Complex System Governance: What it is and What it Offers for Improving Project Performance

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May 2, 2017

OLD DOMINION UNIVERSITY

IDEA FUSION

Scholarship – Research – Relationships – Practice

EMSE

Engineering Management and Systems Engineering

NCSOSE

National Centers for System of Systems Engineering

Old Dominion University

ODU
IDEA FUSION

NCSOSE
National Centers for System of Systems Engineering

Located in Norfolk, Virginia, USA

- **Established 1930, 26,000+ students from 106 countries, 795 Full-time faculty**
- **Degree Programs: 70 undergraduate, 54 Masters, 42 doctoral**
- **Graduates: 124,000+ from 77 different countries**
- **Home to the National Centers for System of Systems Engineering (NCSOSE)** – *focused on system science based engineering of technologies to improve complex system performance*

Topics

01 **Complex System Problem Domain – THE MESS**

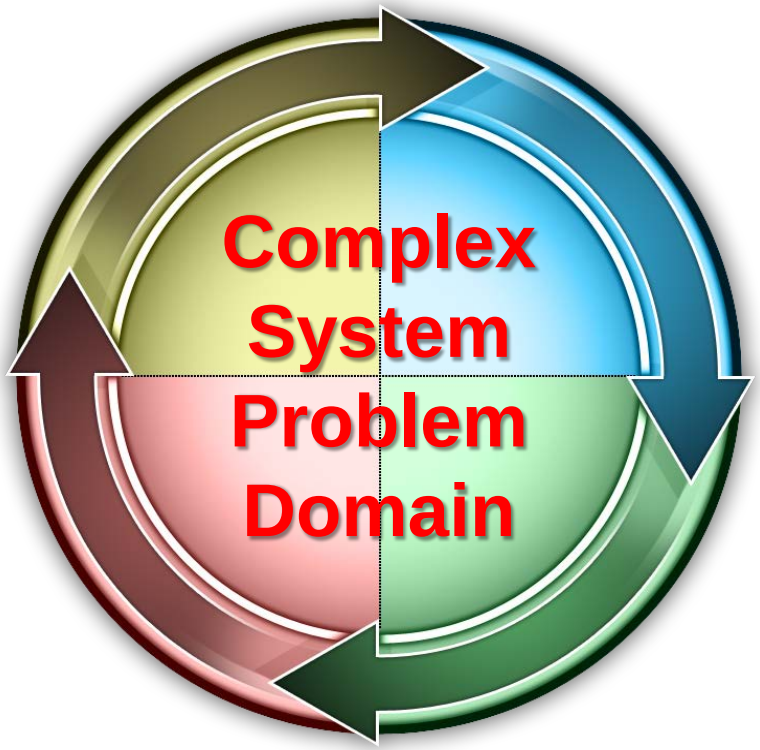
02 **Intro to Complex System Governance – ‘A’ PATH FORWARD**

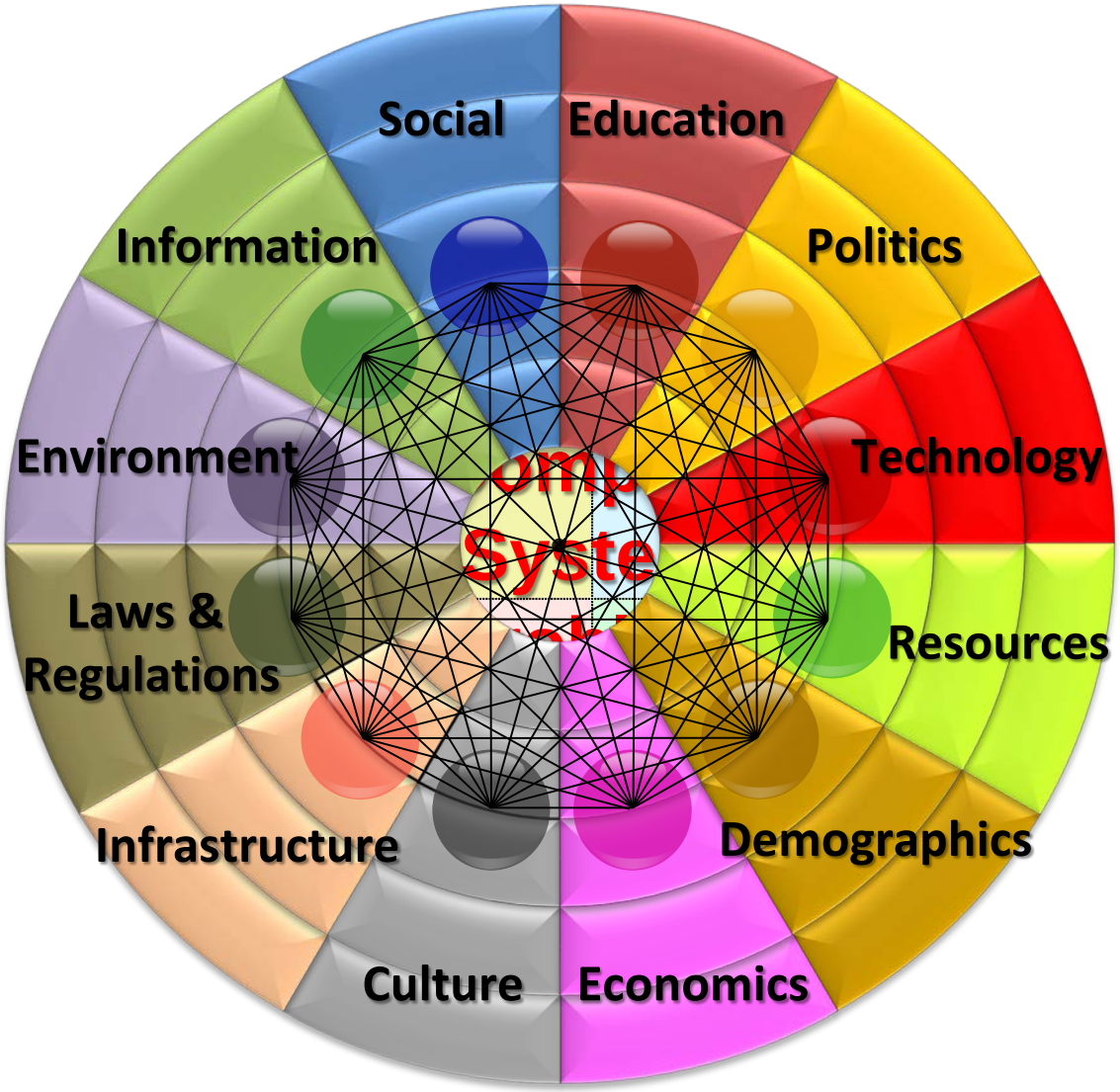
03 **CSG Application Scenarios for Improving Practice - HOW**

04 **Three Recommendations for Practitioners - POSSIBILITIES**

Complex System Problem Domain

Landscape of the modern project management practitioner


Complex
System
Problem
Domain


Social
Education
Information
Politics
Environment
Technology
Laws &
Regulations
Resources
Infrastructure
Demographics
Culture
Economics

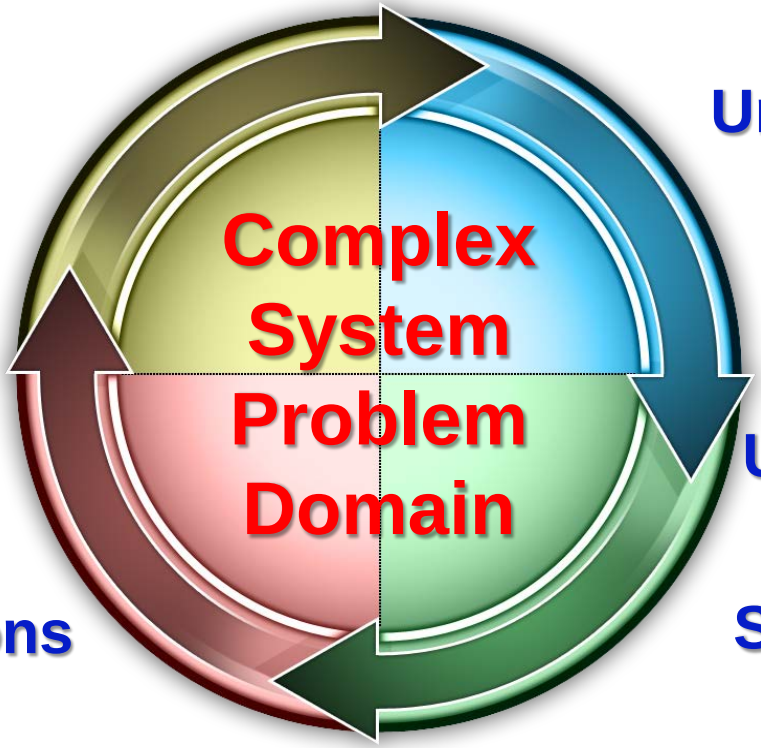
Conflicting Perspectives

Divergent Stakeholders

Lack Sufficient Information

Instabilities

Unstable Resources



Shifting Demands

High Uncertainty

Politically Charged

Unclear Entry Point

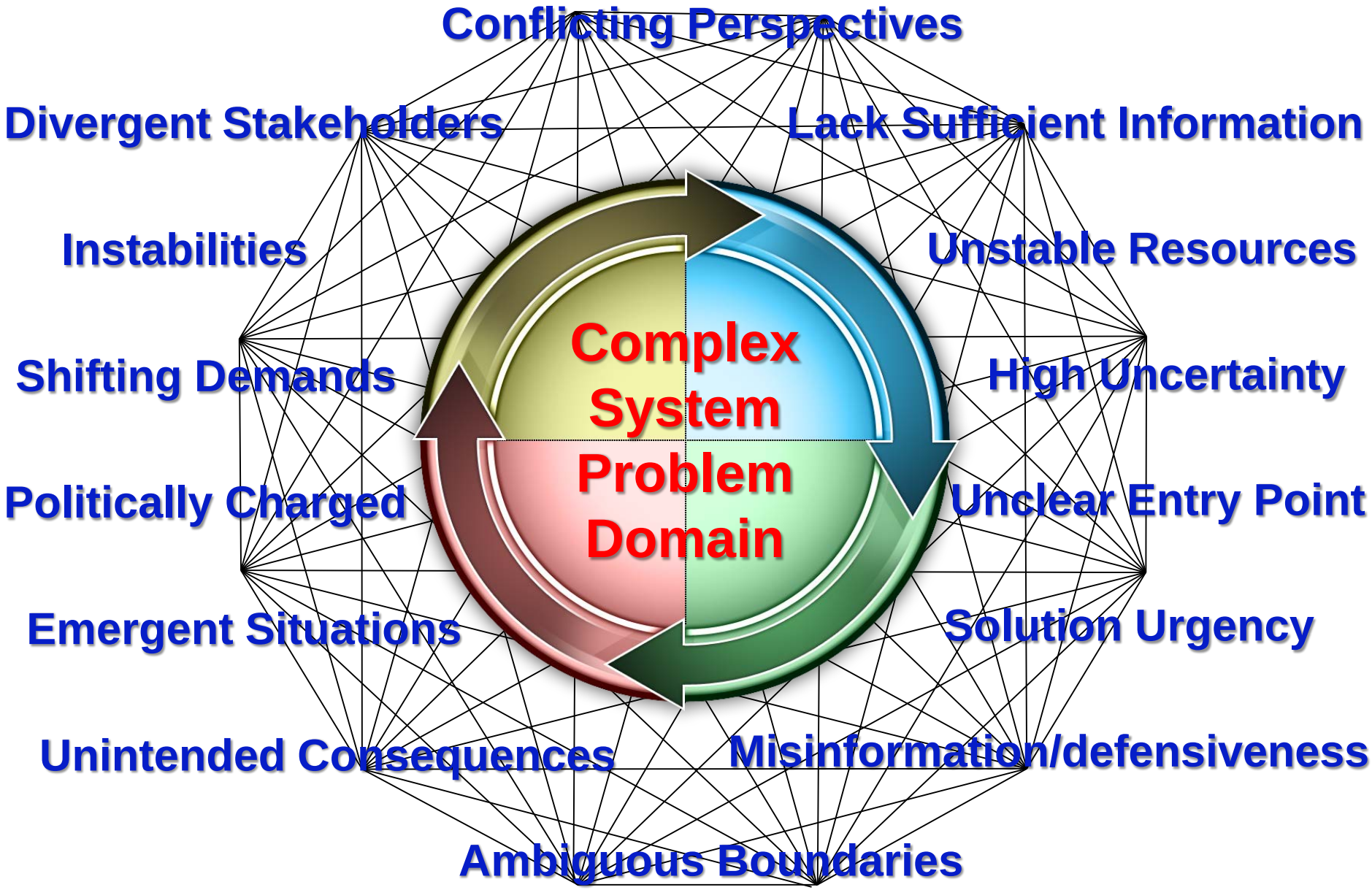
Emergent Situations

Solution Urgency

Unintended Consequences

Misinformation/defensiveness

Ambiguous Boundaries


Conflicting Perspectives
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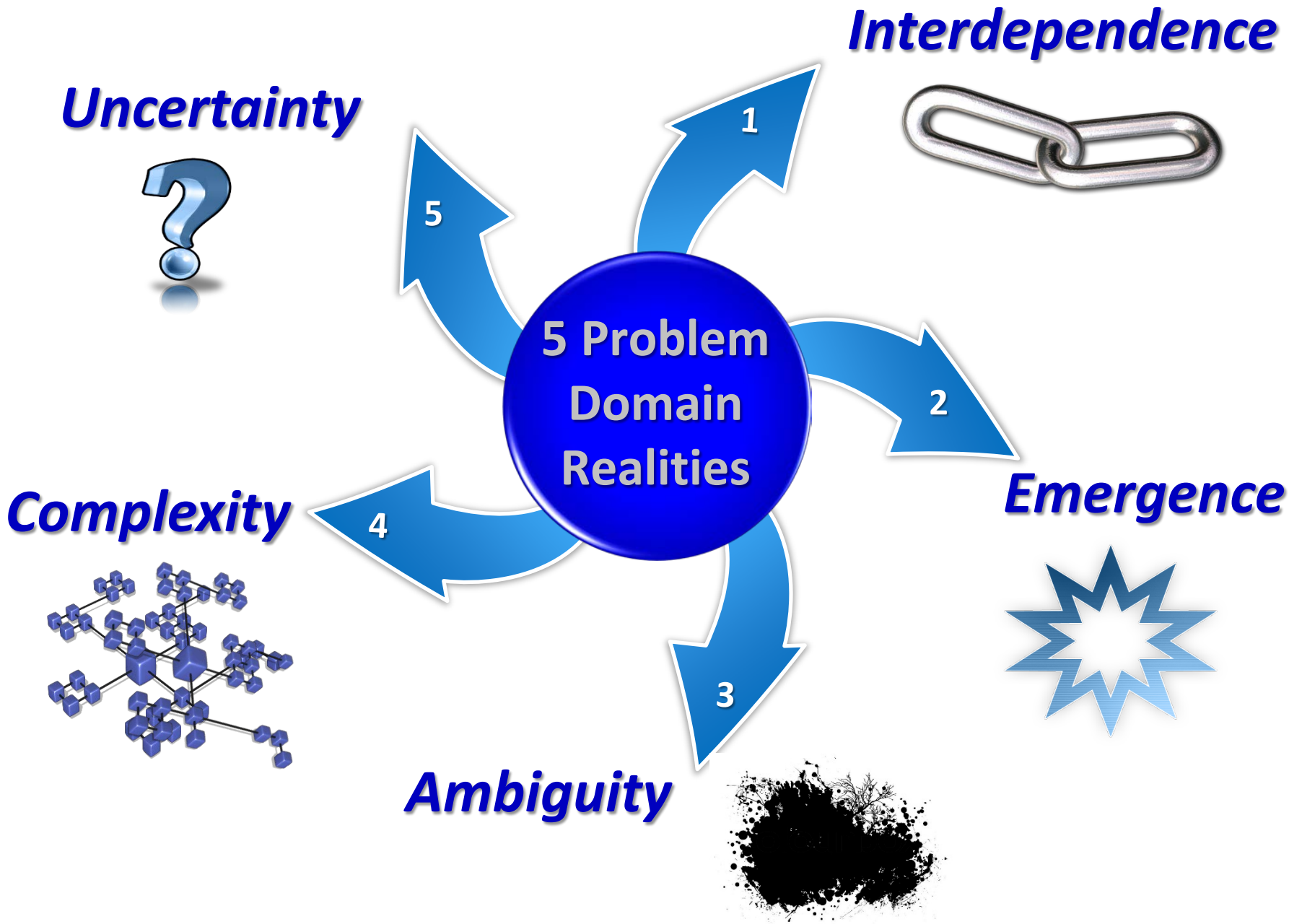
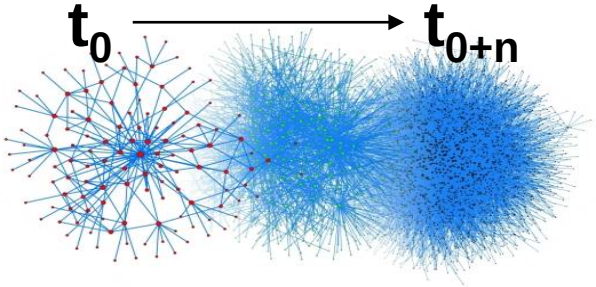
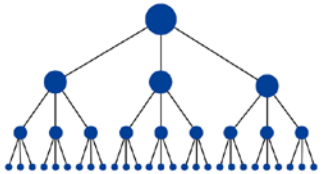

Interdependence
Uncertainty
1
2
3
4
5
5 Problem Domain Realities
Emergence
Complexity
Ambiguity

Why do we seem to be frustrated in responding to this domain?

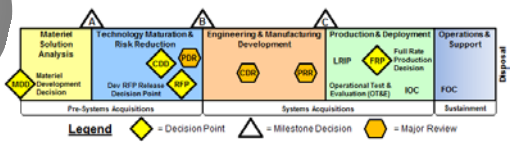
Sprawling Complexity

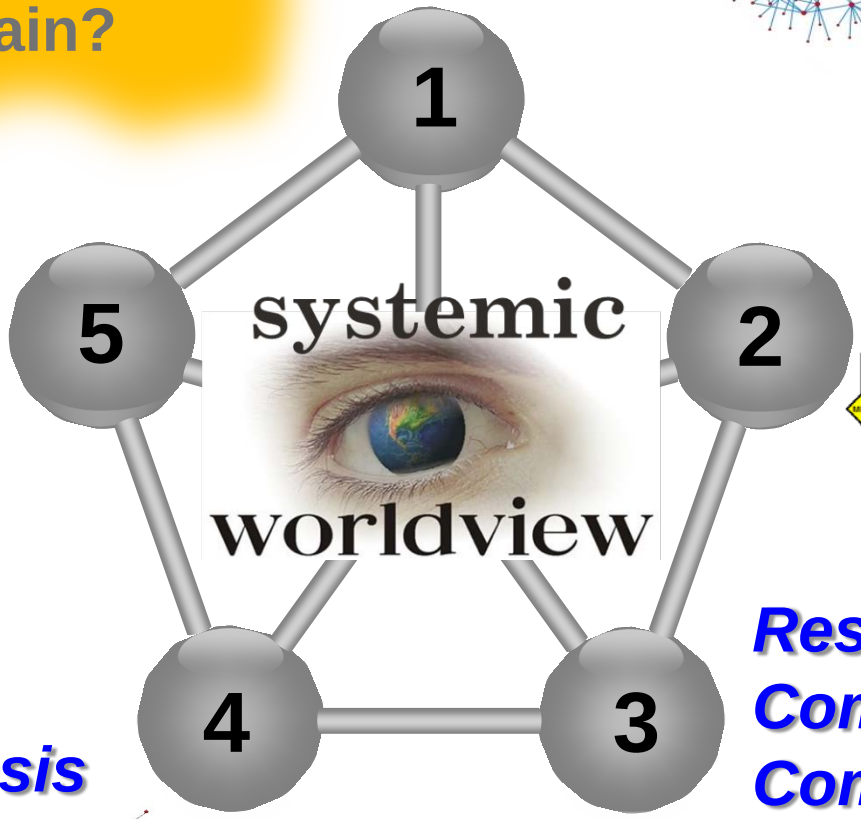


Prominence of Global Control



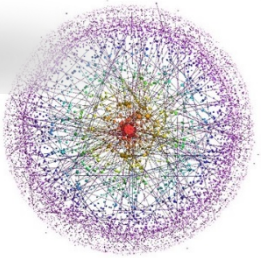
Process & Event Centric

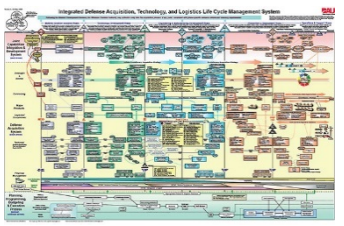




Paradigm Embedded in Output Emphasis

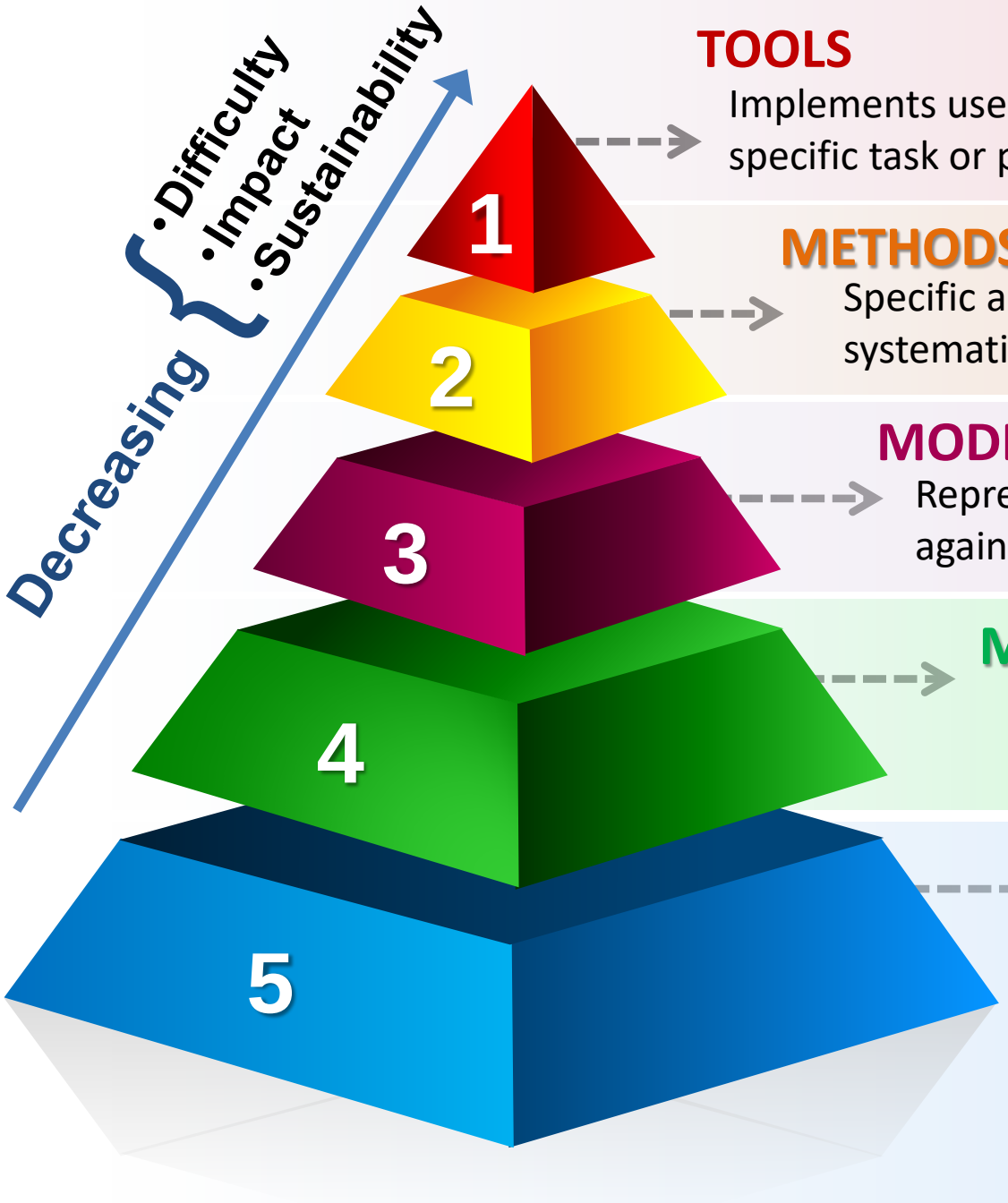
Respond to Complexity with Complication





Introduction to Complex System Governance

Charting a 'Different' Path Forward Out of the Mess



TOOLS

Implements used to support accomplishment of a specific task or purpose

METHODS

Specific approaches that are performed in a systematic manner to accomplish something

MODELS

Representations that capture attributes against which comparisons can be made

METHODOLOGIES

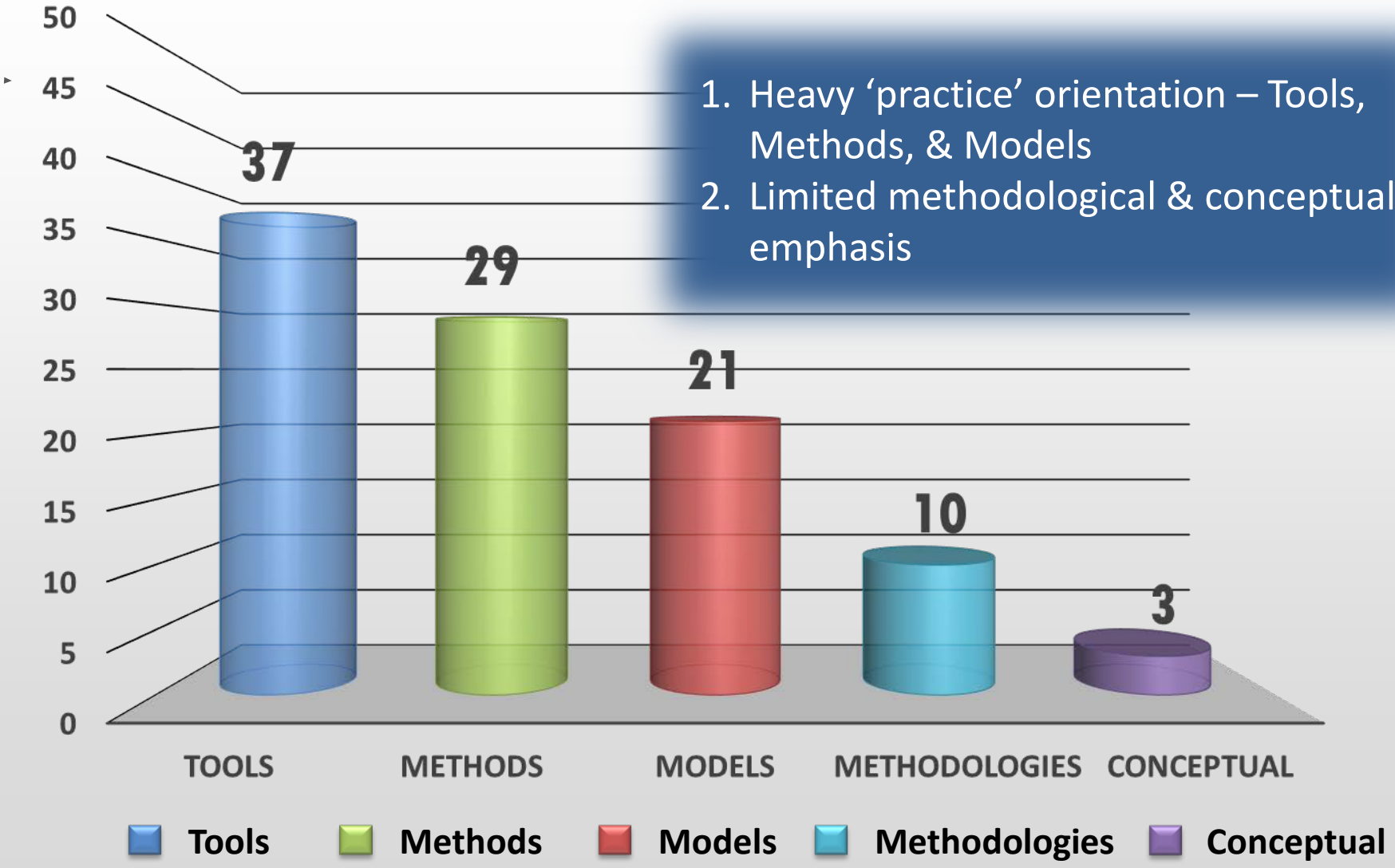
Generalized frameworks that guide applications for the field

CONCEPTUAL FOUNDATIONS

The fundamental underlying philosophical, theoretical, and axiomatic (principles) basis for the field

A Glimpse: Project Management Systems Literature*

*Cited in Google Scholar % (2000 – 2017, 109K+ refs, accessed 4/23/17)

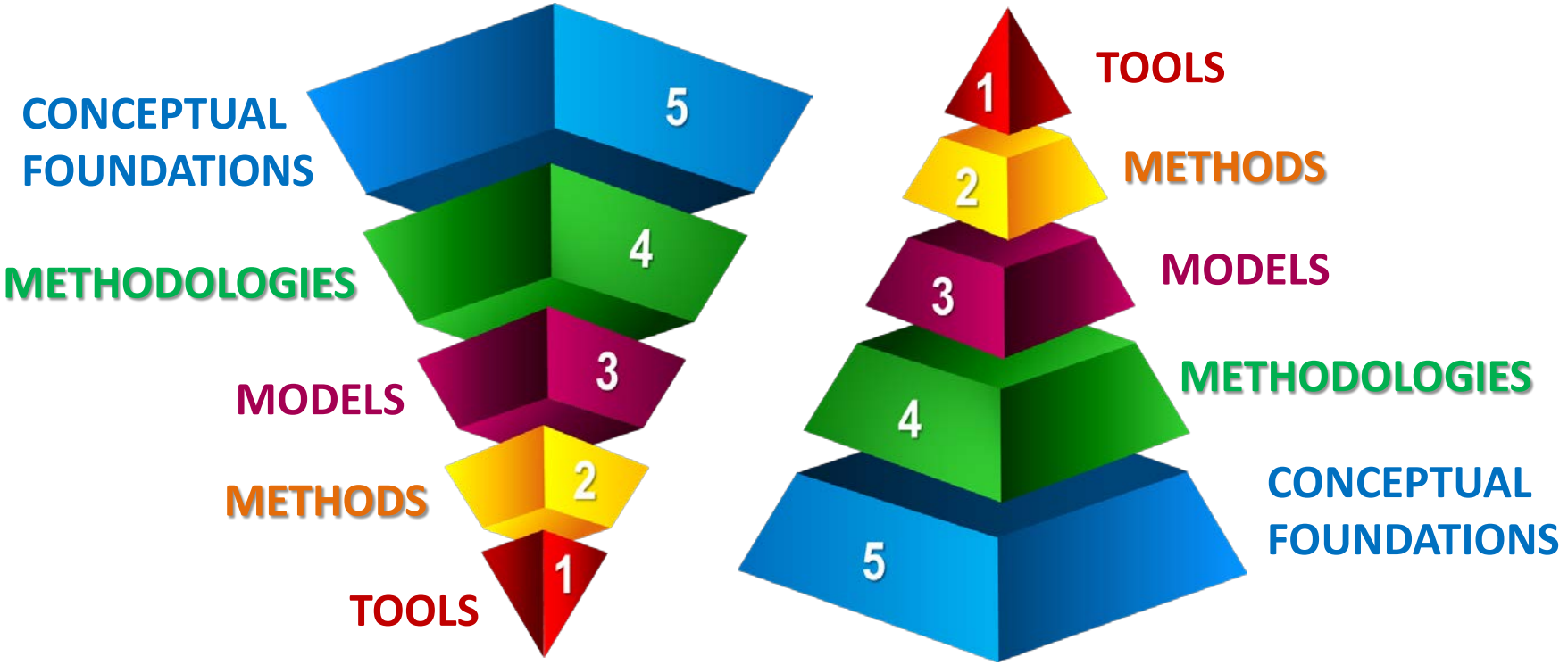


1. Heavy 'practice' orientation – Tools, Methods, & Models
2. Limited methodological & conceptual emphasis

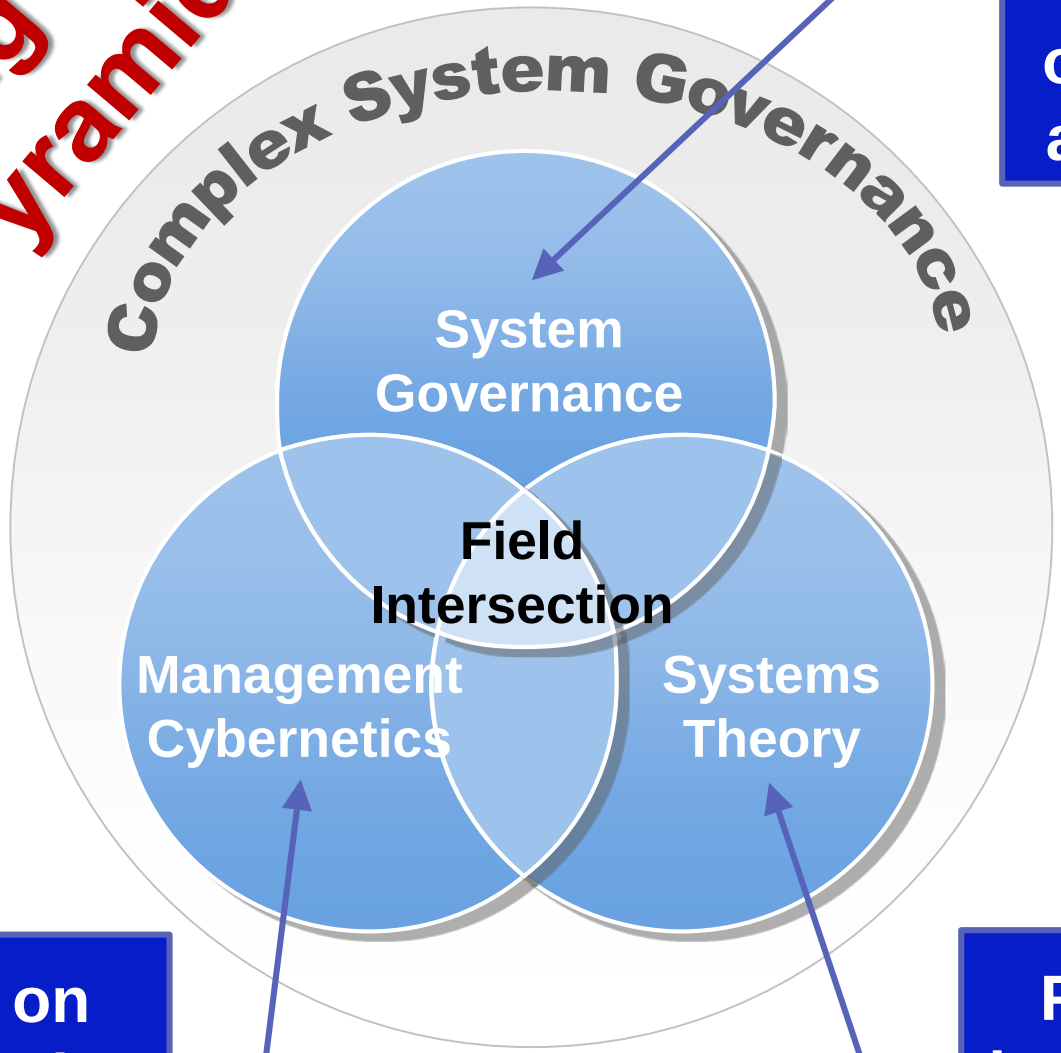
So What? What's the big Deal? Who cares?

Fields (as pyramids) derive their Strength, Stability, and Sustainability from the base.

As is Breakthrough??



Grounding the CSG Pyramid



Focused on direction, oversight, and accountability

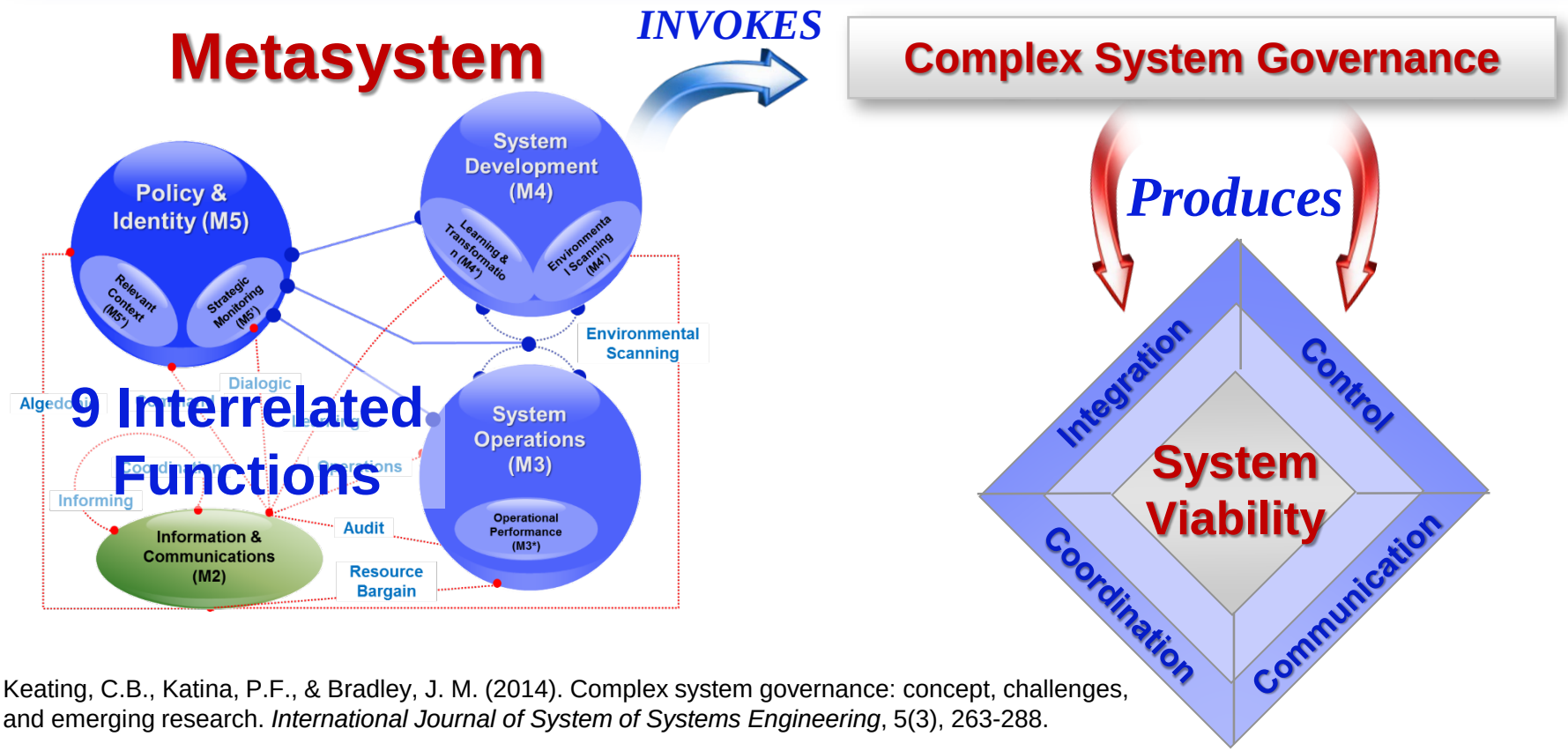
Focused on communication and control

Focused on integration and coordination

Complex System Governance

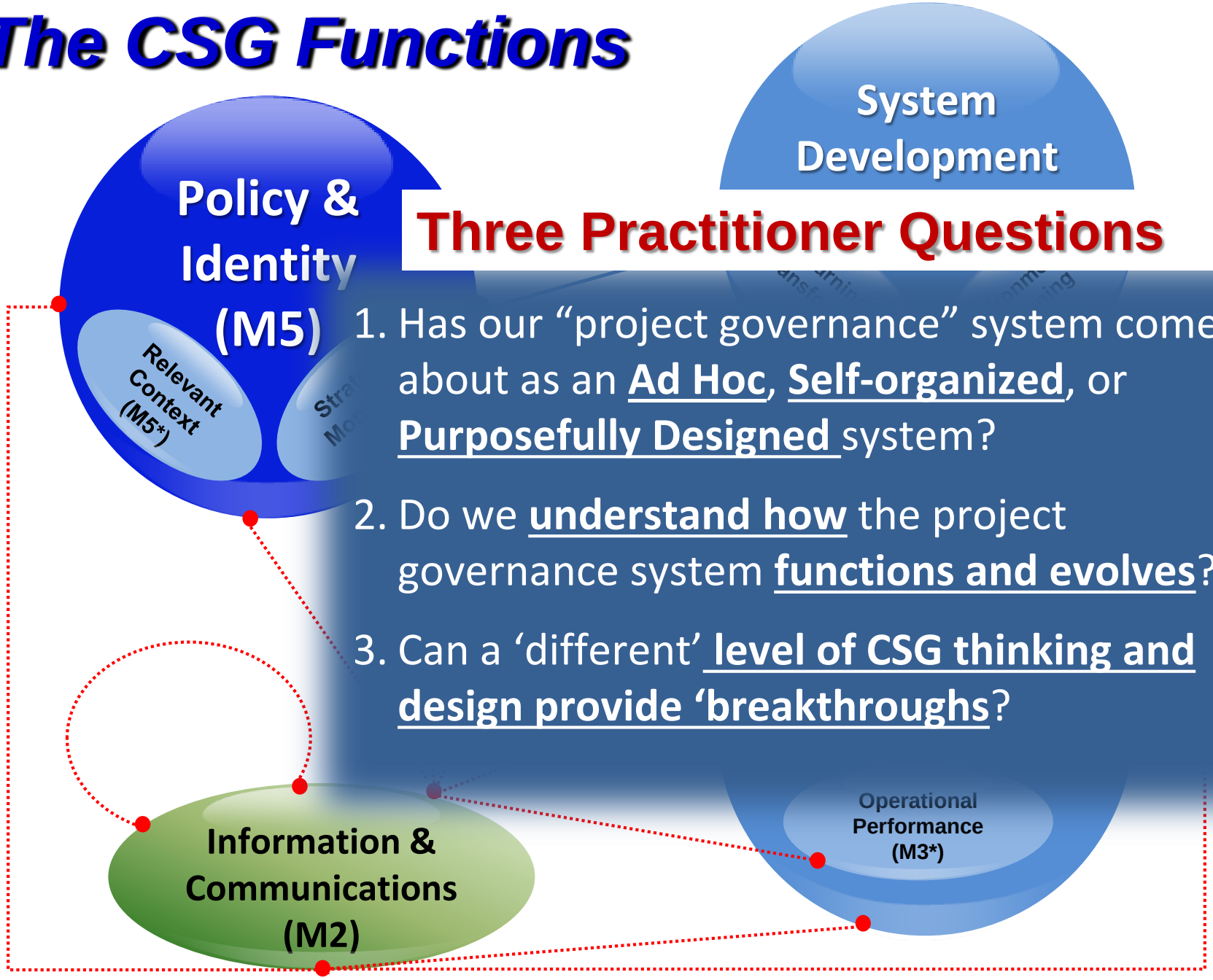
CSG is the design, execution, and evolution of the [nine] metasystem functions necessary to provide control, communication, coordination, and integration of a complex system

(Keating, et al. 2014)



Keating, C.B., Katina, P.F., & Bradley, J. M. (2014). Complex system governance: concept, challenges, and emerging research. *International Journal of System of Systems Engineering*, 5(3), 263-288.

The CSG Functions



Three Practitioner Questions

1. Has our "project governance" system come about as an **Ad Hoc**, **Self-organized**, or **Purposefully Designed** system?
2. Do we **understand how** the project governance system **functions and evolves**?
3. Can a 'different' **level of CSG thinking and design provide 'breakthroughs**?

The CSG Functions

CSG Design

Three Practitic

1. Has our "project gov
   about as an **Ad Hoc**, **Self**
   Purposefully Designed s
2. Do we **understand how**
   governance system **funct** ?
3. Can a 'different' **level of**
   design provide 'breakth

CSG Execution

Policy & Identity (M5)

Relevant Context (M5*)

Information & Communications (M2)

Complex System Governance – in a nutshell of 5 fundamentals points

All systems are subject to the laws of systems

All systems perform essential governance functions that determine system performance.

Governance functions can experience pathologies in their performance.

Pathologies linked to 'violation' of one or more system principles

System performance can be enhanced through purposeful development of governance functions & addressing pathologies

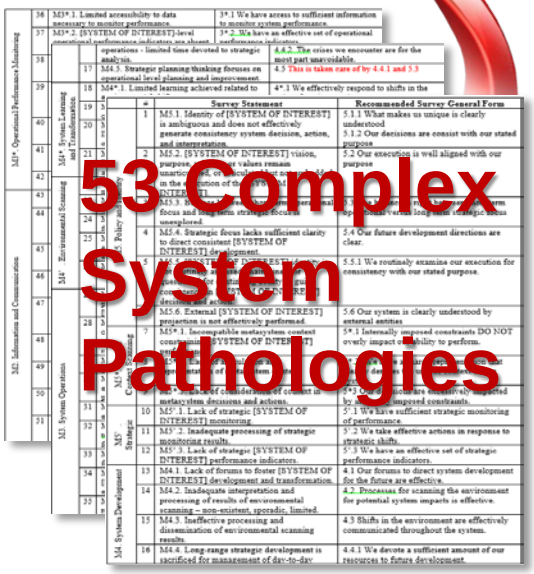
PATHOLOGY

"circumstance, condition, factor, or pattern that acts to limit system performance, or lessen system viability, such that the likelihood of a system achieving performance expectation is reduced" (Keating and Katina, 2012, p. 253)

EXAMPLE
M2.11. Introduction of uncoordinated system changes resulting in excessive oscillation.

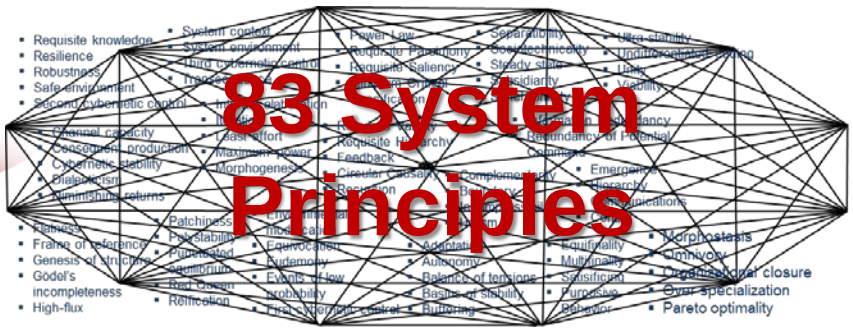
Keating, C. B., & Katina, P. F. (2012). Prevalence of pathologies in systems of systems. *International Journal of System of Systems Engineering*, 3(3-4), 243-267.

Same underlying system pathology appears as 'different' surface issues



53 Complex System Pathologies

Maps to 9 Governance Functions



83 System Principles

Four Application Examples

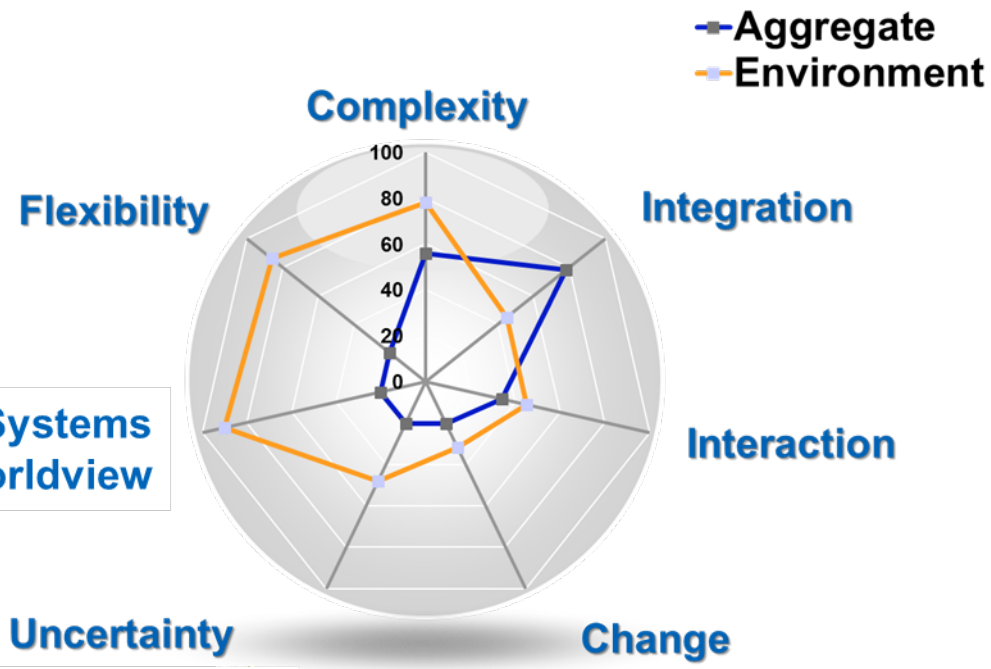
Finding Utility for Practice and Practitioners

1 Workforce Capacity for Systems Thinking

SCENARIO: Workforce is continually behind in responding to environment shifts -- resulting in crises, surprises, and performance shortfalls.

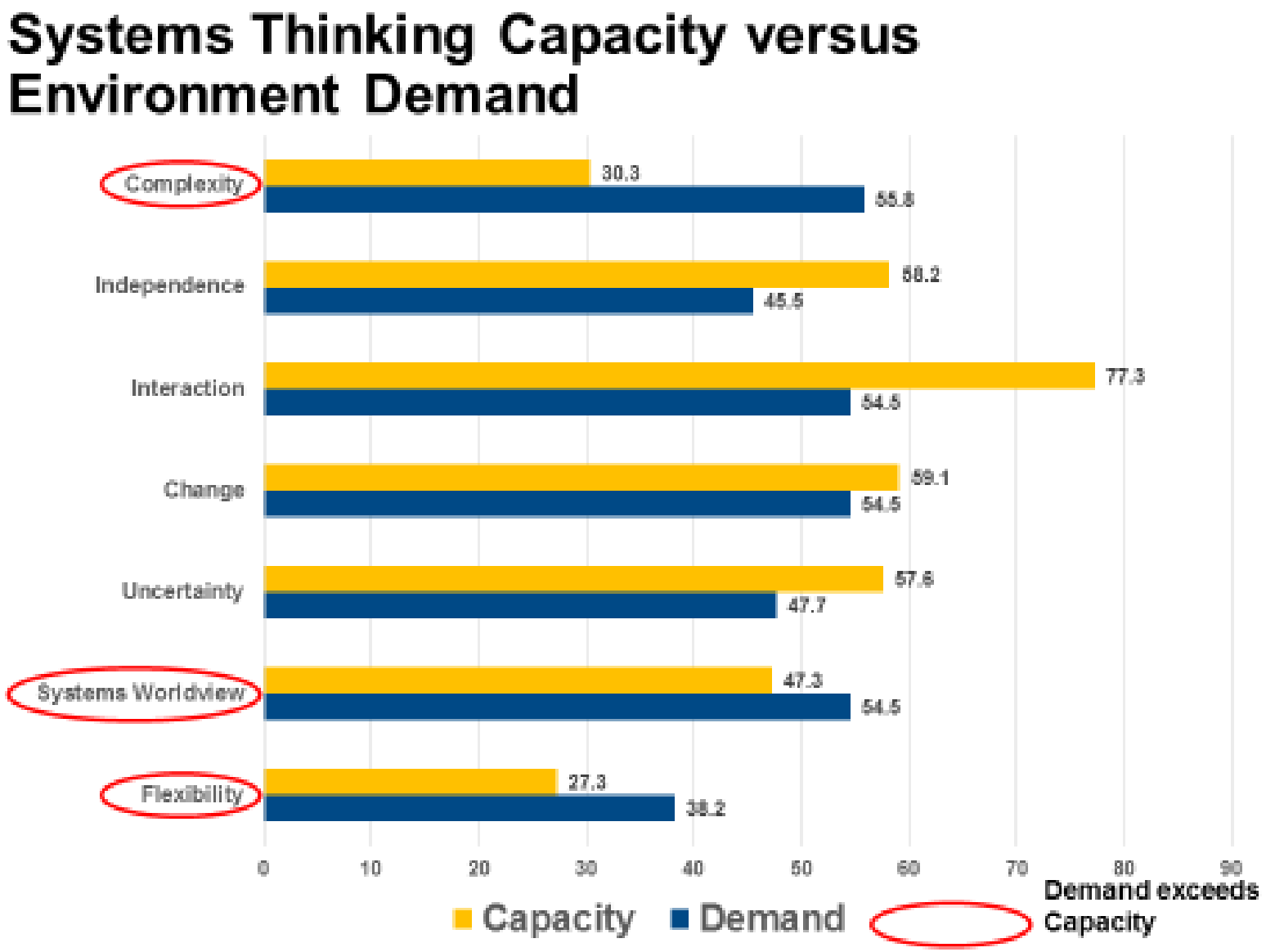
CSG RESPONSE:
Identify the gaps between Systems Thinking Capacity of the workforce and that demanded by the environment

Gaps across 7 dimensions of systems

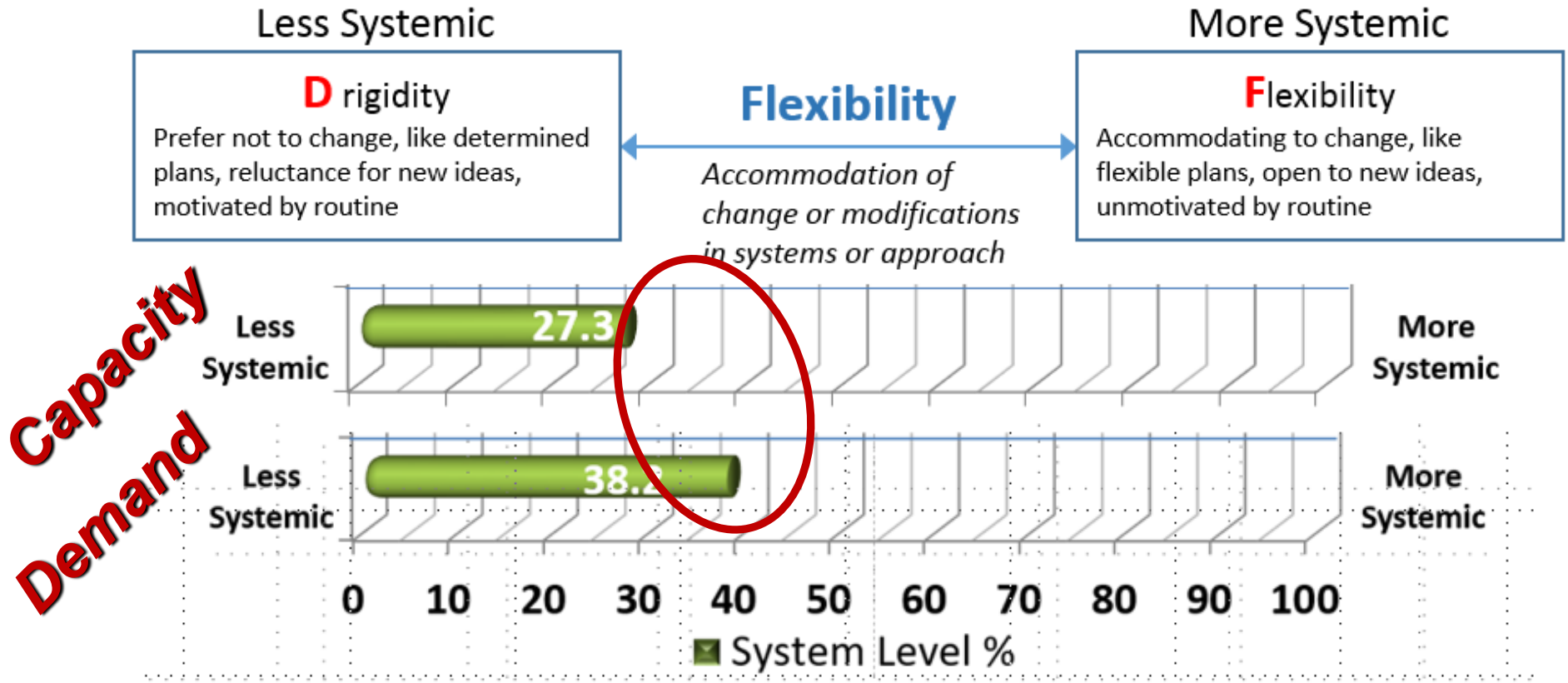


Systems Thinking Capacity **Must be** $\geq$ Systems Thinking Environment Demand

ST-Cap vs. Env Complexity Demand



Flexibility Dimension



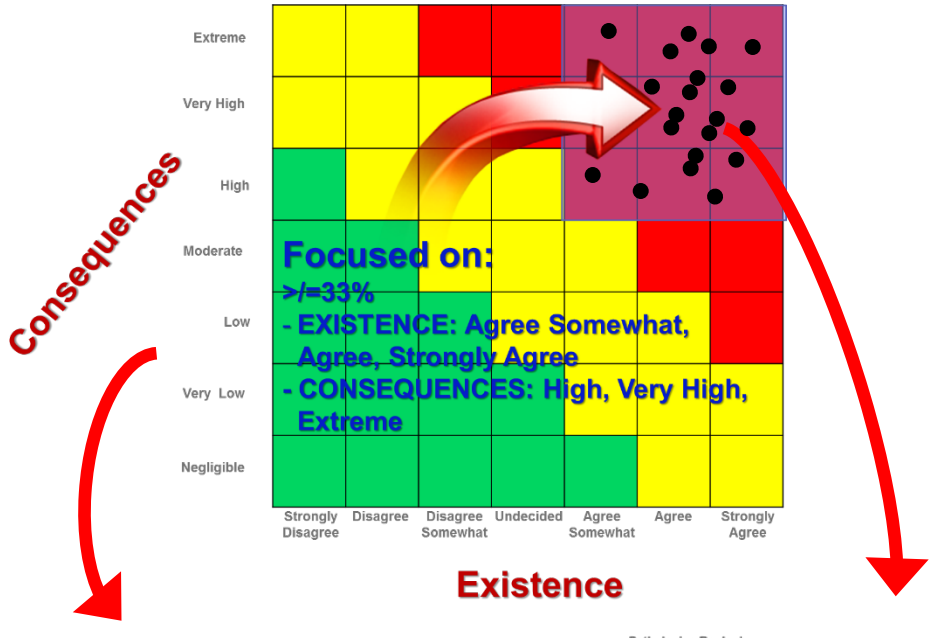
Environment demand exceeds capacity

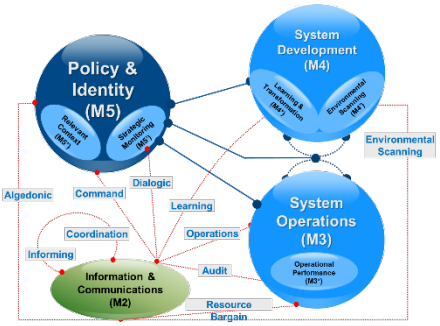
2 System Governance Pathologies Identification

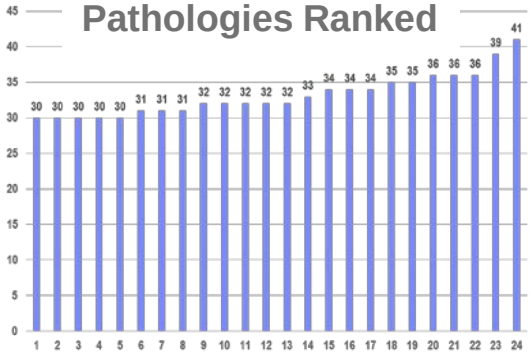
SCENARIO: A system is experiencing continual failures (e.g. cost overruns, schedule delays, missed performance targets) that are resistant to improvement efforts.

CSG Response: CSG pathologies (aberrations from healthy system conditions) across 9 governance functions are identified, mapped, systemically explored, and prioritized for response.

Identification of existence and consequences of 53 pathologies prioritized and mapped to 9 system governance functions





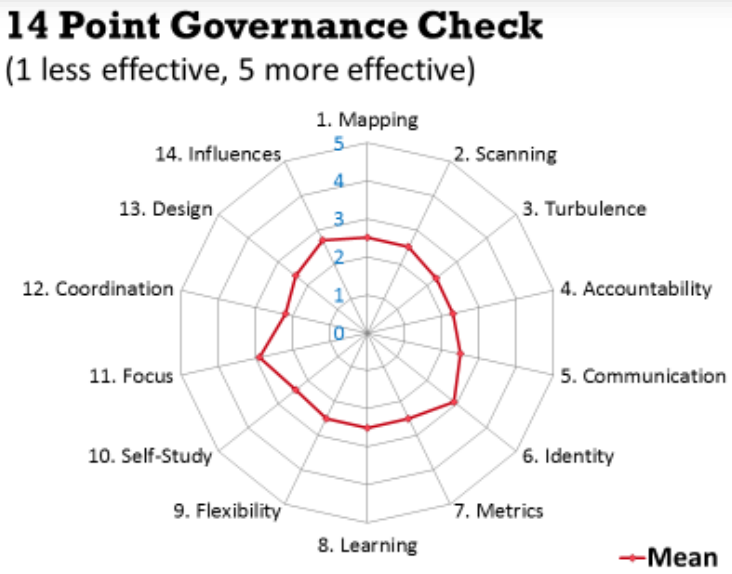


3 CSG 14 Point Check

SCENARIO: An entity (project, organization, dept, etc.) desires a snapshot of the state of Complex System Governance for their system.

CSG Response: Provided a snapshot of the state of Complex System Governance based on several areas of perceived effectiveness in design and execution of CSG functions.

- A "rough" indicator of perceived CSG function performance effectiveness
- Suggests deeper exploration and development opportunity

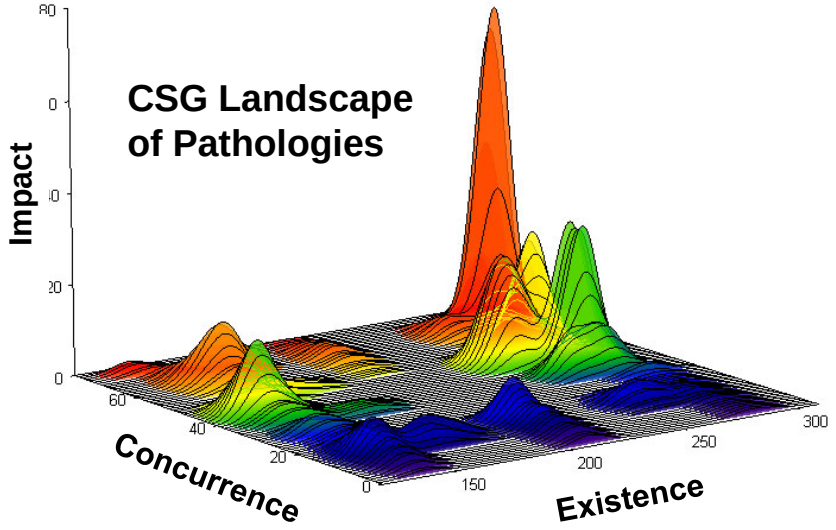


4 System Governance Development

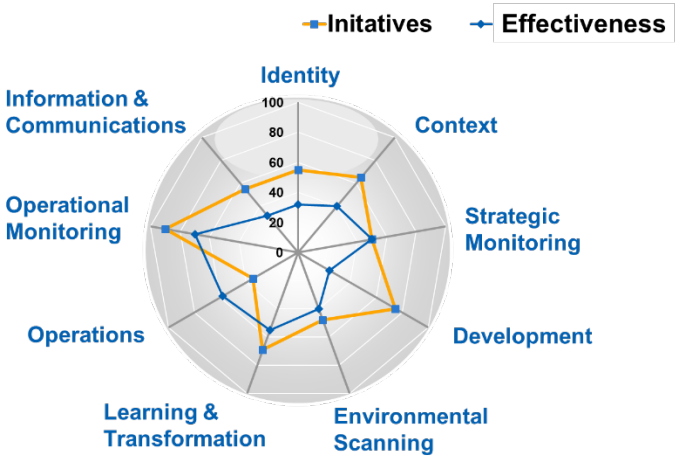
SCENARIO: An organization has difficulty in providing a clear, coherent, and accountable system development strategy.

CSG Response: Mapping CSG landscape provides visualization for analysis of critical challenges for CSG development (peaks). Past, on-going, and future planned system development initiatives are mapped against the existing governance landscape.

CSG Landscape Map to identify highest impact development areas.



Complex System Governance Profile



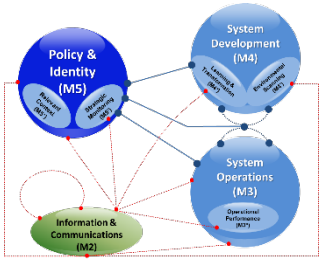
Three CSG Recommendations for Practitioners

Considerations for Employing CSG

Practitioner Recommendations for Exploiting CSG

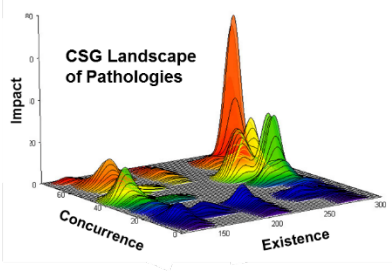
1

Development of a ‘systemic worldview’ provides workforce with new language to support different thinking, decision, action, and interpretation. **EXCEED DEMAND**.



2

Purposeful development of CSG functions
All systems perform CSG functions – but usually without purposeful design, execution, or development. **SELF STUDY**



3

Discovery of ‘Deep system’ pathologies is critical to system development, viability, and stemming emergent crises.
FOCUSED RESOURCES/INITIATIVES.

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