

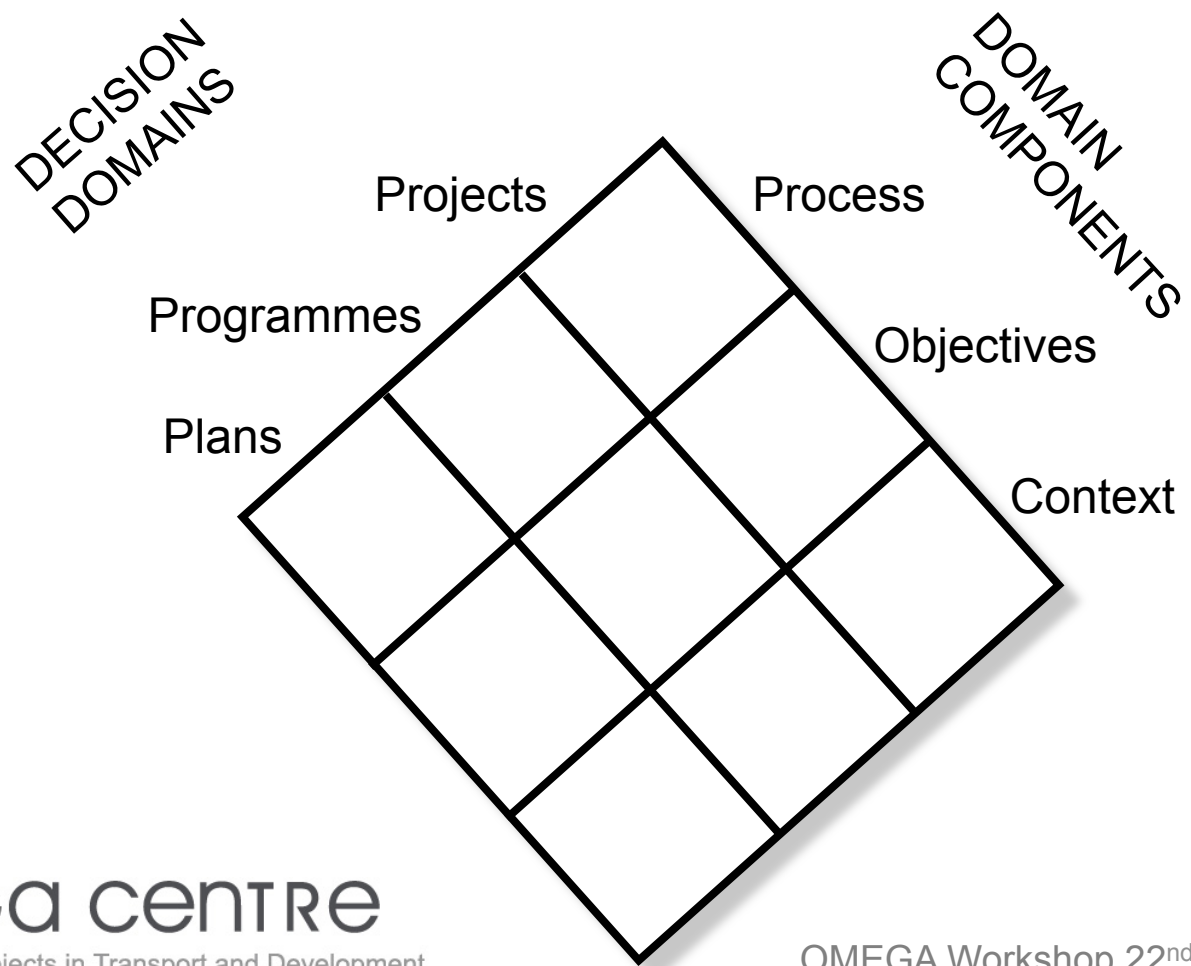
# Complexity, Uncertainty & Risk in Planning Decisions

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# Content

- What is the problem?
- Concepts, theory and definitions
- Managing
- Tools and methods
- Conclusions

# Decision Domains and Components



# Symptoms

- Murphy's Law
- Law of Unintended Consequences
- Wicked Problems

# Characteristics of 'Wicked Problems'

- Interconnectedness
- Complicatedness
- Uncertainty
- Ambiguity
- Conflict
- Constraints
- Cannot be solved by conventional analytic methods

# Complex system properties

These include:

- Emergence
- Relationships contain feedback loops
- Complex systems are open
- The parts cannot contain the whole
- Complex systems have a history
- Complex systems are nested
- Boundaries are difficult to determine
- Relationships are short-range
- Relationships are non-linear

# Implications of complexity theory

- Inability to predict
- Inability to control
- Self-organisation and emergence
- Small set of simple rules

(Batty, 2006)

# Uncertainty

*“Uncertainty is an expression of confidence about the state of knowledge in a given situation.”*

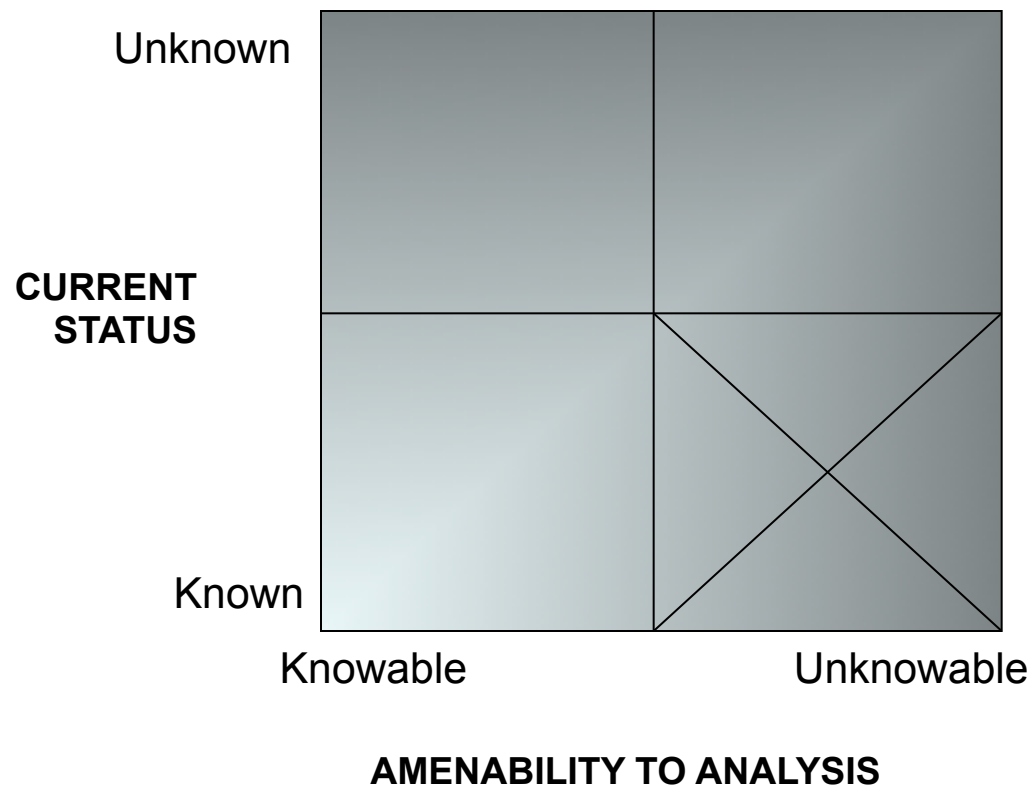
Brown, 2004

*"The message is that there are known knowns - there are things that we know that we know. There are known unknowns - that is to say, there are things that we now know we don't know. But there are also unknown unknowns - there are things we do not know we don't know. And each year we discover a few more of those unknown unknowns."*

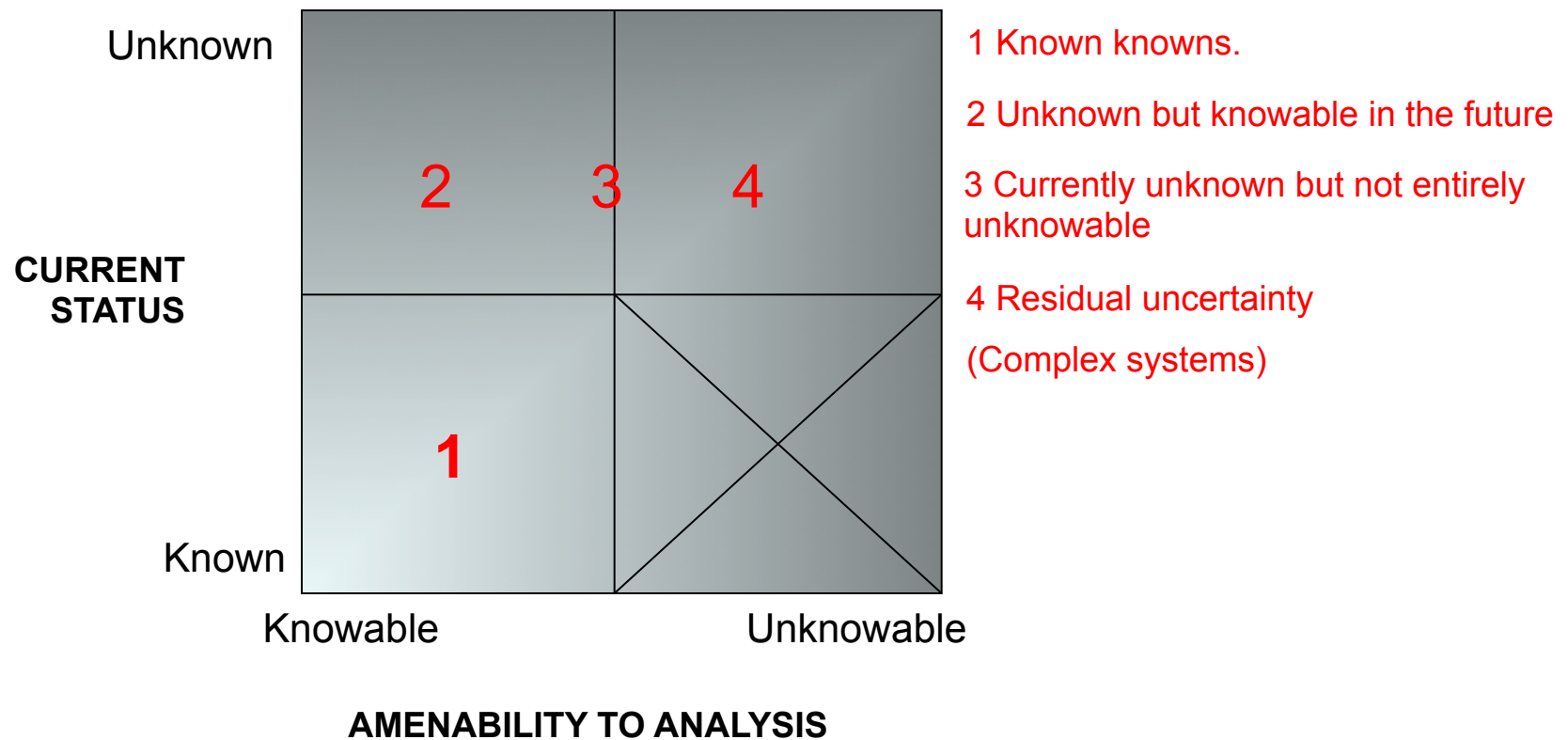
Donald Rumsfeld, US Secretary of State for Defence, 2004



# Nature of Uncertainty



# Nature of Uncertainty



# Taxonomy of Imperfect Knowledge

	Realms of Confidence							
	Certainty	'Bounded' Uncertainty (All possible outcomes known)			'Unbounded' Uncertainty (Not all outcomes known)			Indeterminacy
Known Outcomes	All	All	All	All	Some	Some	None	Unknowable
Known Probabilities	Not applicable	All	Some	None	Some	None	None	Unknowable

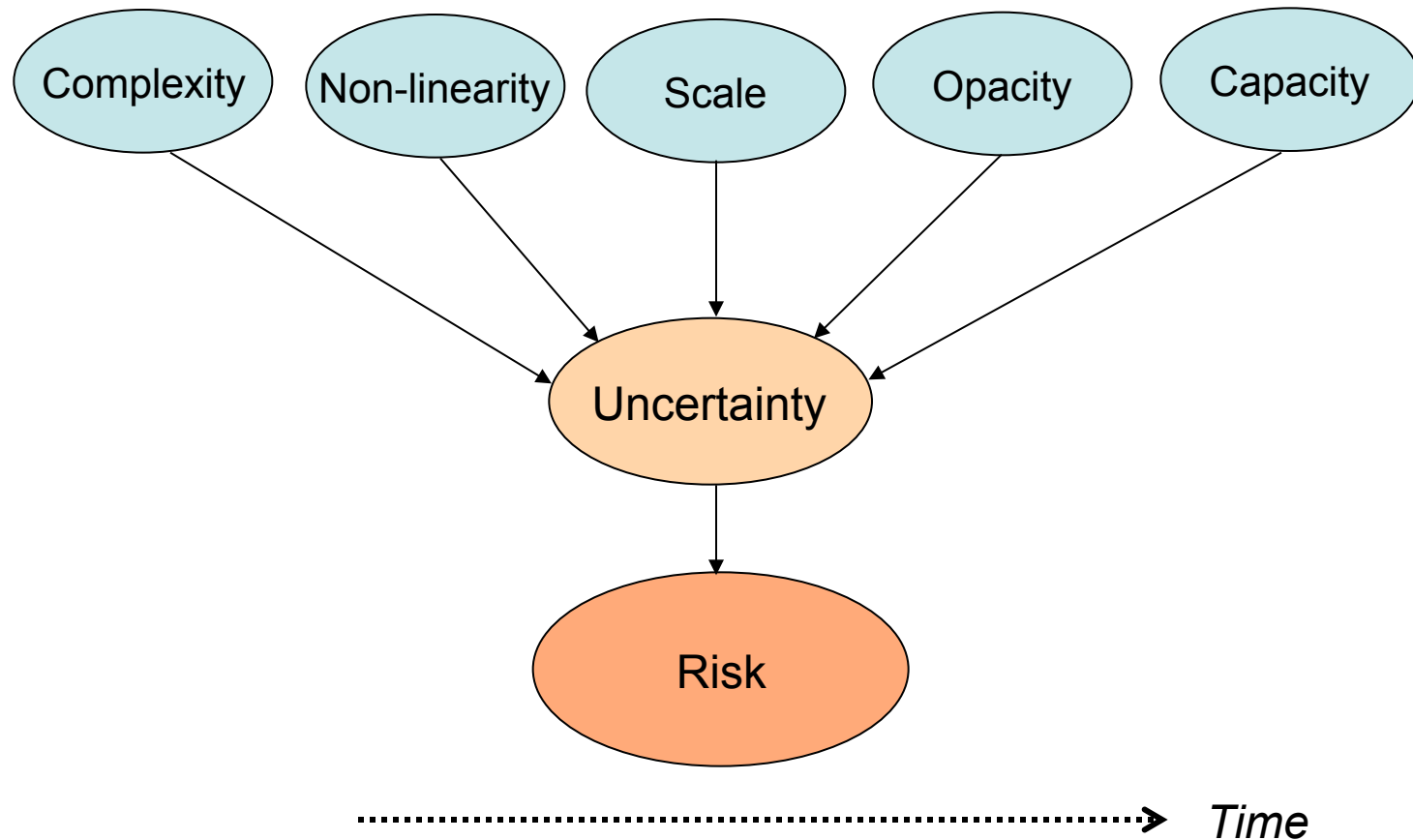
(Brown, 2004)

# Roots of Uncertainty

- **Complexity** – it appears more complex than models imply
- **Non-linearity** – it is too variable or chaotic to capture uniquely
- **Scale** – it is too large or interconnected to observe everything at once, or too small to observe at all
- **Opacity** – it is too opaque to be observed
- **Capacity** – there are inadequate resources to observe it.

# Uncertainty and Risk

C A U S E S



# Meanings of 'risk'

For example:

- The possibility of suffering harm or loss(dictionary)
- Linkage to hazards or accidents(H&S)
- Hazard x exposure (toxicologist)
- Unintended and inescapable consequences of modernity identified through science (Beck, 1996)
- *“An uncertain event...that should it occur will have an effect on the achievement of the project objectives“ (APM, 2004)*

# Responses to managing 'uncertainty'(1)

'**Closure**' (delimiting an investigation by imposing boundaries) is introduced through:

- **Closed ears:** Unwillingness to accept alternative views
- **Closed bank:** Absence of resources to consider
- **Closed eyes:** Deliberately ignoring a problem
- **Closed minds:** Ignoring alternative views

(Massey, 1999)

# Responses to managing ‘uncertainty’ (2)

## Bounded rationality

*“Decision –makers confine their perception of a situation to the goals and activities of their specific and immediate domain.”*

(Simon, 1986)



# Responses to managing 'uncertainty' (3)

- **Denial**
  - Refusal to reveal to stakeholders risk related information that may hold negative or discomfoting connotations
- **Avoidance**
  - Lack of attention to risk related information due to insufficient trust or belief in the efficacy of that information.
- **Delay**
  - Failure to consider or resolve risk due to apathy, lack of interest or general approach.
- **Ignorance**
  - The complete lack of awareness of risk related information by stakeholders
- **Outcome**
  - **Optimism bias – intentional or unintentional, but failure to manage expectations.**

(Source: empirical research by Kutsch and Hall)

## Project management techniques to manage uncertainty and risk

The most commonly used techniques to manage uncertainty and risk in project management exhibit several weaknesses, in that they:

- rely on quantitative data;
- focus on predicting and controlling risk *events*, to the neglect of risk *processes*;
- rely on historic data to forecast future events;
- fail to address the issue of unanticipated risks.

# Project management

- Methods from Systems Engineering, and Systems Analysis influenced the development of project management, which has inherited their ‘hard’ assumptions about the world.
- Projects have often been perceived to have failed due to project managers not paying sufficient attention to soft criteria.
- Soft issues have been identified as the key success factors in many projects.

## The paradigm of 'rational comprehensive planning'

- Identify objectives with weights
- Identify optional courses of action
- Predict consequence of actions in terms of objectives
- Evaluate the consequences on a common scale of value.
- Select the option expected to yield highest net benefit.

(Rosenhead, 1989, p3),

# Characteristics of the dominant planning paradigm

1	<ul style="list-style-type: none"> <li>Problem formulation in terms of a single objective and optimisation; multiple objectives if recognised, are subjected to trade-off onto a common scale</li> </ul>
2	<ul style="list-style-type: none"> <li>Overwhelming data demands with consequent problems of distortion, data availability, and data credibility.</li> </ul>
3	<ul style="list-style-type: none"> <li>Scientisation and de-politicisation, assuming consensus.</li> </ul>
4	<ul style="list-style-type: none"> <li>people are treated as passive objects.</li> </ul>
5	<ul style="list-style-type: none"> <li>Assumption of a single decision maker with abstract objectives from which concrete actions can be deduced for implementation through a hierarchical chain of command.</li> </ul>
6	<ul style="list-style-type: none"> <li>Attempts to abolish future uncertainty, and pre-take future decisions.</li> </ul>

Source: After Rosenhead, 1989

# Dominant and Alternative Planning Paradigms

Characteristics of the dominant planning paradigm		Characteristics of the Alternative paradigm
1	<ul style="list-style-type: none"> <li>Problem formulation in terms of a single objective and optimisation; multiple objectives if recognised, are subjected to trade-off onto a common scale</li> </ul>	<ul style="list-style-type: none"> <li>Non-optimising, seeks alternative solutions which are acceptable on separate dimensions without trade-offs.</li> </ul>
2	<ul style="list-style-type: none"> <li>Overwhelming data demands with consequent problems of distortion, data availability, and data credibility.</li> </ul>	<ul style="list-style-type: none"> <li>Reduced data demands achieved by greater integration of hard and soft data with social judgements.</li> </ul>
3	<ul style="list-style-type: none"> <li>Scientisation and de-politicisation, assuming consensus.</li> </ul>	<ul style="list-style-type: none"> <li>Simplicity and transparency, aimed at clarifying the terms of conflict</li> </ul>
4	<ul style="list-style-type: none"> <li>people are treated as passive objects.</li> </ul>	<ul style="list-style-type: none"> <li>Conceptualises people as active subjects</li> </ul>
5	<ul style="list-style-type: none"> <li>Assumption of a single decision maker with abstract objectives from which concrete actions can be deduced for implementation through a hierarchical chain of command.</li> </ul>	<ul style="list-style-type: none"> <li>Facilitates planning from the bottom-up</li> </ul>
6	<ul style="list-style-type: none"> <li>Attempts to abolish future uncertainty, and pre-take future decisions.</li> </ul>	<ul style="list-style-type: none"> <li>Accepts uncertainty and aims to keep options open for later resolution</li> </ul>

(Source: After Rosenhead, 1989)

# What tools do we need to address complexity, uncertainty, and risk

- Address context
- Embrace complexity
- Confront uncertainty
- Focus on Decisions
- Emphasise the Qualitative
- Inclusive
- Coherent
- Transferable
- Scaleable

## Some candidates:

- Hard and Soft systems
- Strategic Choice
- Scenarios
- Sense-making (Cynefin approach)

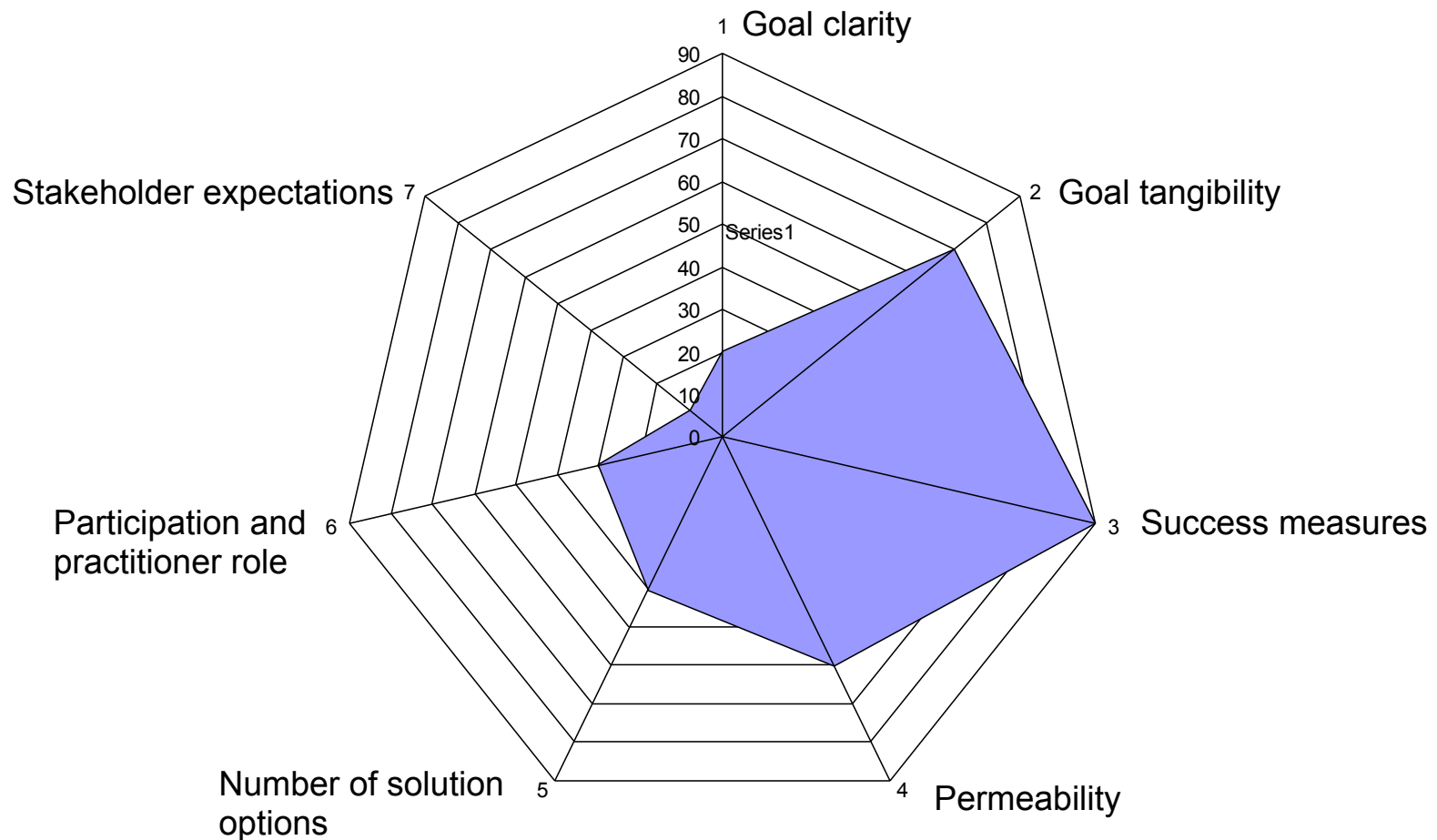


# Hard and Soft Systems: a Dimensions Framework

Hard					Soft				
Goals/objectives clearly defined	0		1. Goal clarity	100	Goals/objectives highly ambiguously defined				
Physical artifact	0		2. Goal tangibility	100	Abstract concept				
Only quantitative measures	0		3. Success measures	100	Only qualitative measures				
Not subject to external influences	0		4. Project permeability	100	Highly subject to external influences				
Refinement of single solution	0		5. Number of solution options	100	Exploration of many alternative solutions				
Expert practitioner, no stakeholder participation	0		6. Participation and practitioner role	100	Facilitative practitioner, high stakeholder involvement				
Value technical performance, and efficiency, manages by monitoring and control	0		7. Stakeholder expectations	100	Values relationships, culture and meaning, manages by negotiation and discussion.				

Source: Crawford and Pollack, 2004

# Hard and Soft Systems: Mapping dichotomies



# Soft Systems Methodology: SSM

- Versatile established technique
- Models purposes, boundaries, and relationships in systems
- Recognises complex phenomena can be viewed from different perspectives
- ‘Uncertainty’ explicit
- Open and accessible.

# Strategic Choice Approach (SCA)

- Planning is “choosing strategically through time”
- Focus on strategic decision-making
- Openly available accessible methods
- Promotes interactive participation
- Explicit treatment of uncertainty

After Friend and Hickling, 2005

# Strategic Choice and Uncertainty

Type of Uncertainty	Exploratory Option	Typical Methods	Outcomes
UE working <b>Environment</b>	More information	Research, survey, analysis	Confidence gained (reduced uncertainty).
UV guiding <b>Values</b>	Clearer objectives	Policy guidance, clarify aims.	
UR <b>Related decisions</b>	More coordination	Liaison, negotiation.	Resources used (finance, skills, energy, goodwill)
			Decision and action delayed

# Scenario Planning

- Scenario planning is a discipline for rediscovering the original entrepreneurial power of creative foresight in contexts of accelerated change, greater complexity, and genuine uncertainty.” (Pierre Wack, Royal Dutch/Shell, 1984)
- A scenario is generally a descriptive narrative, which presents a vision of the future with comments on the probability of certain events occurring
- scenarios represent a tool for ordering perceptions of the future
- scenarios present alternative images instead of extrapolating current trends from the present.
- the purpose is to make strategic decisions that will be sound for all plausible futures.

# The key characteristics of Strategic Choice Approach (SCA)

- A focus on decisions to be made in a particular planning situation
- Highlights the judgments involved in handling the technical, political and procedural uncertainties surrounding a decision.
- An incremental approach, rather than one which looks towards an end product of a comprehensive strategy at some point in the future.
- It generates a ‘commitment package’ which expresses a balance between decisions to be made immediately, and those to be postponed until a specified future time horizon.
- It promotes interaction as a framework for communication and collaboration between stakeholders with different backgrounds and skills.

# SCA: Decisions, Uncertainty, and Responses

Type of Uncertainty	Response to Uncertainty	Typical Methods	Outcomes
UE working Environment	More information	Research, survey, analysis	Confidence gained Resources used
UV guiding Values	Clearer objectives	Policy guidance, clarify aims.	Decision and action delayed
UR Related decisions	More coordination	Liaison, negotiation.	

(Friend and Hickling, 1987)



## SCA combines five emphases

- enriching communication rather than reinforcing expertise
- supporting decisions rather than investigating systems
- managing uncertainty rather than organizing information
- sustaining progress rather than producing plans
- developing connections rather than maintaining control.

# Further development of SCA

- Increasing attention to the ‘**context**’ of decision-making, including mobilising ideas and organizational modes of expression;
- Shifting the role of plans in decision-making from one of **directing decisions according to preconceived ideas**, to one of **providing intelligence for decision-makers** on the likely ramifications of their intended action.

(Faludi 2004, p231),

# What the decision-maker operating amidst complexity needs:

An appreciation of the concept of '**complexity**' as the **context** of decision-making;

A '**sense-making**' capability in order to understand the complexity of the decision-making environment.

For a system which is inherently complex completely **different management and planning methods**.

- according to David Snowden (2004)

# The Cynefin Framework

## *Emergent Order*

## *Directed Order*

<p><b>COMPLEX</b></p> <ul style="list-style-type: none"> <li>• Cause and effect are only coherent in retrospect and do not repeat</li> <li>• Pattern management</li> <li>• Perspective filters</li> <li>• Complex adaptive systems</li> <li>• Probe-Sense-Respond</li> </ul>	<p><b>KNOWABLE</b></p> <ul style="list-style-type: none"> <li>• Cause and effect separated over time and space</li> <li>• Analytical/Reductionist</li> <li>• Scenario planning</li> <li>• Systems thinking</li> <li>• Sense-Analyze-Respond</li> </ul>
<p><b>CHAOTIC</b></p> <ul style="list-style-type: none"> <li>• No cause and effect relationships perceivable</li> <li>• Stability-focused intervention</li> <li>• Enactment tools</li> <li>• Crisis management</li> <li>• Act-Sense-Respond</li> </ul>	<p><b>KNOWN</b></p> <ul style="list-style-type: none"> <li>• Cause and effect relations repeatable, perceivable and predictable</li> <li>• Legitimate best practice</li> <li>• Standard operating procedures</li> <li>• Process reengineering</li> <li>• Sense-Categorize-Respond</li> </ul>

# Sense-making methods

System of interactions between different actors who are:

- collectively using the interaction to **individually make sense** of a situation, triggered by complexity, ambiguity and uncertainty.
- **building a collective understanding** of a situation, developing a strategic model of the intervention and defining a shared, desired outcome.
- **Narrative pattern analysis** to inform on complexity of projects.

Source: Kurtz and Snowden, 2003

# Response Models

The four spaces and their appropriate response models are:

- |            |                          |
|------------|--------------------------|
| • Known    | sense-categorize-respond |
| • Knowable | sense-analyze-respond    |
| • Complex  | probe-sense-respond      |
| • Chaotic  | act-sense-respond        |

# Conclusions

## For projects, programmes and plans:

- Influence of 'complexity'
- Intervention
- Outcomes and impacts
- Measurement and evaluation
- Directed and emergent order
- Appropriate methods

# Conclusions

## For Planning:

- The right analogy
- Demise of the traditional model
- Promising avenues
- Comprehensive framework
- Not all 'complex'
- Appropriate planning paradigm