Complex Project Management

A Systems Thinking Approach

Unintended Consequence

"Now that we can tell time, I'd like to suggest that we begin imposing deadlines."

I'm sure glad the hole isn't in our end...

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IEEE Seminar Feb 2013 Ottawa

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DND/PMO Canadian Surface Combatant Program

Issue:

"Even if all parts are optimised, the performance of the whole organisation can be disastrous if the parts do not interact together well."

Jackson, M. 2003. Systems Thinking: Creative Holism for Managers

Remedy:

Systems Thinking

"The study of a system as a whole is put before that of the parts, so that at an organisational level the parts function, are related properly, and serve the purposes of the whole."
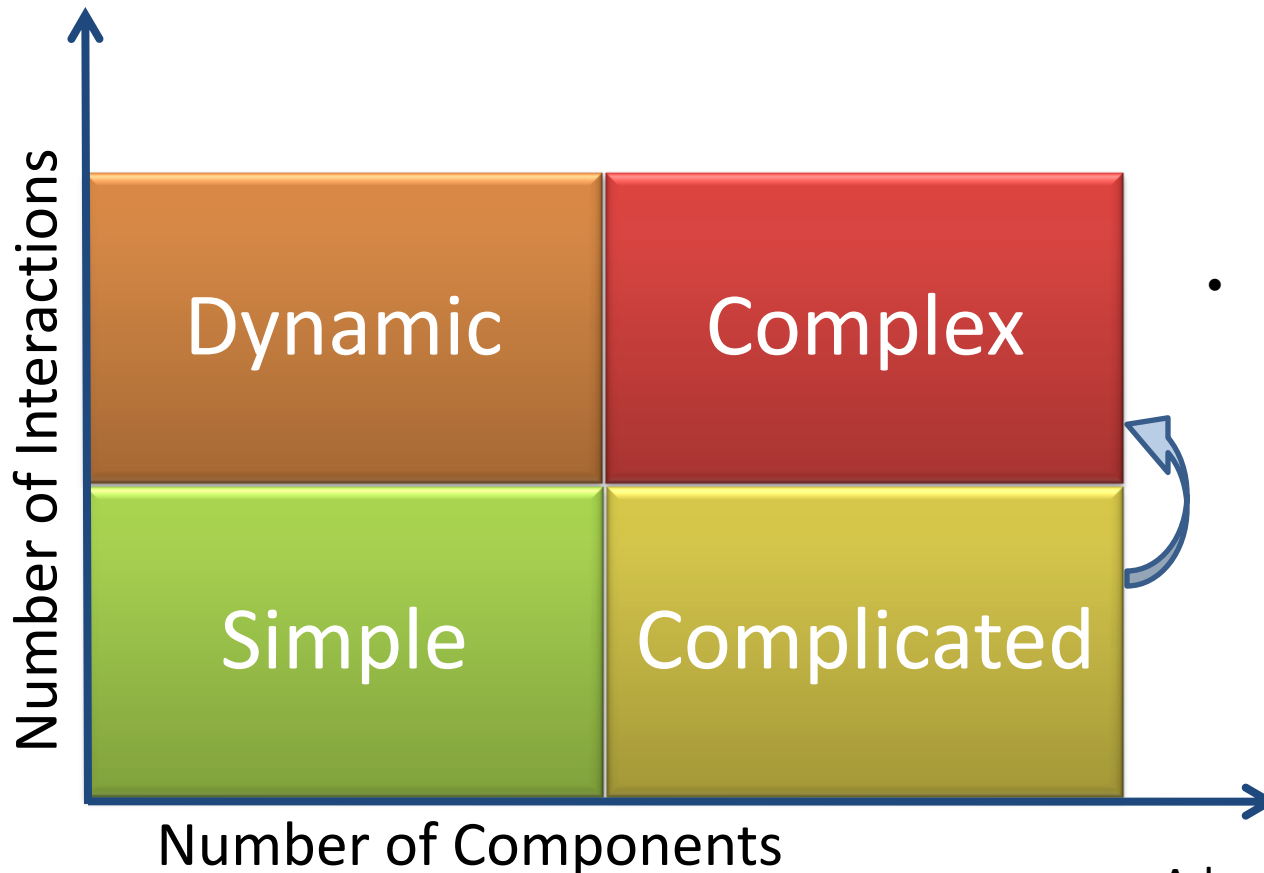
Jackson, M. 2003. Systems Thinking: Creative Holism for Managers

Complex Project Management (CPM)
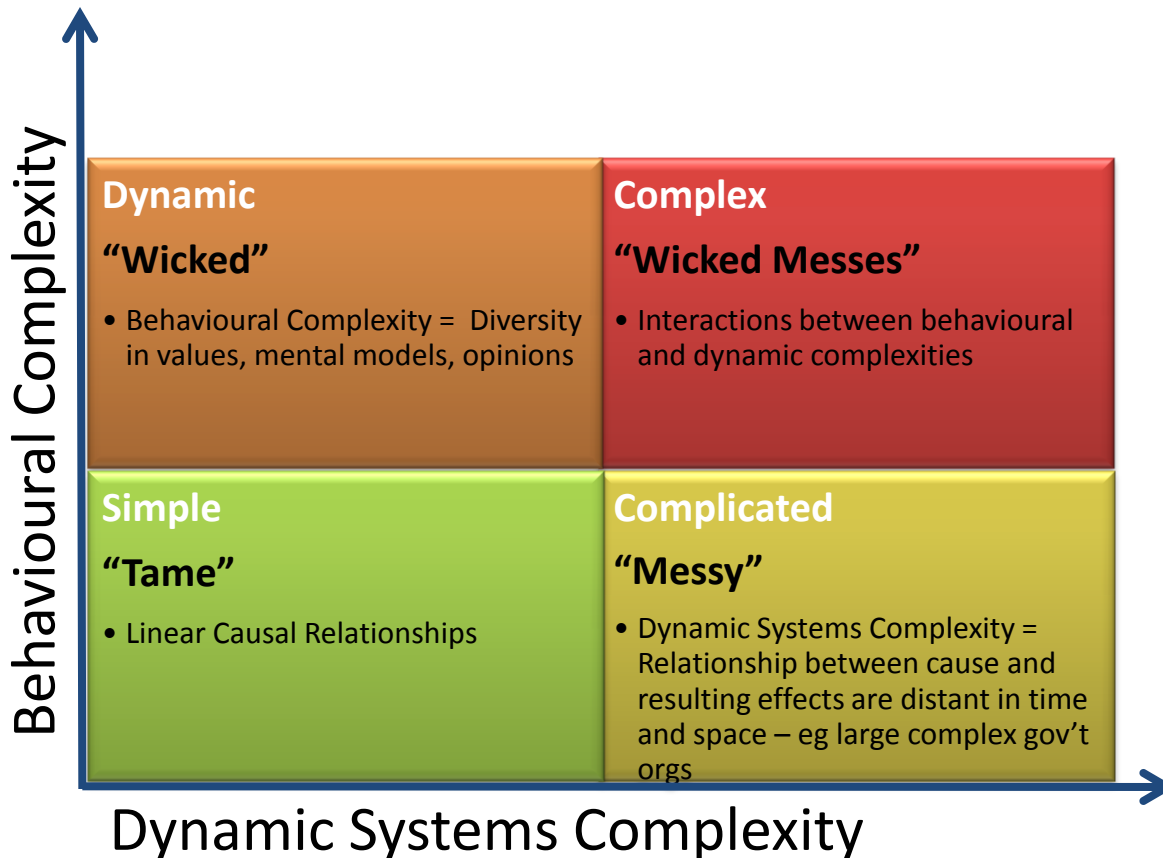
A Systems Thinking Approach

Project or System Types –'Complex'

(chart — vertical axis: Number of Interactions; horizontal axis: Number of Components)

- Dynamic
- Complex
- Simple
- Complicated

- Projects are classed dependant upon the Number of Interactions and Number of Components

- Note the difference between Complicated (eg some COTS Procurement), and Complex (eg New Design) is driven by the number of interactions or interrelations

Adapted from Sheffield, 2012

Project and System Typology

Systems-Think Terminology – "another view, another language"

Behavioural Complexity (y-axis)

Dynamic Systems Complexity (x-axis)

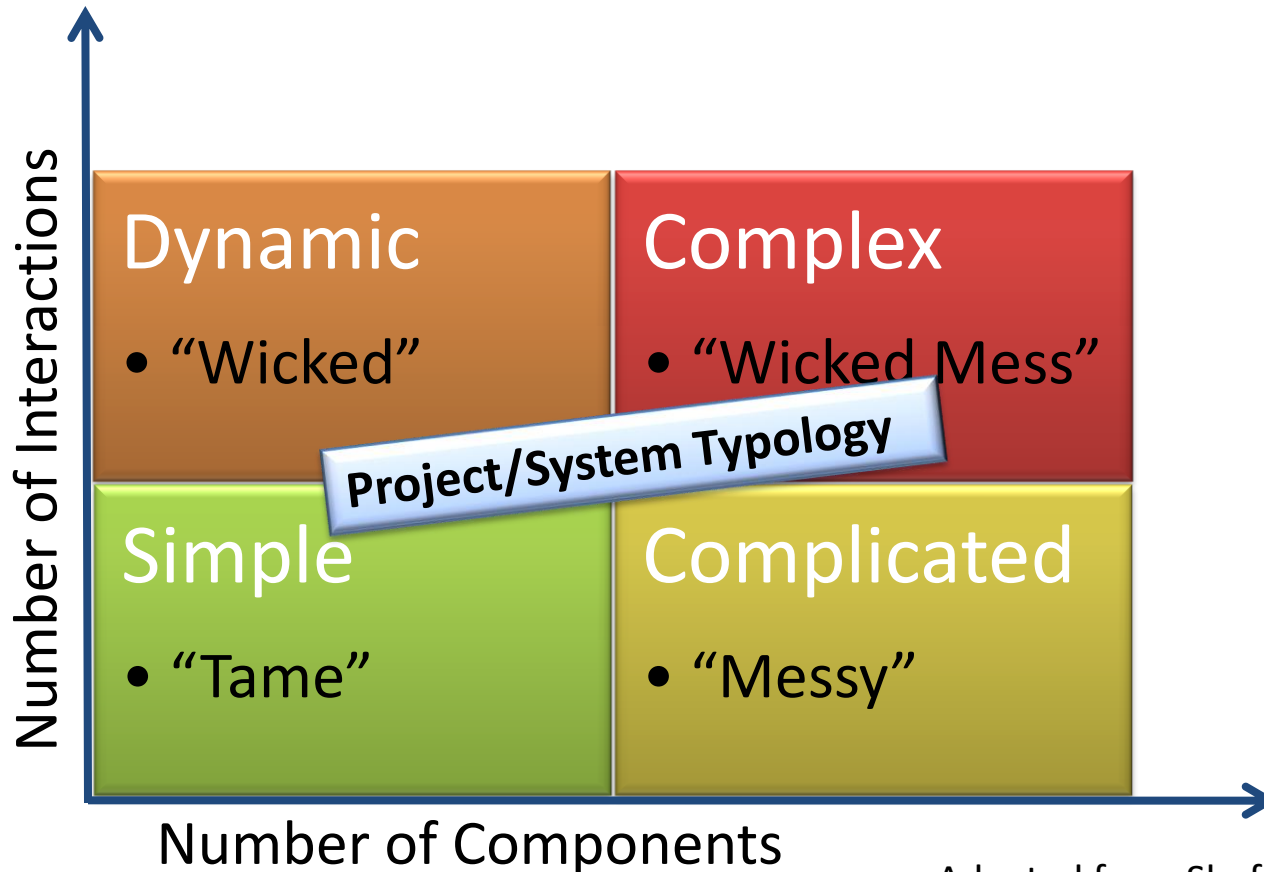| **Dynamic** "Wicked" • Behavioural Complexity = Diversity in values, mental models, opinions	**Complex** "Wicked Messes" • Interactions between behavioural and dynamic complexities
Simple "Tame" • Linear Causal Relationships	**Complicated** "Messy" • Dynamic Systems Complexity = Relationship between cause and resulting effects are distant in time and space – eg large complex gov't orgs

- Systems Thinking Approach recognises significance of Terminology

- Acknowledges diversity of Terminology can lead to multiple interpretations

- Emphasises Terminology must therefore be clearly defined !
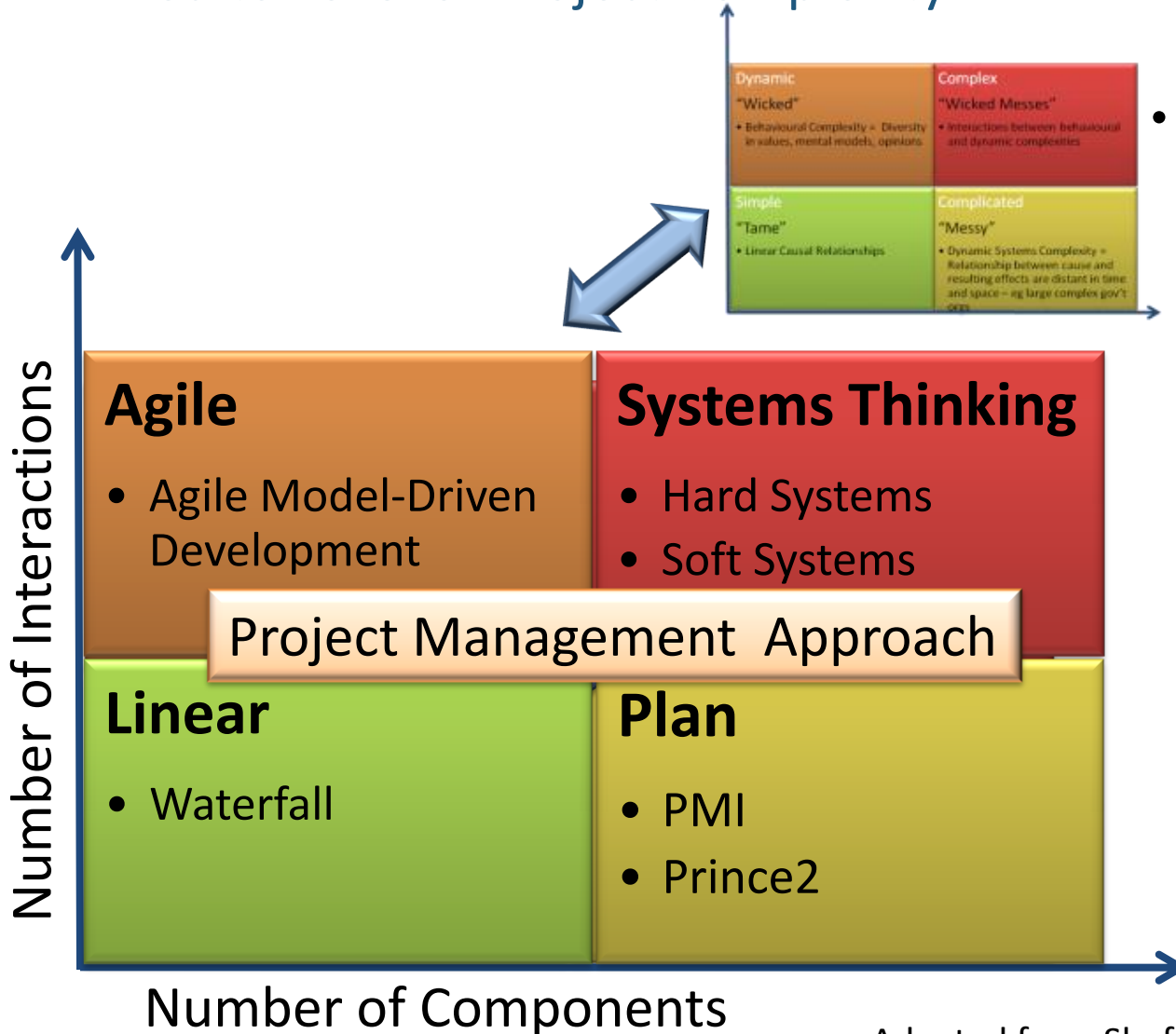
Adapted from Hancock, 2010

Project Management Approach
Linked to Level of Project Complexity

Number of Interactions

Dynamic • "Wicked"	**Complex** • "Wicked Mess"
Simple • "Tame"	**Complicated** • "Messy"

Project/System Typology

Number of Components

Adapted from Sheffield, 2012, Hancock, 2010

Project Management Approach
Linked to Level of Project Complexity

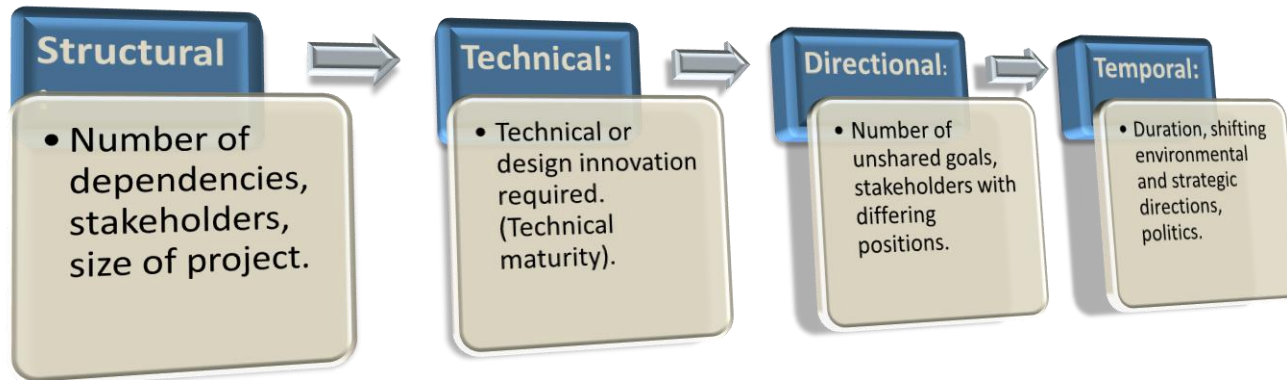- Appropriate PM approaches dependant upon Level of Project Complexity

Number of Interactions (y-axis)

Number of Components (x-axis)

Agile
- Agile Model-Driven Development

Systems Thinking
- Hard Systems
- Soft Systems

Project Management Approach

Linear
- Waterfall

Plan
- PMI
- Prince2

Adapted from Sheffield, 2012, Hancock, 2010

Complex Project Management
Complexity Mapping Tool – Making Sense of the "Messes"

- Remington and Pollack (2007) propose mapping project complexity against four dimensions of complexity, to facilitate sense-making and goal-setting

- Complexity Dimensions:

Structural
- Number of dependencies, stakeholders, size of project.

Technical:
- Technical or design innovation required. (Technical maturity).

Directional:
- Number of unshared goals, stakeholders with differing positions.

Temporal:
- Duration, shifting environmental and strategic directions, politics.
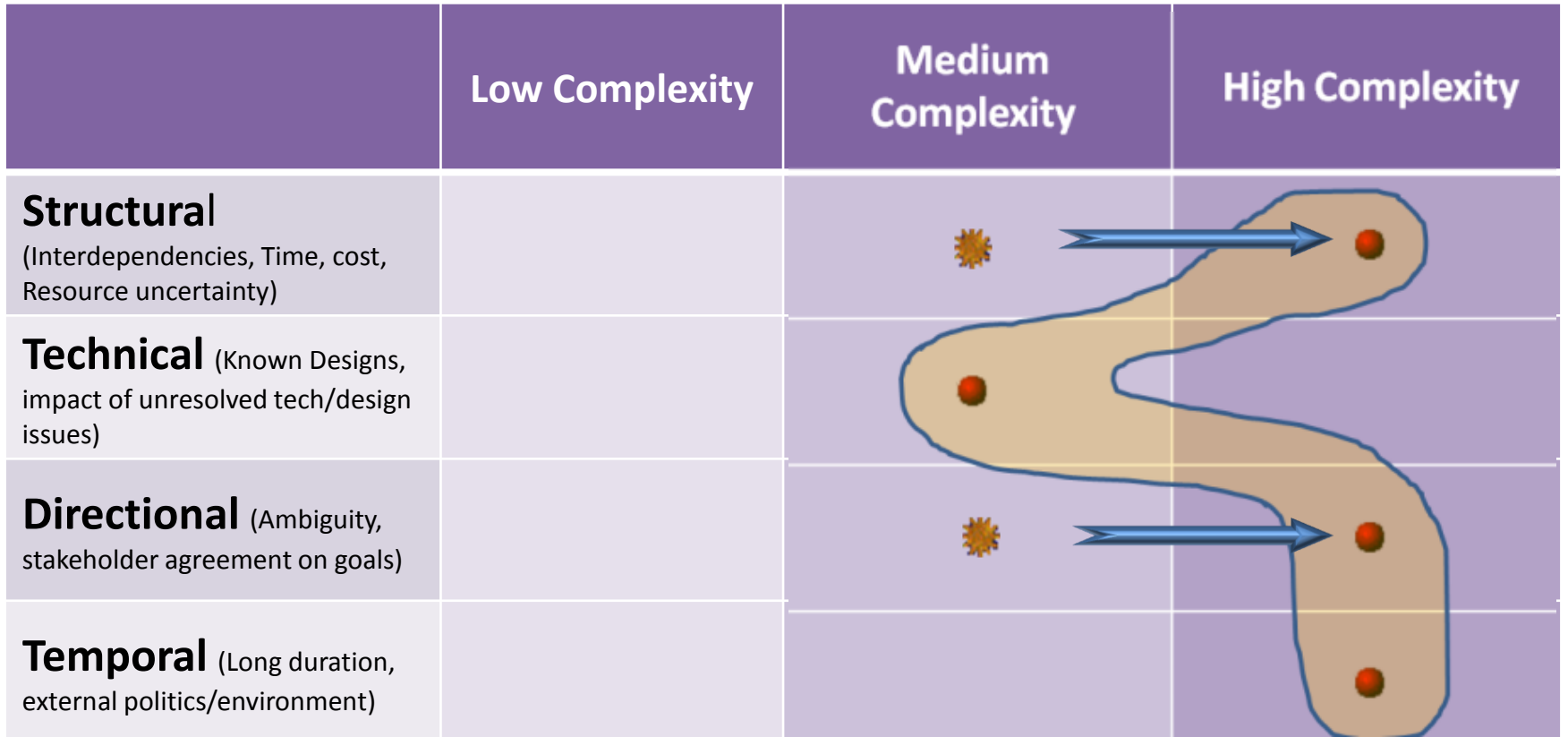
- As with the project types, there are appropriate remedies specific to the types of complexity.

  - EG: Stakeholder Mapping is an aid for dealing with Directional Complexity
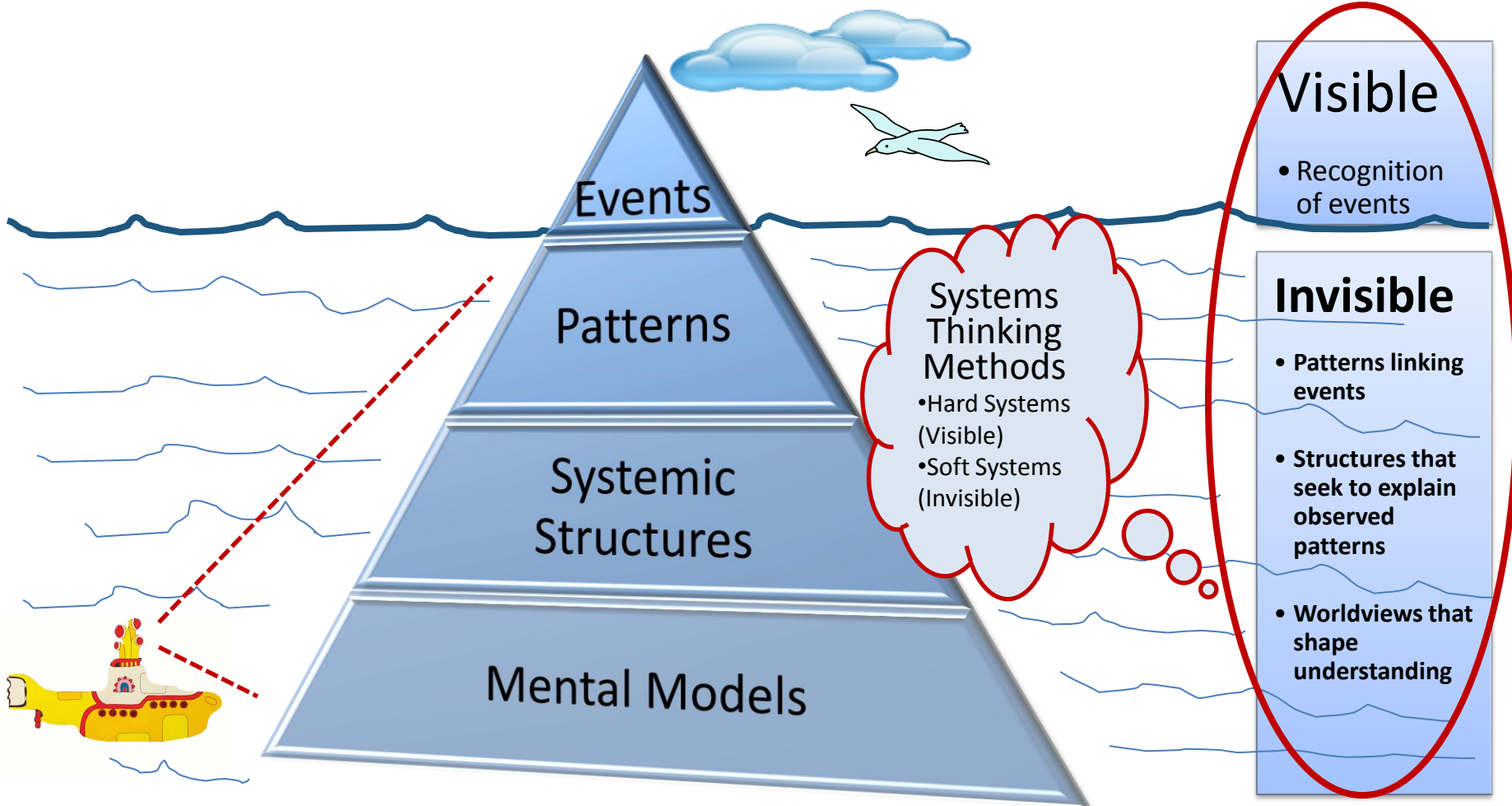
Sample CSC Complexity Map

•[Adapted from Remington and Pollack (2007)]

	Low Complexity	Medium Complexity	High Complexity
Structural (Interdependencies, Time, cost, Resource uncertainty)			
Technical (Known Designs, impact of unresolved tech/design issues)			
Directional (Ambiguity, stakeholder agreement on goals)			
Temporal (Long duration, external politics/environment)			

Low — CSC Overall Complexity — High

Systems Thinking Approach
Iceberg Analogy for Levels of Thinking

Events

Patterns

Systemic Structures

Mental Models

Systems Thinking Methods
- Hard Systems (Visible)
- Soft Systems (Invisible)

Visible
- Recognition of events

Invisible

- **Patterns linking events**

- **Structures that seek to explain observed patterns**

- **Worldviews that shape understanding**

Adapted from Sheffield, 2012

Complex Project Management

A Systems Thinking Approach – Context Matters!

- Identify the type of problem confronting you.

- Use the <u>appropriate</u> techniques to develop successful solutions.
    - Project Type, Context or Environment is paramount

- Using the wrong tools to solve the wrong type of problems will not only waste a great deal of time and resources, but lead ultimately to project failure and a lack of functionality in the final products.

- Furthermore if we are unaware of the type of problems we face, then blindly applying methods that have worked for us in the past may, in these new instances lead us to fail, sometimes with dramatic results.

- Also known as "Unintended Consequences" !

Adapted from Hancock, 2010

Complex Project Management

A Systems Thinking Approach – Context – Rich Pictures

- Evaluation and PM Approach should be matched to the nature of the situation, considering;
  - ✓ the context (environment),
  - ✓ the relevant system to be studied,
  - ✓ relations between system elements,
  - ✓ and the interactions between the actors involved.

- Draw your Project Rich Picture !

- For your Project, what is your:
  - ❑ context (environment),
  - ❑ relevant system(s) to be studied,
  - ❑ relations between system elements,
  - ❑ interactions between the actors involved?

☞ Helpful in deciding what remedies or interventions are applicable
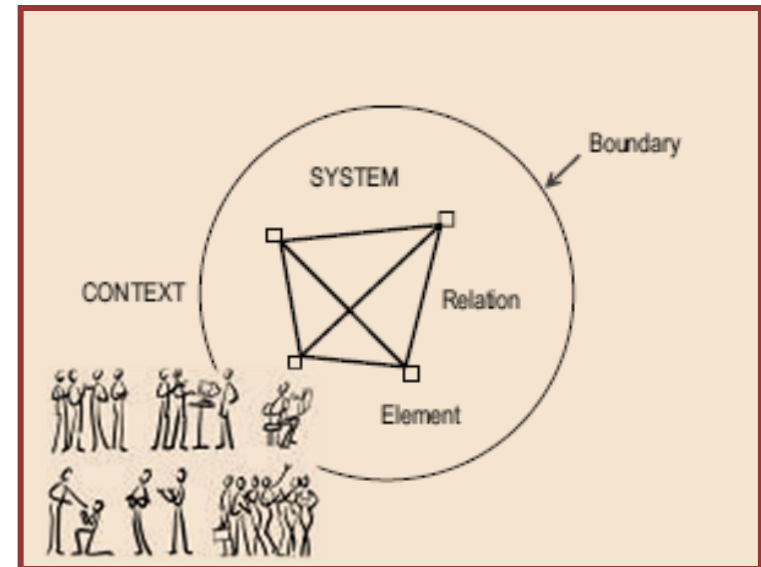
Project "Rich Picture" facilitates Context-View

Adapted from Hummelbrunner 2011, Jackson 2010
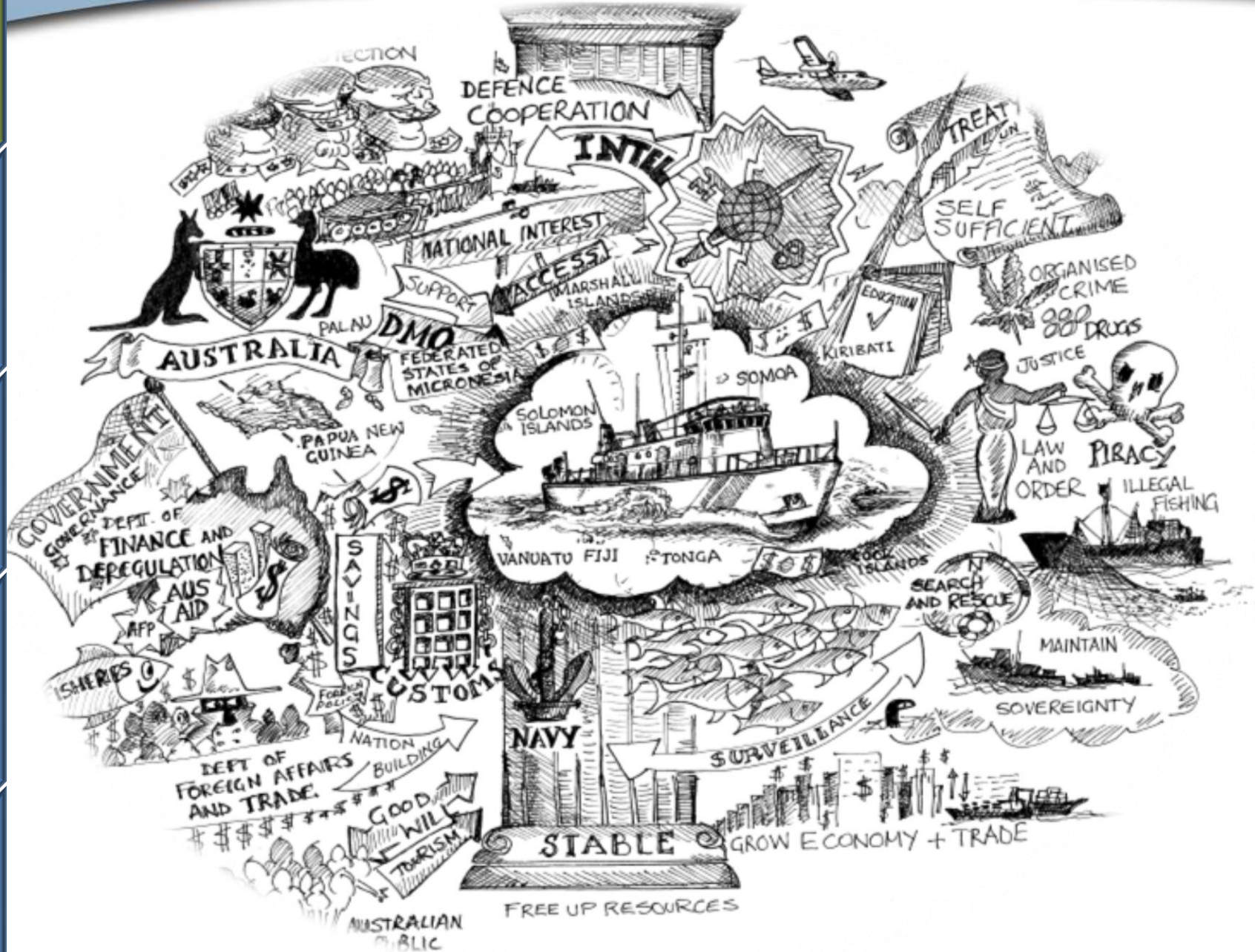
Rich Picture - Australia Pacific Patrol Boat Recapitalisation Project - 2010

Complex Project Management
A Systems Thinking Approach – Boundaries Concepts

- Interrelationships
    - Dynamic aspects, - they may change over time
    - Nonlinear – positive and negative feedback loops, scale of effect unrelated to scale of cause
    - Sensitivity to context – same intervention in a different context leads to different results
    - Entanglement, emergence, creates a "Complex Adaptive System" that is self-organising
- Perspectives
    - Systems Thinking approaches distinguish between perspectives:
        o Of Stakeholders – those that can affect or are affected by the project
        o In relation to their Stakes – individual values or motivations that may influence behaviours
    - Systems Thinking improves mutual understanding by comparing perceptions
    - Once you have understanding of other perspectives, it is almost impossible to not alter your boundary judgements (consciously, or subconsciously)
- Boundaries
    - Systems Thinking approaches try to identify main boundaries and <u>assess the consequences of the boundary choices</u>
    - Not necessarily 'holistically including all' > but more importantly surfaces what can reasonably be left out!

Adapted from Ulrich 1998, Jackson 2010

Complex Project Management

A Systems Thinking Approach – Boundary Choices > a Soft Tool

Systems Thinking approaches boundary choices considering 4 dimensions

- Considers both "is" and "ought to be" aspects
- Surfaces that the dominant (Power) usually decides the boundaries, but this is not necessarily the optimum choice
- Considers from 4 perspectives ; *client, decision-maker, expert, affected but not involved*

Systems Thinking offers a Boundary Critique tool of 4 dimensions/12 questions

- **Sources of Motivation >** Who benefits, and in what way?
    - 1. Who is (ought to be) the client of the project?
    - 2. What is (ought to be) the purpose of the project?
    - 3. What is (ought to be) the measure of success for the project?

- **Sources of Power/Control >** Who does (and does not) have what resources?
    - 4. Who is (ought to be) the decision maker enabling the project?
    - 5. What are (ought to be) the resources controlled by the decision maker?
    - 6. What are (ought to be) the external constraints for the project? (not controlled by the decision maker)

Complex Project Management

A Systems Thinking Approach – Boundary Choices > a Tool

Systems Thinking approaches boundary choices considering 4 dimensions (con't)

- **Sources of Knowledge** > What expertise is honoured or ignored?
    7. Who is (ought to be) an expert advising project management?
    8. What is (ought to be) the type of expertise used to design the project?
    9. What is (ought to be) the guarantee of success provided by the experts?

- **Sources of Legitimacy** > What makes this the right thing to do – and who decides that?
    10. Who is (ought to be) the witness to the interests of those who are affected by but not involved in the project?
    11. How are (ought to be) managed the interests of those who are affected by but not involved in the project?
    12. Whose perspective is (ought to be) dominant in the management of the project?

Adapted from Ulrich 1998, Jackson 2010

Complex Project Management

A Systems Thinking Approach – **Boundary Judgement Triangle**

- **Core Principles for Boundary Critique**
  - A problem definition or solution relies on your <u>assertion of relevance</u> of some facts
  - These facts you considered relevant depend upon <u>how we bound</u> the reference system
  - For example, change the boundary judgement, and relevant facts are likely to change as well

Boundary Judgements

'SYSTEM'

'FACTS'   *'VALUES'*

Observations   Evaluations
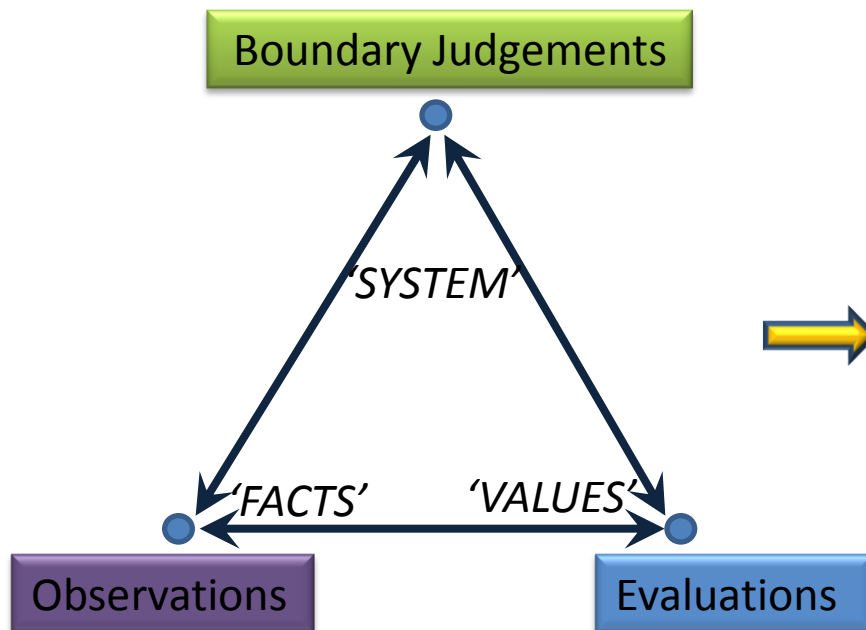
Argumentative Triangle, Adapted from Ulrich 1998

Systemic Triangulation

o What new facts become relevant if we expand/contract boundaries?

o What new facts become relevant if we modify our value judgements?

o How do our evaluations change if we consider new facts that refer to a modified boundary

o In what way may our boundaries (system) fail to address the perspectives of different stakeholders?

Complex Project Management
Complexity Symptoms – What does Complexity "Feel Like"

- ICCPM – International Centre for Complex Project Management research provides insight into ``complexity symptoms`` (*www.**iccpm**.com*)

**Indicators of Project Complexity**
- **Uncertainty**
  - Nature of Deliverables, or how to achieve objectives is no longer clear or certain > AMBIGUITY
  - Information is lacking, or inadequate
  - Details are ambiguous, unpredictable
  - Members feel unsure about their knowledge or available knowledge
- **Trust**
  - Reduced member`s confidence in themselves, or in the leadership
  - Feelings of discomfort
  - Reduced trust in themselves or leadership
  - Tendencies to blame
- **Difficulty in Linking Cause and Effect**
  - Multiple decision points necessary with multiple actors diffuse predictable linear cause and effect
  - Emergence of Non-Linearity, positive feedback loops
  - Increased `vicious cycles' of rework
- **Governance**
  - Lack of untimely, or unclear decision-making
  - Unresponsive to environmental changes
  - Organisational rules do not support Governance

Adapted from Remington, Kaye, 2011 Leading Complex Projects

Complex Project Management
A Systems Thinking Approach – Organisational Flexibility Required

Project Complexity vs Organisational Design

- DGMPD(L&S) advocates requirement for projects to be Agile, Flexible

- Geraldi defines the required flexibility to cope with complexity in terms of:

  - **What** (Scope), which implies contract flexibility

  - **How** (process and organisation), ability to change process

  - **Who** (leadership, members), ability to define/reallocate partners, tasks

  - **When** , ability to change when tasks should be realised

  - **How Much** (budget), responsibility lies with owner of the tasks (PM)

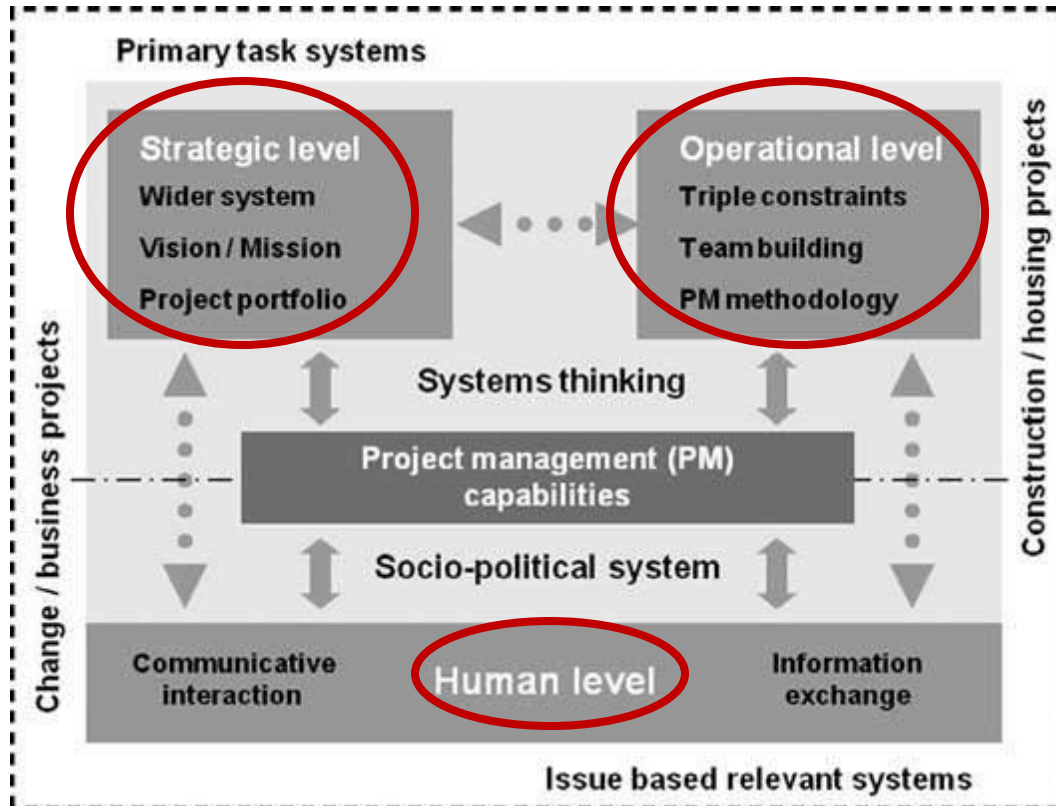 - **Where** the locus of competencies exist
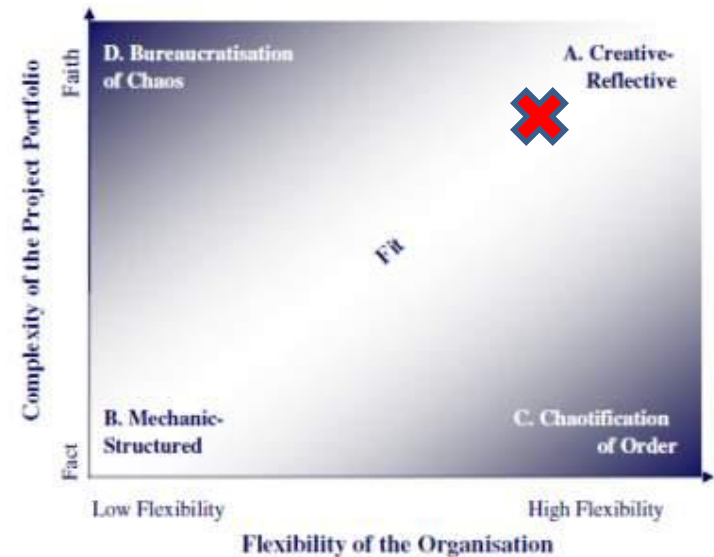
In his model High Project Complexity requires High Org Flex.

- Scope and budget variable

- Outcomes often negotiated

- Reliance on subjectivity required

- Rework and iterations

Adapted from Geraldi 2007

Complex Project Management (CPM)

A Systems Thinking Approach – PM Capabilities

Primary task systems

Strategic level
- Wider system
- Vision / Mission
- Project portfolio

Operational level
- Triple constraints
- Team building
- PM methodology

Systems thinking

Project management (PM) capabilities

Socio-political system

Communicative interaction

Human level

Information exchange

Issue based relevant systems

Change / business projects

Construction / housing projects

PM capabilities within 3 levels

A Systems-Thinking Approach acknowledges that CPM requires PM capabilities within 3 levels :

- Strategic Level
- Human Level ("Soft Systems")
- Operational Level (" Traditional Hard Systems")

Adapted from Staadt 2012

Complex Project Management
A Systems Thinking Approach – Strategic vs Operational for PMO CSC

- The different types of high complexity will require differing Project Management responses
- CSC Requires Operational Management to deliver product outcomes and Strategic Management to deliver the benefits
  - Tension between the two must be managed

	Operationally Managed Projects	Strategically Managed Projects
Basic Paradigm	Projects are a collection of activities that need to be executed on time, budget and requirements	Projects are strategic organisational processes that are initiated to achieve business goals
Focus	Efficiency	Effectiveness and efficiency
Perspective	Operational	Strategic, operational, human
Manager's Role	Getting the job done – on time, within budget, according to specifications	Getting the business results. Winning in the market place
Project Management Style	One size fits all	Adaptive approach
Project Definition	Project scope (Statement of work). What needs to be done?	Product, competitive advantage, strategy, scope
Planning	Activity, schedule, budget	End results, success dimensions, activities
Project Reviews	Progress, status, milestones, budget	Customer needs, strategy, success dimensions, status
Human Side	Teams, conflict resolution	Leadership, vision, spirit, meaning, motivation

Comparison between strategically managed and operationally managed projects (Shenhar, 2004)

Complex Project Management

A Systems Thinking Approach – Summary

An awareness of your **project complexity** can be used to shape the most appropriate PM Approach, in order to avoid the <u>unintended consequences</u>.

Tame or **Simple** Projects are not less difficult, but do follow logical paths to a conclusion, with a linear or waterfall type of PM approach.

Messes or **Complicated** projects can be addressed with PMBOK, PMI, P3M3 PM approaches, as they are characterised by distance in cause and effect relationships, but behavioral influences are low.

Wicked or **Dynamic** Projects suffer from high behavioral aspects, and resolution requires buy-in from multiple diverse stakeholders. Stakeholder engagement/analysis in the PM approach is necessary.

Wicked messes or **Complex** Projects are characterised by interactions between behavioural and dynamic complexities, creating a Complex Adaptive System (CAS). Non-linearity, emergence, and sensitivity to context warrant a Systems Thinking PM approach for successful resolution. CPMs will require PM capabilities in the Strategic, Operational, and Human Levels.

Dynamic
"Wicked"
• Behavioural Complexity = Diversity in values, mental models, opinions

Complex
"Wicked Messes"
• Interactions between behavioural and dynamic complexities

Simple
"Tame"
• Linear Causal Relationships

Complicated
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• Dynamic Systems Complexity = Relationship between cause and resulting effects are distant in time and space – eg large complex gov't

Complex Project Management
A Systems Thinking Approach – Contact info and References

- Contact Info:

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Government of Canada

- References:

  - Hancock, D. (2010) *Tame, Messy & Wicked Risk Leadership - Helping Professionals Understand the Limitations of the Present Project & Risk Management Techniques* UK: Ashgate Publishing.

  - Jackson, M.C. (2003) *Systems Thinking: Creative Holism for Managers* London: John Wiley and Sons Ltd.

  - Sheffield, J. et al (2012) "*Systems Thinking: Taming Complexity in Project Management* " On the Horizon, Vol. 20 Iss: 2 pp. 126 – 136

  - Hummelbrunner, R. (2011) " *Systems Thinking and Evaluation* " Sage Publications Vol. 17(4) pp. 395–403

  - Staadt, J., (2012),"*Redesigning a project-oriented organization in a complex system: A soft systems methodology approach*", International Journal of Managing Projects in Business, Vol. 5 Iss: 1 pp. 51 – 66

  - Geraldi, J. (2008), "*The balance between order and chaos in multi-project firms: A conceptual model*" International Journal of Project Management 26 (2008) pp. 348–356

Questions ?

Habits of a Systems Thinker
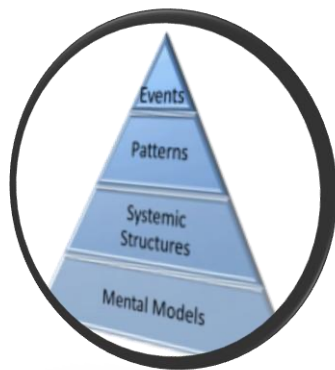
- Seeks to understand the big picture
- Observes how elements within systems change over time, generating patterns and trends
- Recognizes that a system's structure generates its behavior
- Identifies the circular nature of complex cause and effect relationships
- Changes perspectives to increase understanding
- Surfaces and tests assumptions
- Considers an issue fully and resists the urge to come to a quick conclusion
- Considers how mental models affect current reality and the future
- Uses understanding of system structure to identify possible leverage actions
- Considers both short and long-term consequences of actions
- Finds where unintended consequences emerge
- Recognizes the impact of time delays when exploring cause and effect relationships
- Checks results and changes actions if needed: "successive approximation"

Events
Patterns
Systemic Structures
Mental Models