Action Learning:
Power and control in real-world hyper-complex situations

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Action Learning

The primary purpose of Action Learning is to better ***influence the future***

The ability to ***predict consequences*** is essential and central to Action Learning and Action Research

'Experience' - 'Making a ***test*** of situations perceived through senses, a trial proof or knowledge gained from repeated trials' (from *expiriri* meaning 'to try or test')

*'Action learning is using **experiences** to **mentally** predict consequences' to better influence the future*

Two Feedback Loop Limitation Axiom

1. **Individuals cannot mentally predict the outcomes of situations whose behaviour is driven by two or more feedback loops**
2. There is a widely-held individual delusion that individuals can predict behaviours and outcomes of situations with behaviours shaped by two or more feedback loops

The Two Feedback Loop Limitation axiom was identified by Dr Terence Love in 1994.

Three bounds on the scope of Action Learning

Two Feedback Loop Limitation Axiom

'Humans cannot predict complex situations whose behaviour is shaped by two or more feedback loops' (this applies as much to groups as individuals)

Hyper-complex Situations

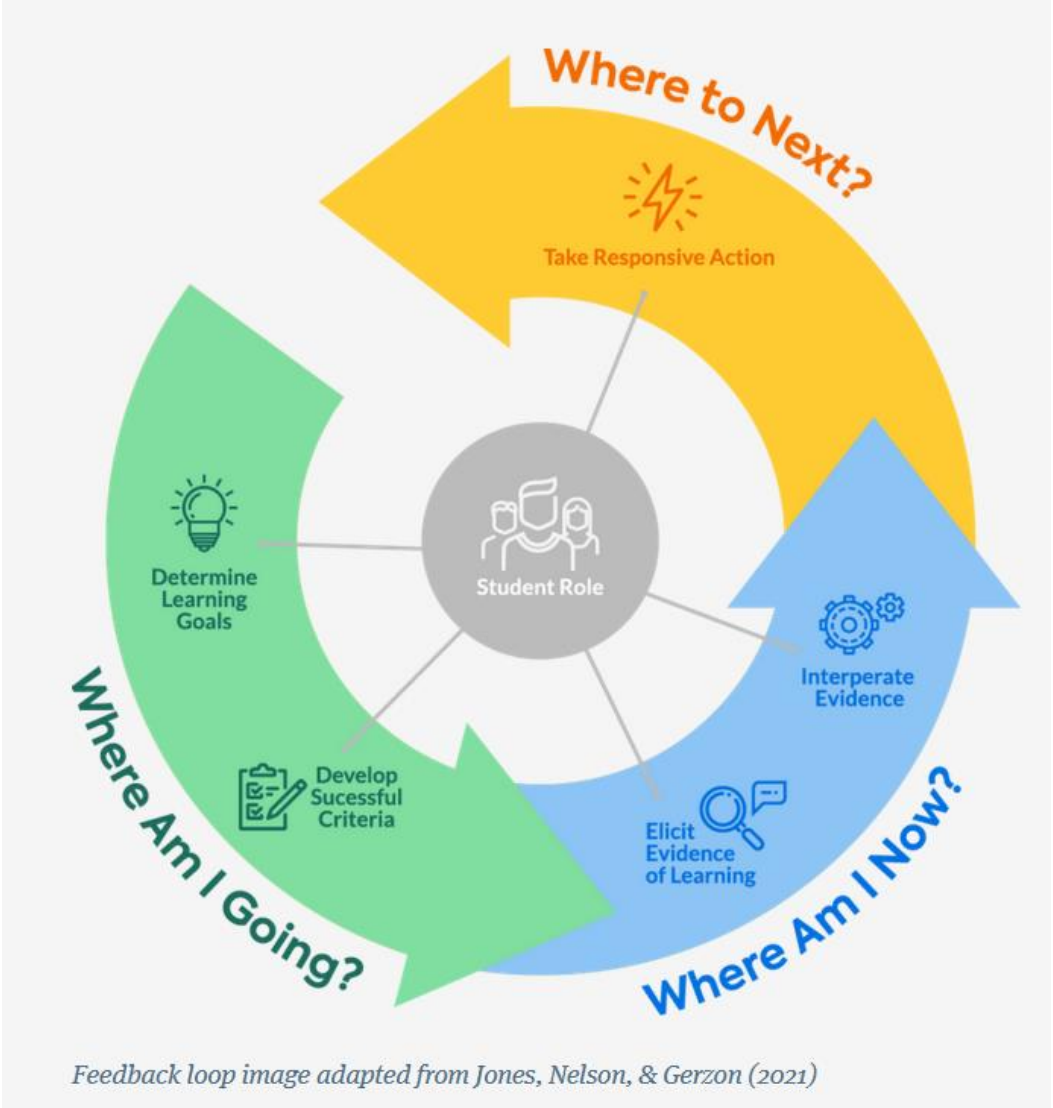
Action Learning and Systems Thinking approaches are ineffective for situations that do not conform to the assumptions of systems analysis.

Causal Analysis

Action Learning and Systems Thinking fundamentally depend on analysis of causes and their effects.

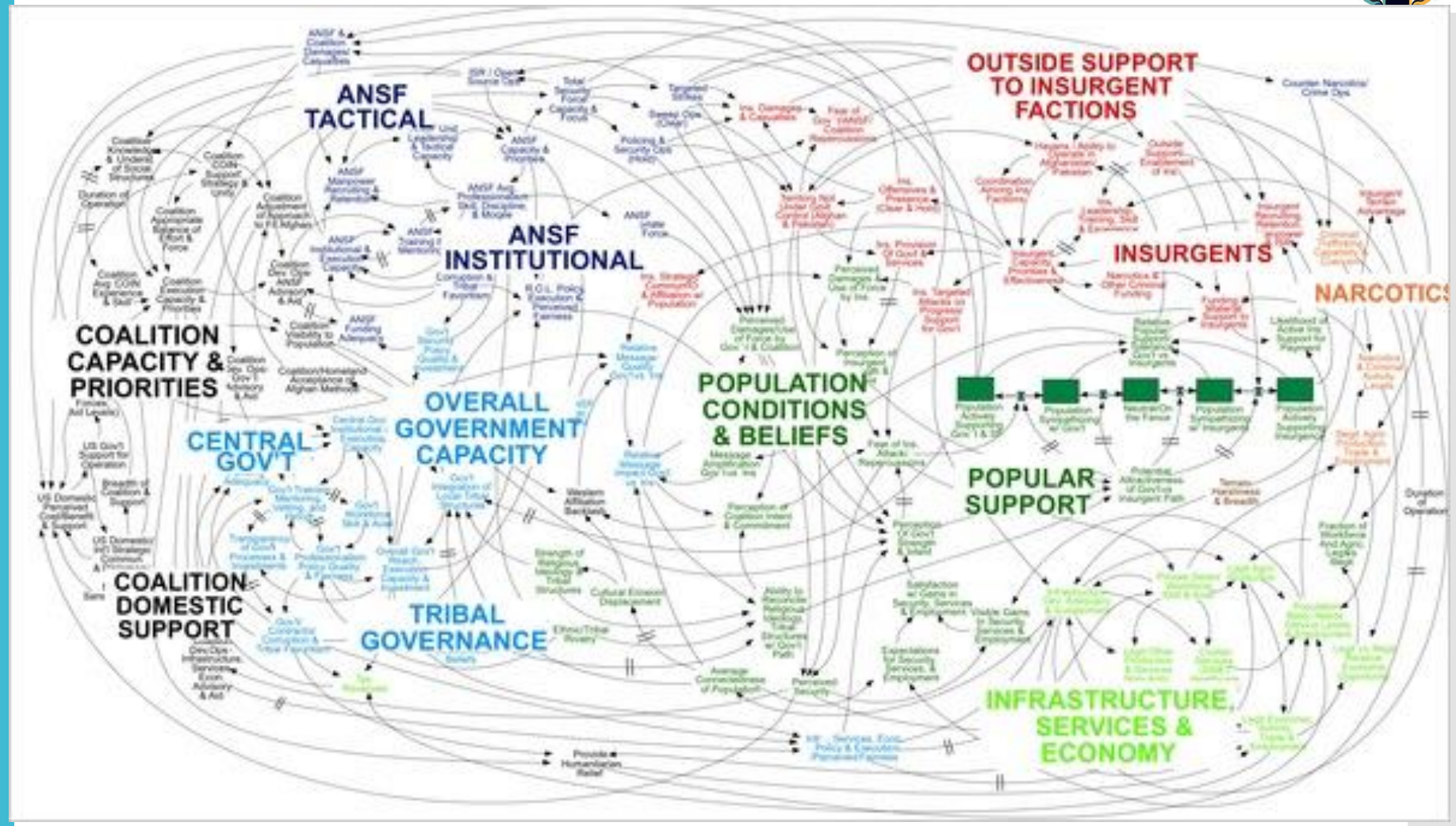
The challenge for addressing the limitations of Action Learning and Systems Thinking is to develop methods that are not focused on causes and effects.

Single Feedback Loop



Feedback loop image adapted from Jones, Nelson, & Gerzon (2021)

Typical real world power and control context



US Action Learning model of war in Afghanistan

Outside conventional Action Learning and Systems Thinking

- Large numbers of feedback loops
- Coercive with multiple changing dynamics of power and control
- Asymmetric power where managers/controllers have less power
- Unresolvable conflicts between multiple key stakeholders
- Systems with discontinuous behaviours
- Systems that do not comply with the system structure assumptions

Hyper-complex situations

- System behaviours, purpose, ownerships, subsystems, subsystem relationships and control mechanisms vary continuously.
- System boundary is dynamic, does not separate system elements of interest from environment is not always owned and controlled by the system owner
- Sub-systems are not static in ownership, purpose, roles or relationships
- Control is dynamic and exerted by a variety of changing subsystems and factors some of which are outside the system
- Multiple feedback loops exist changing in structure, dynamics, purposes, existence and ownership
- Coercive situations involving multiple asymmetric power relations unaligned to subsystems
- Control and system behaviours operate outside of the variables being addressed
- Parts of system and environment are chaotic

Examples of coercive hyper-complex systems

- US –Afghanistan and similar wars
- Epidemics with associated disasters and social breakdowns
- Middle East (Saudi, Iran, Israel, Lebanon, Palestine, US, Russia)
- Climate change control and politics
- Local government
- Health systems in impoverished countries with low levels of governance or conflicted governance
- Managing malnutrition
- Sectarianism in India
- Large-scale international business competition
- Improving the government of countries captured by criminal cartels or industry lobbies
- Any system with large number of feedback loops in which the systems structure and ownerships of system elements changes
- International political tension between elites (wars by any means)
- National systems subject to hidden control via psyops or similar

System categories

System Category	Number of variables	Number of relationships	Number of feedback loops	Structure
SIMPLE	Low	Low	Maximum 1	Fits system conventions
COMPLICATED	High	High	Maximum 1	Fits system conventions
COMPLEX	Any	Any	2 or more	Fits system conventions
HYPER-COMPLEX	Any	Any	2 or more	Does not fit system conventions
CHAOTIC	Any	Any	2 or more	Not mathematically determinate

Variety Dynamics

Variety Dynamics is a new field developed to:

- **Support the aims of Action Learning and Systems Thinking to better influence outcomes, whilst,**
- **Going beyond the fundamental limitations of Action Learning and Systems Thinking methods in addressing complex and hyper-complex situations**

Creation of Variety Dynamics

Dr Terence Love

Dr Trudi Cooper

Variety Dynamics developed by Profs Terence Love and Trudi Cooper starting around 1972 and includes:

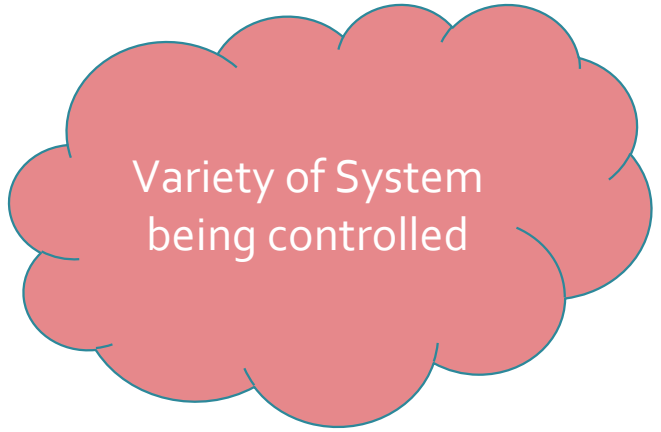
- **Concepts** (systemic and mathematical)
- **Axioms** describing patterns of control influence and outcomes (currently 47 to date)
- **Practical strategies** for achieving control in hyper-complex coercive situations
- **New mathematical field** interacting with set theory, function analysis, combinatorics, topology of variable spaces, and hyper-complex vectors etc.

Variety Dynamics

- **Variety** is the number of **options** possible of any aspect of a situation
- **Variety Dynamics** focuses on **distributions**, **dynamics**, **ownership** and **control** of the **dynamics** of **varieties (options) by different elements of** hyper-complex systems
- It does **NOT** address ***causal*** relations between elements

Ashby's Law of Requisite Variety

For control must be LARGER THAN ->



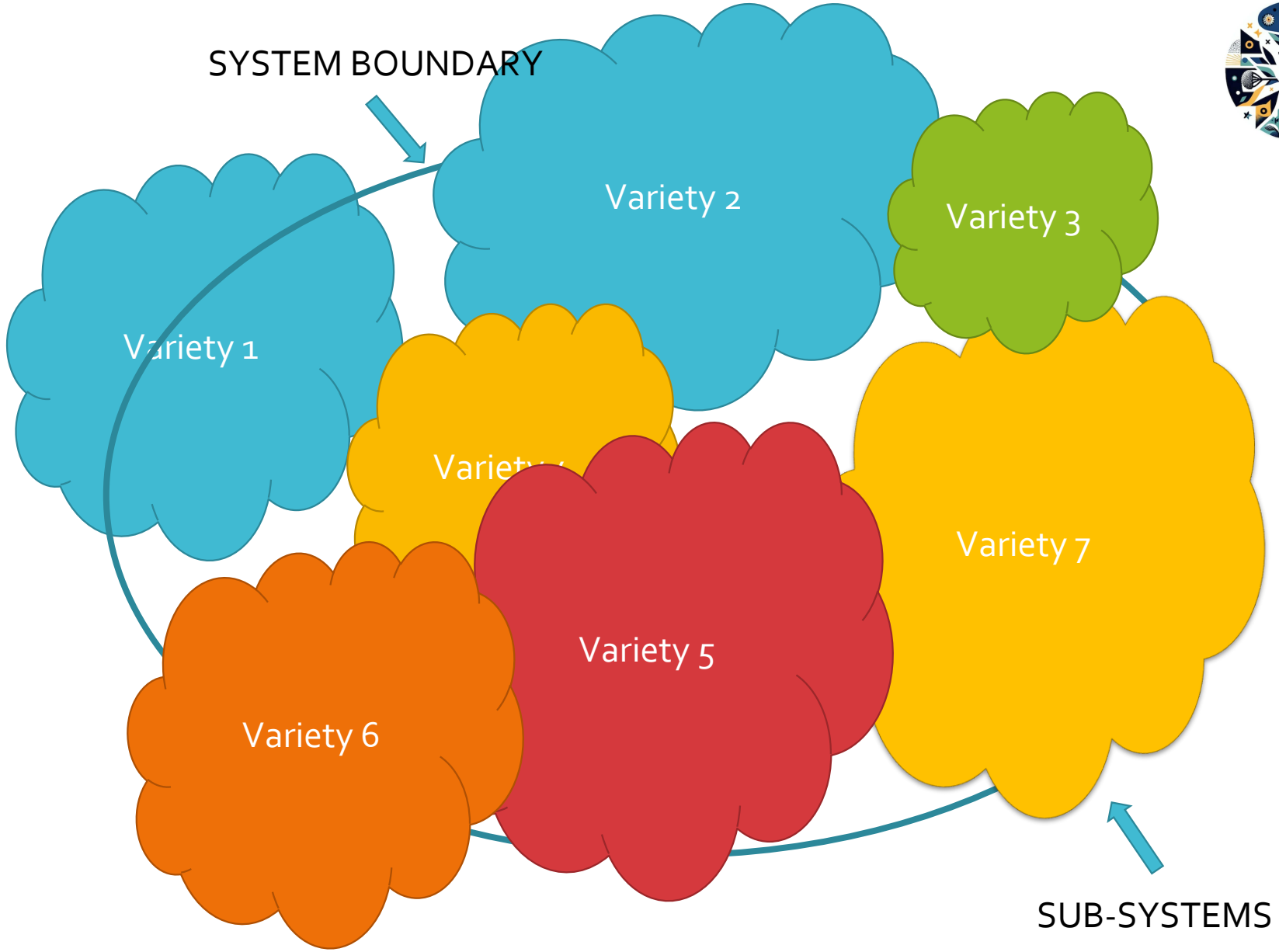
Variety Dynamics originated over 20 years ago as an extension to Ashby's Law based on work in AI , design optimization and political analysis undertaken by the authors in the 1970s and 1980s.

The variety available to the controller to control the system must be larger than the variety able to be generated by the system.

Example: Variety in simple power and control context - school

Variety available to teacher must be greater than that generated by pupils

Real situations with dynamic variety distributions



- Distributions of variety and control and ownership are changing continuously in highly interrelated ways

Variety Dynamics Axiom 1

Variety Dynamics Axiom 1

For complex and hyper-complex systems involving multiple constituencies in which the distributions of variety generation and control variety is uneven across the system at any one time,

THEN

The differing distributions and dynamics of generated and controlling variety result in a structural basis for differing amounts of power and hegemonic control over the structure, evolution and distribution of benefits and costs of the system by different constituencies.

This extends 'Ashby's Law of Requisite Variety' (Ashby, 1956; Conant & Ashby, 1970) into the larger realm of power and control and at the same time provides a broader mathematical foundation.

Axiom 1 Example strategy

Variety is more important than power

Change variety distribution and variety dynamics to change ownership of power and change outcomes

Practical example of use of Axiom 1:

Activists vs motor industry

1. Activists asked motor industry to implement strict emission control standard - motor industry refused
2. Activists persuades different states to implement **different** emission control standards (i.e. increased the variety to be addressed beyond motor industry's ability to control)
3. Offered to resolve via a single national emission standard
4. Motor industry agrees new national emission standard

Management of changes of variety resulted in power transfer TO the activists FROM the motor industry – without use of force or power

The power of Variety Dynamics methods

Changing variety is more effective than using force or authority

Variety Dynamics comprises :

- 47 axioms to guide management of variety to influence trajectory of power in different situations
- A new field of mathematics
- A strong link to ethology
- A new approach to AI
- A suite of methods to address difficult issues across multiple disciplines particularly in Humanities and Arts
- A new suite of design methods for addressing problems previously viewed as 'wicked problems'

The Two Feedback Loop Limitation ensures that most Variety Dynamics strategies are effectively hidden from view.

Variety Dynamics and Time axiom

Introduction of variety that results in changes to the time dynamic of availability of variety results in changes to the locus of power and the distribution of benefits and costs of the system by, and to, different constituencies.

Example of variety and time equivalence in power

Immediately following a Special Forces action, terrorists released a video indicating its members had been executed while at prayer.

This increase in variety resulted in a grounding of Special Forces for 30 days while it was investigated

Increase in variety via information warfare resulted in a significant temporary shift in the trajectory of power

Image: specna-arms-kVVKHGNgsAw-unsplash.jpg

Variety Dynamics and Action Learning

- Variety Dynamics enables Action Learning to go beyond its current limitations.
- Variety Dynamics axioms provide the basis for new and additional Action Learning methods, theories and practice pathways.
- Politically and economically, Variety Dynamics offers a pathway to changing the current power relations in education
- Technically, Variety Dynamics opens paths to improved new education modalities that better utilise emerging technology practices in education.

Variety Dynamics

Axiom 10

Control via feedback loops in dynamic variety generation

In complex and hyper-complex systems in which multiple and variable sources of variety generation and variety control interact, and in which control varieties are generated dynamically to respond to changes in system varieties

THEN

Relative control of the feedback loops driving control varieties shapes the future distribution of power and hegemonic control between sub-systems and constituencies together with the structure, evolution and distribution of benefits and costs of the system.

Axiom 10 Example strategy

Obtain ownership of the feedback loops that influence variety

Influence agendas, meeting minutes, reports, evaluations, planning policies

Example Axiom 10:

Influence feedback loops policy, agenda, minutes, strategy….

Variety Dynamics

Axiom 32

Agency issues

Power flows between HQs and peripheral organisations from variety management

When an organisation has a powerful HQ and less powerful regional or similar organisations then HQ typically supplements its own power and controls them by:

- Ensuring HQ management has more control variety than the variety available to be generated by peripheral organisations
- HQ attenuates variety possible to be generated by peripheral organisations

If a peripheral organisation generates variety at a rate (variety changes/time) faster than HQ can cope, then

Power flows to peripheral organisation from HQ, and HQ must bear transaction costs and operational costs to increase its variety to address shortfall.

If peripheral organisation increase variety to only just exceed HQ abilities, then transaction cost limitations can ensure HQ does not develop sufficient responses by increasing its own control variety. The result will be ongoing transfer of power from HQ to the periphery.

However, if the value to HQ of the rate of change of variety by the peripheral part of the organisation exceeds the transaction costs of HQ to increases its control variety, then HQ can either increase its control variety or use its variety and power to attenuate and limit the variety generation of the peripheral organisation(s) by repressive action

Axiom 32

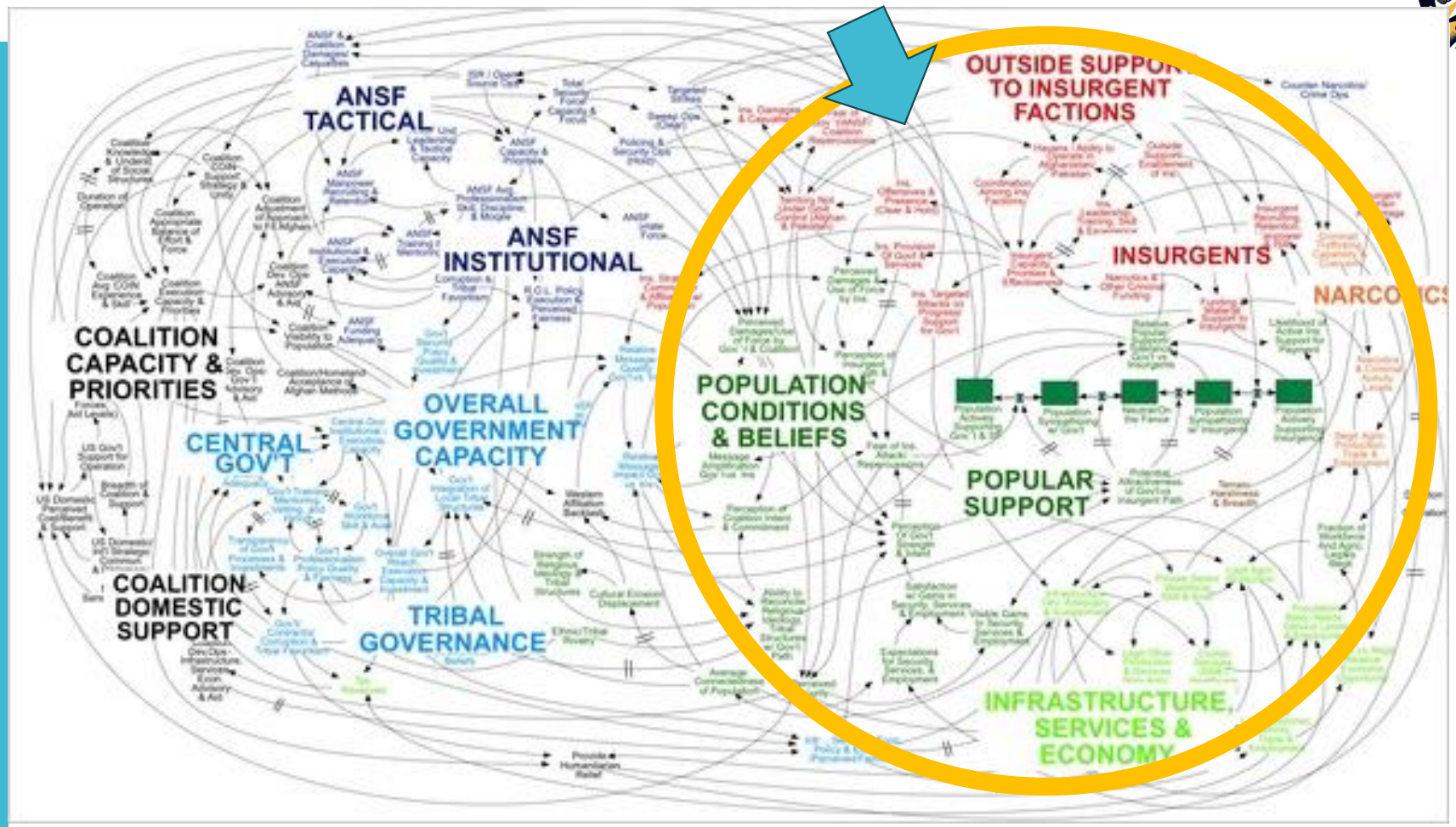
Example strategy

Peripheral organisations can increase the variety that HQ has to provide control for.

This is an internal war for control between departments and HQ with departments wanting autonomy and HQ wanting control over them

Variety analysis of Afghanistan and US=

Insurgent variety



Insurgent variety potentially larger than US military variety hence US would be expected to lose ownership of control – regardless of availability of force (Variety and its distribution and dynamics is more important than force)

Contact details

For more information, for commercial consultancy and advice on specific issues, and for offers to fund/collaborate in research, contact:

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Mathematics of variety 'spaces'

- Mathematically, a **space** consists of selected **objects** (of any sort or type) that are treated as points and vectors along with selected **relationships** between these points.
- The objects can be of many types including:
  - **Characteristics**
  - **Functions**
  - **Restraints (boundaries)**
  - **Classification systems**
  - **Other spaces**
- 'Spaces' can be considered as:
  - **Geometric** spaces (with ***m*** dimensions)
  - **Algebraic** spaces (of order ***m)***
  - **Communication** languages of order ***m***
  - **Feedback loop systems** of abstraction ***m+n***
  - **Hyper-complex vectors**

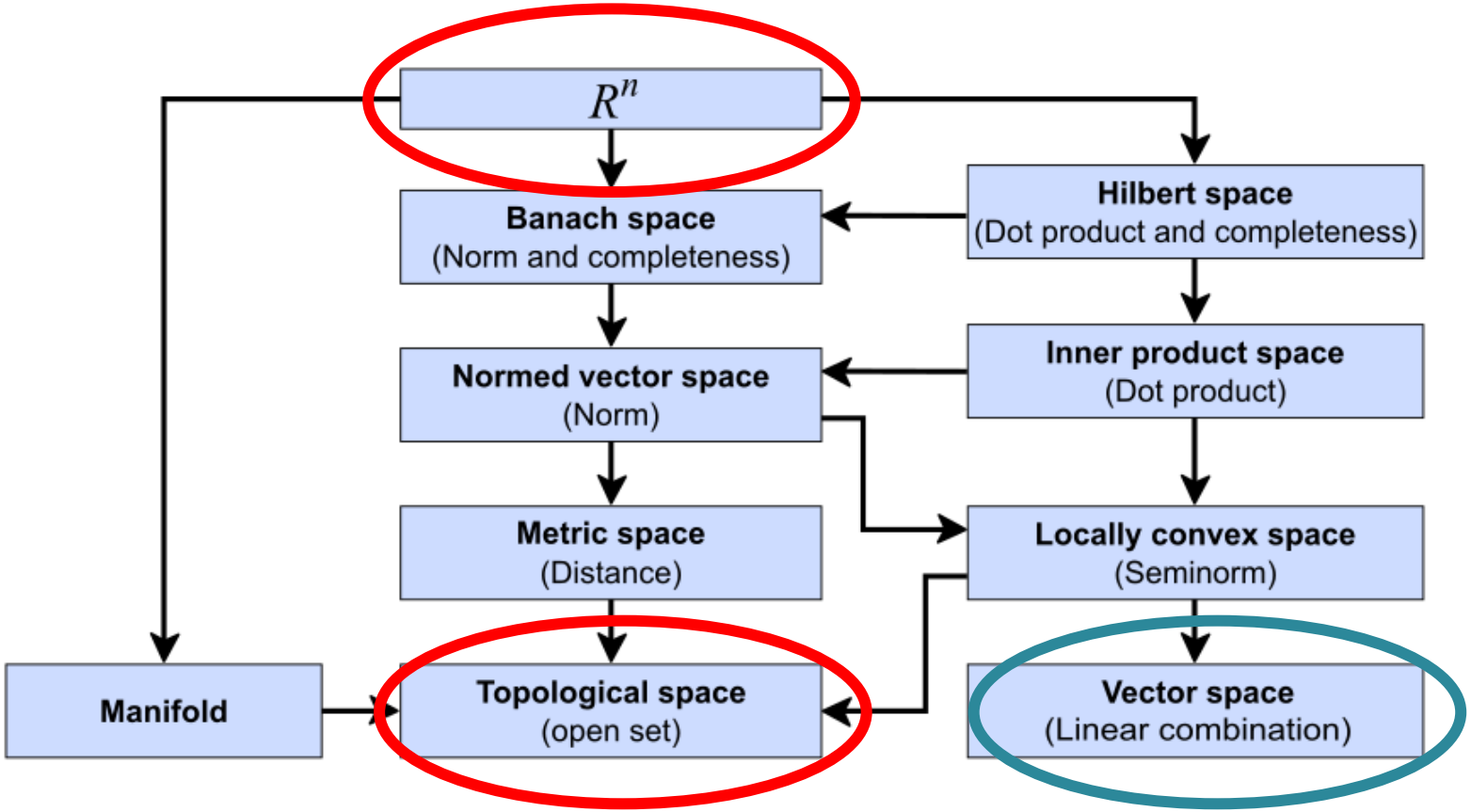
Variety Dynamics and Hyper-complex vectors

Hyper-complex vectors first used as part of Variety Dynamics in 1972

Advantages of hyper-complex vectors include:

- Can be combined via dot product
- Provide an alternative to neural net AI / data mining/machine learning
- Can be decomposed and hence reveal reasoning (unlike AI etc.)
- Use around 1/25 of the energy needed compared to AI/machine learning and less computer power
- Are around 25 times faster than conventional AI

Variety Dynamics in different abstractions of mathematical variety spaces



- Conventional **systems modelling** operates in ***causal* vector space**
- **Variety space** is at the boundaries of R^n where ***n*** is a function of the **maximum variety of any one variety sub-space** and the **variety of subspaces** themselves – or as combinations of different R^n
- **Variety space** can be envisaged as **topological space** of order ***n***.
- **Variety spaces** can also include **probability spaces**