other words, it employs feedback to learn or adapt. This is rather complex learning behaviour because it involves adjusting both the behaviour and the schema driving that behaviour.

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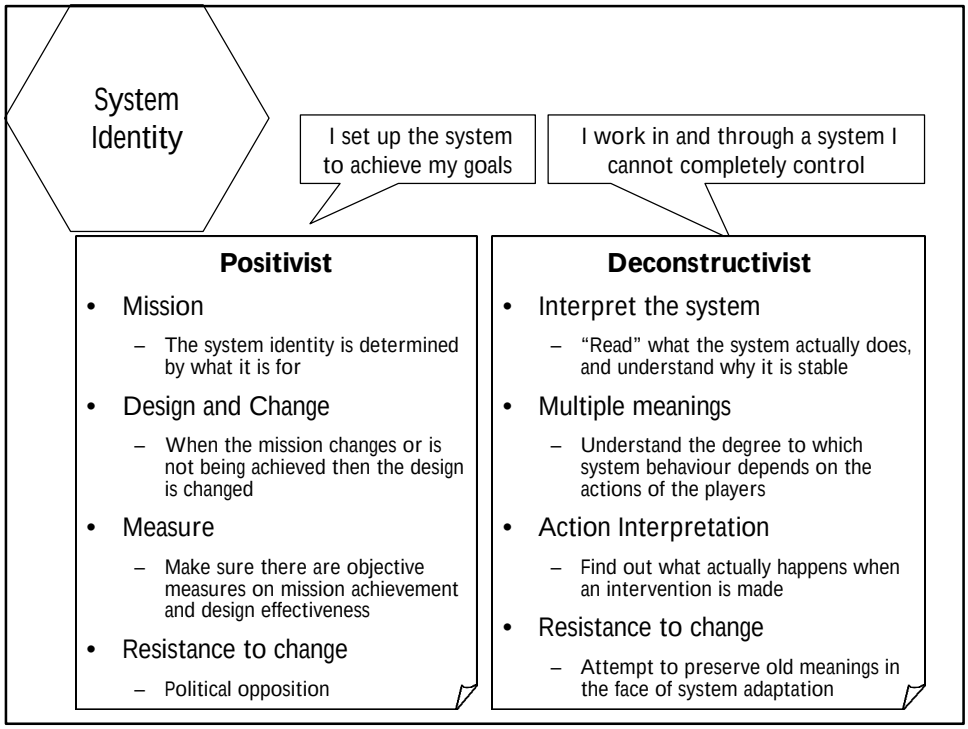

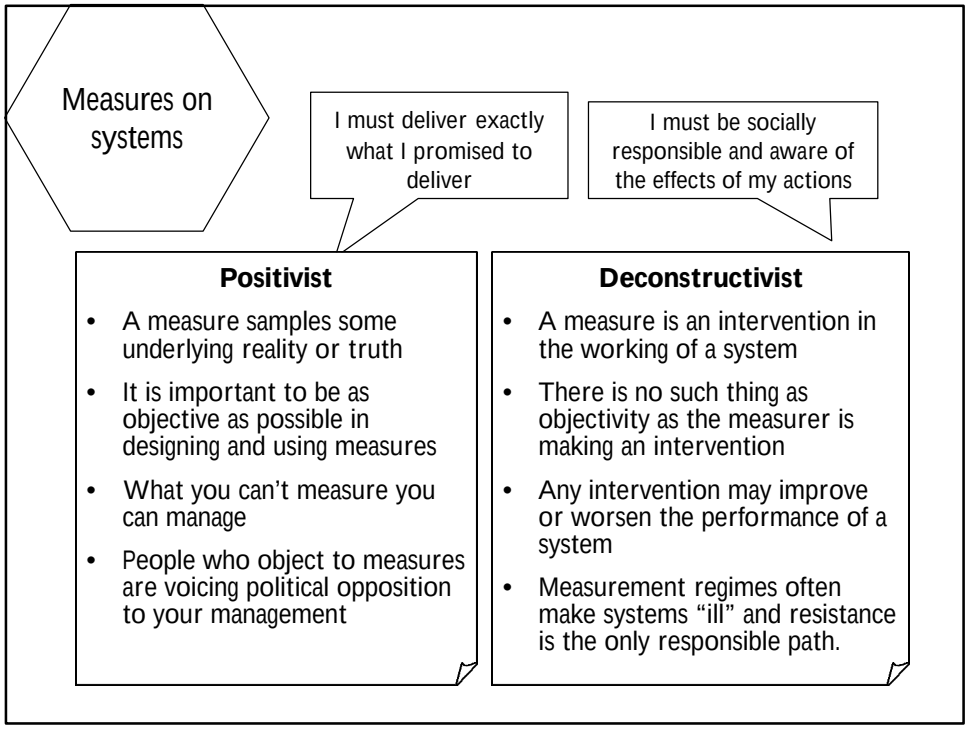

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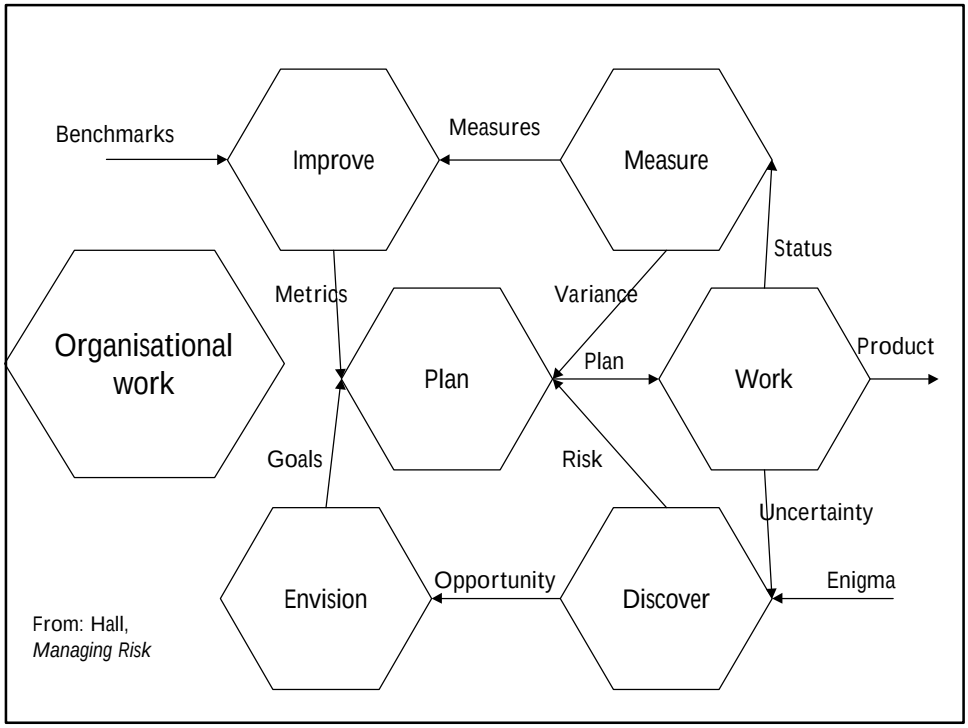

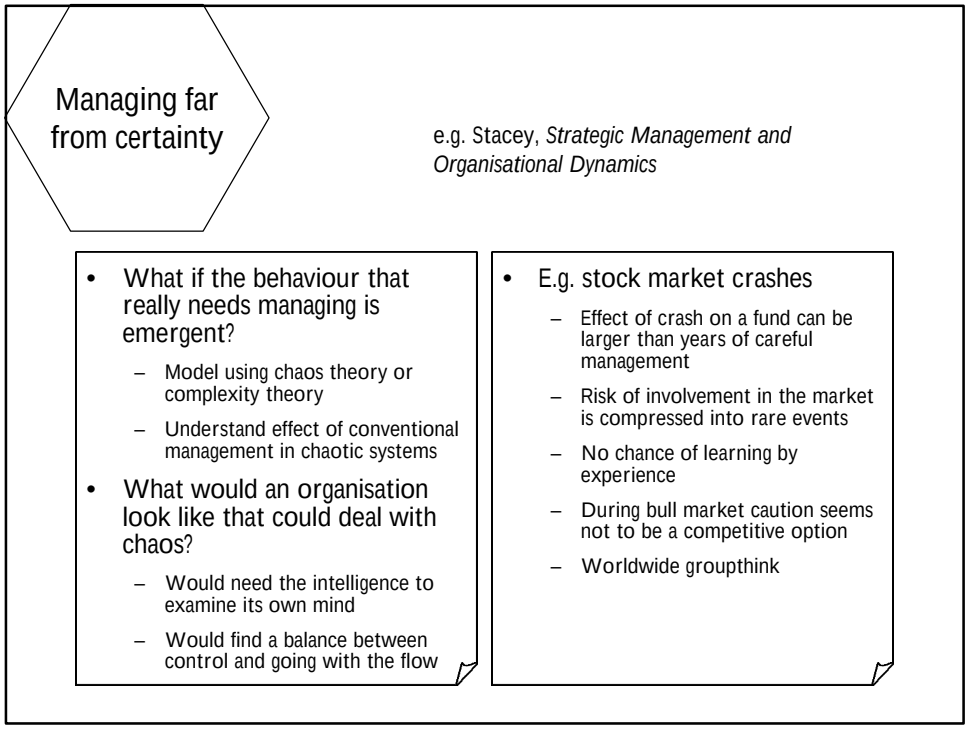

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Ecological Interventions

Eco-friendly?

- Return to a status thought to represent nature-before-man
- Intervene to correct "problems" and allow populations to recover
- Manage the system to protect endangered species
- Study the dynamics to understand the interlocking impacts of existing interventions

Systems insights

- Tread lightly
- Believe in ecology's ability to self-repair
- Imagine just how different things could be / could have been
- Remember how interconnected and interdependent everything is

Places to Intervene in a System

Source: Donella H. Meadows "Places to Intervene in a System"(Whole Earth Review, Winter 97). Available at http://www.wholeearthmag.com/ArticleBin/109.html

increasing effectiveness

9	Numbers (subsidies, taxes, standards)	**System Dynamics & Simulation**
8	Material stocks and flows	
7	Regulating negative feedback loops	
6	Driving positive feedback loops	**System Structure & Governance**
5	Information flows	
4	The rules of the system (incentives, punishment, constraints)	
3	The power of self-organization	
2	The goals of the system	
1	The mindset or paradigm out of which the goals, rules, feedback structure arise	**Stakeholder Risk/Reward**
0	The power to transcend paradigms	

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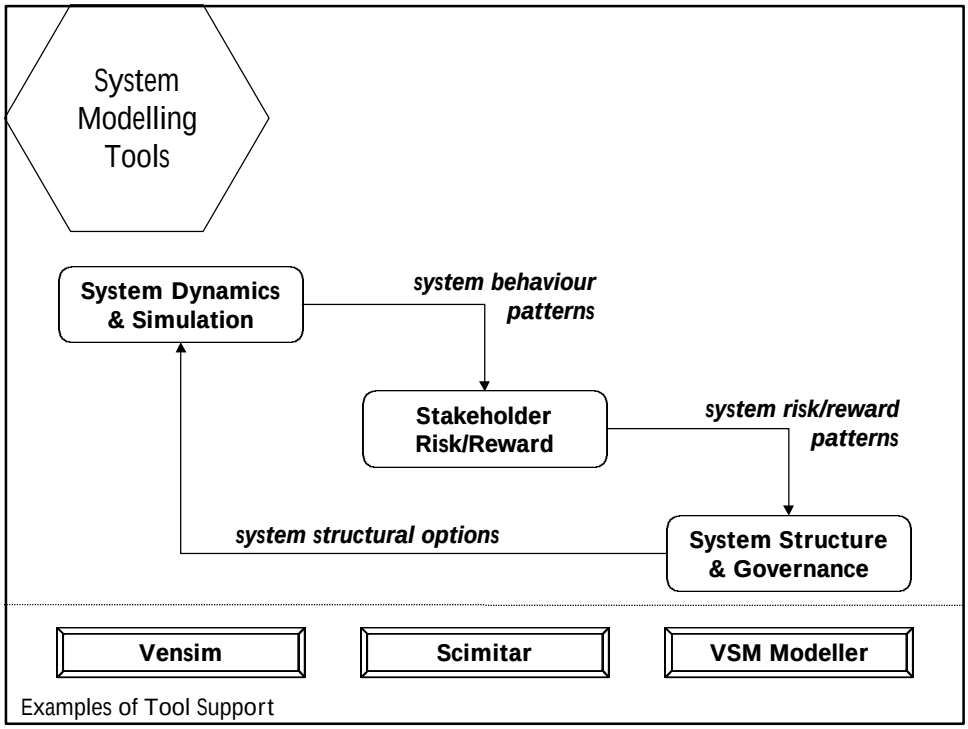

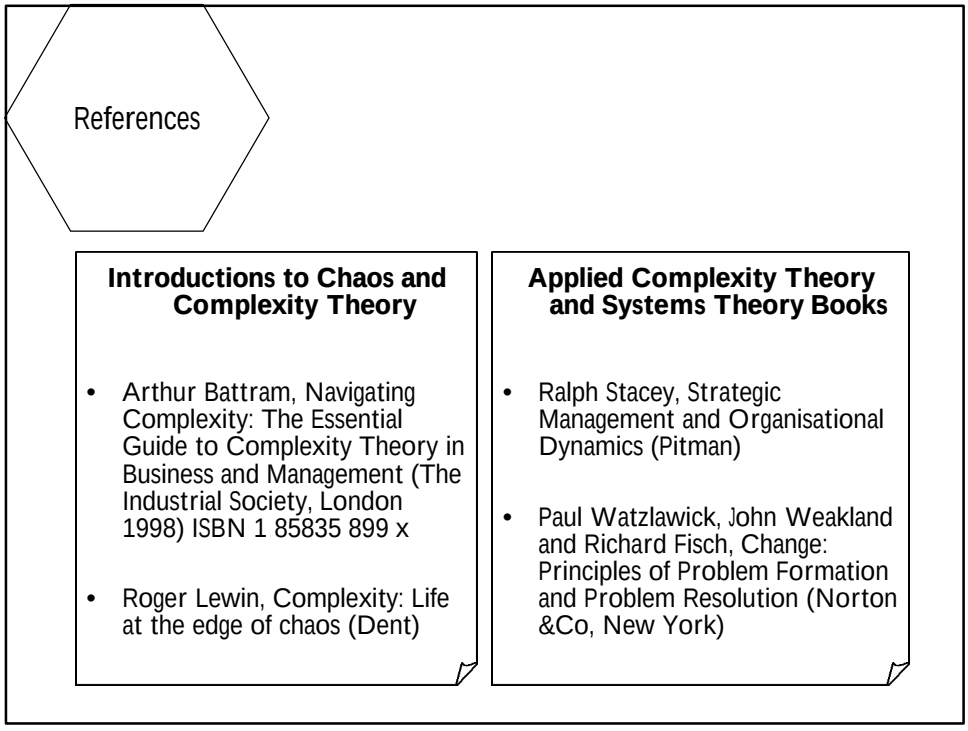

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