Systemic Intervention for Complex System Governance

Charles B. Keating, Ph.D.
Raed M. Jaradat, Ph.D.
Polinpapilinho F. Katina, Ph.D.
Joseph M. Bradley, Ph.D., P.E.
Richard Hodge, Ph.D.

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OLD DOMINION UNIVERSITY
IDEA FUSION

Scholarship – Research – Relationships – Practice

EMSE
Engineering Management and Systems Engineering

NCSOSE
National Centers for System of Systems Engineering

Topics

01 Complex System Governance (CSG) and Systemic Intervention (SI)

02 Approach and Some Initial Results for SI in a CSG context

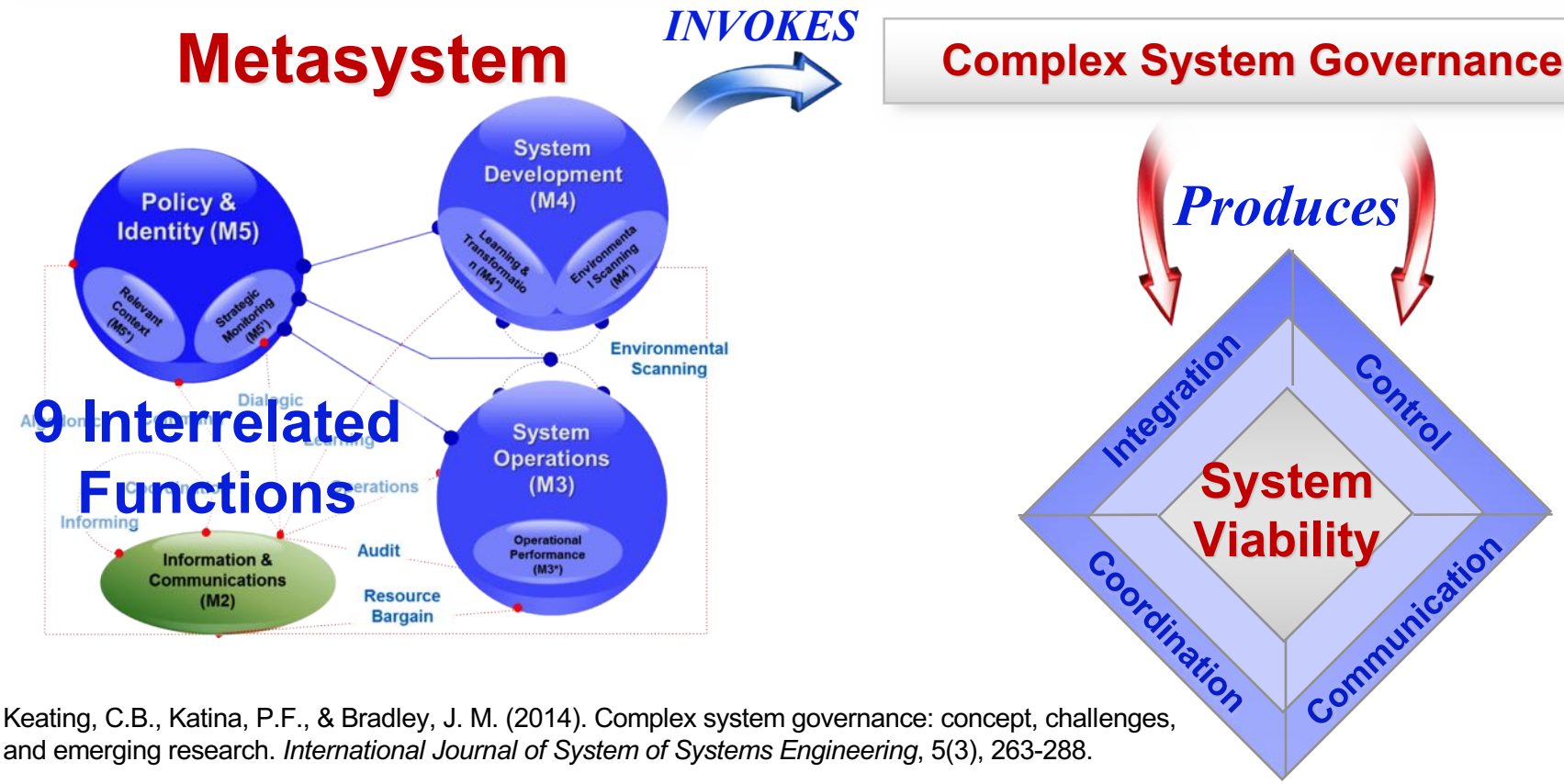
03 Lessons Learned and Challenges for SI

Complex System Governance

Complex System Governance

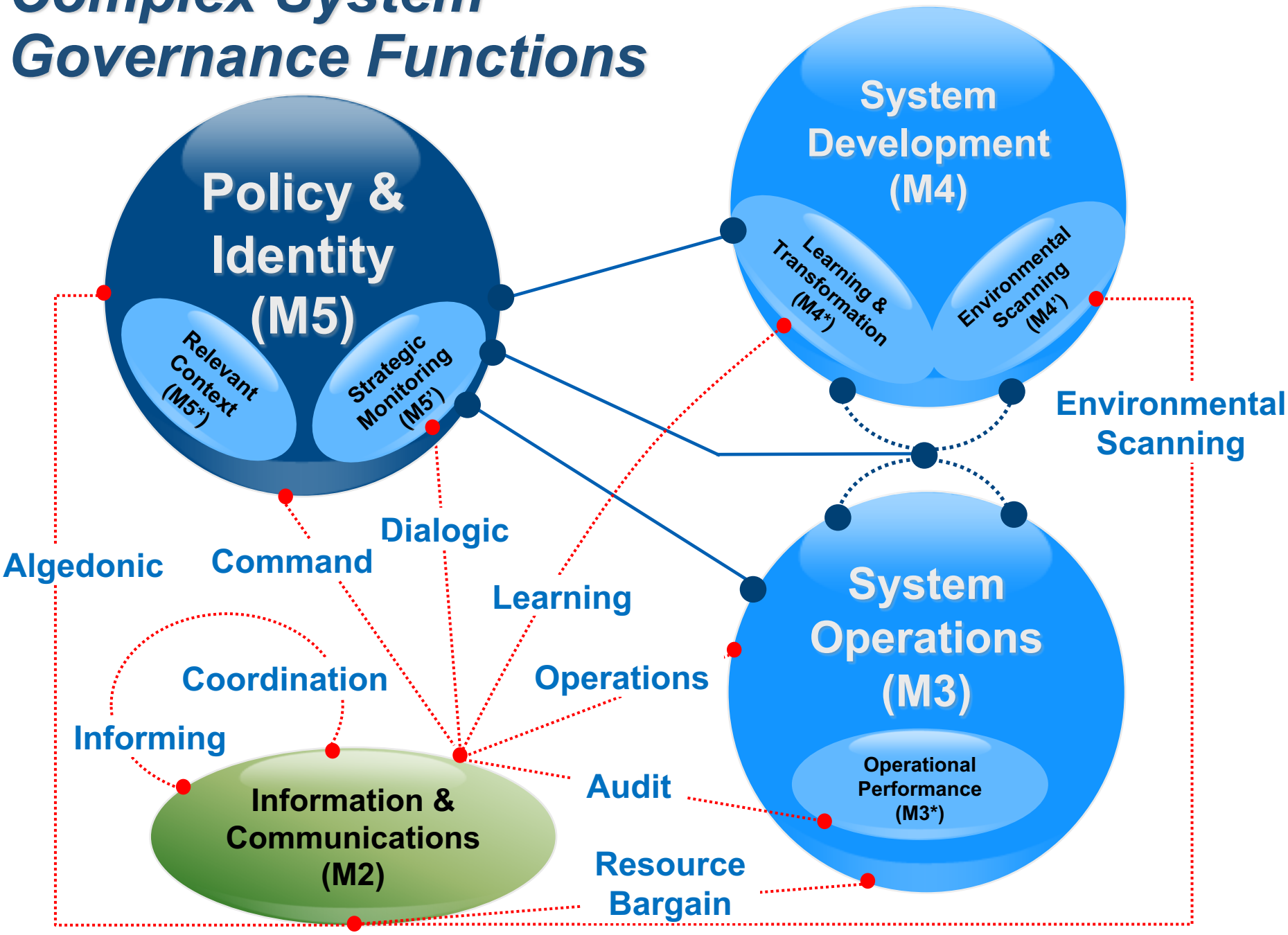
CSG is the design, execution, and evolution of the [nine] metasystem functions necessary to provide control, communication, coordination, and integration of a complex system

(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.

Complex System Governance Functions



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.

Cost Overrun

Schedule Overrun

OBSERVED FAILURE(s)

Missed Performance Target

High Employee Turnover

1

2

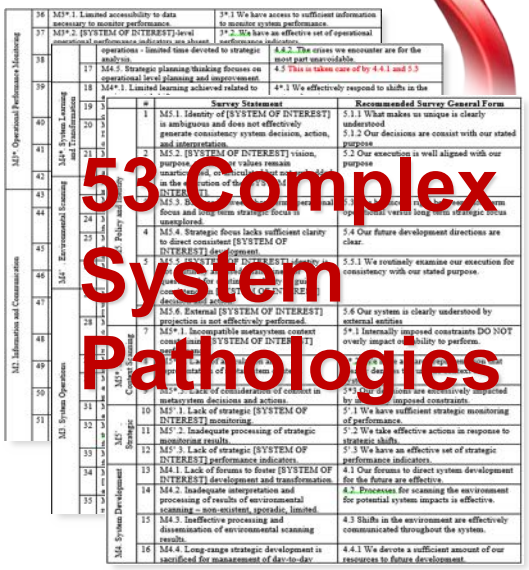
3

4

UNOBSERVED FAILURE SOURCES

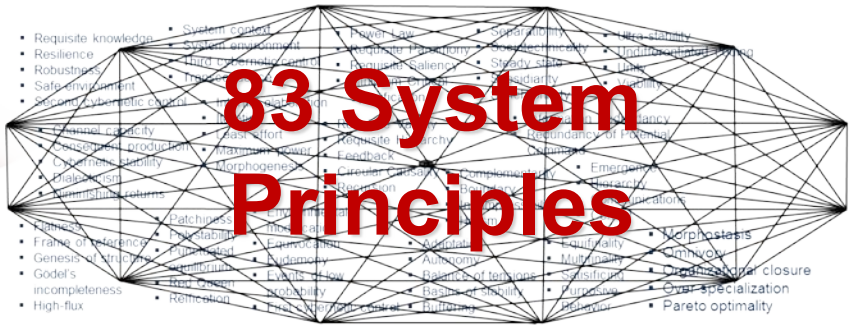
Same underlying system pathology appears as 'different' surface issues

53 Complex System Pathologies



Maps to 9 Governance Functions

83 System Principles



Systemic Intervention

Four Types of Intervention

FORM	APPROACH	ACCOUNTABILITY	RISK
1 ***Additive Resources***	Add resources	Agent for resource adequacy	Agent
2 ***Problem Resolution***	Resolve problem	Agent for solution	Agent
3 ***Expert Advice***	Expert advice	Target for advice implementation	Target
4 ***Participatory***	Collaborative improvement	Shared between agent and target	Agent & Target

Systemic Intervention

The purposeful action by an agent, generally human for complex systems, to produce change in a system or situation

"It's some new thing called an intervention."

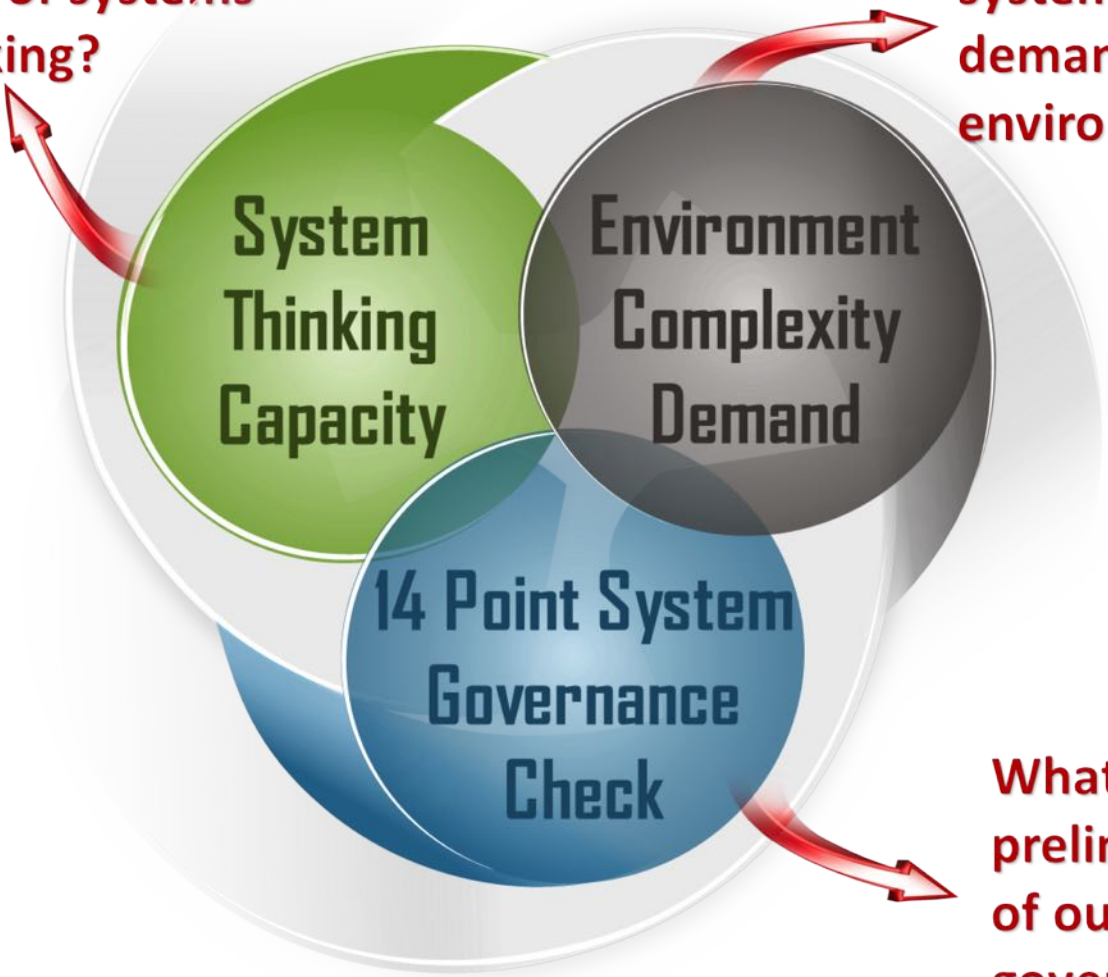
Following Midgley, G. *Systemic Intervention* (2000)

CSG Intervention – Approach and Some Results

Complex System Governance Entry

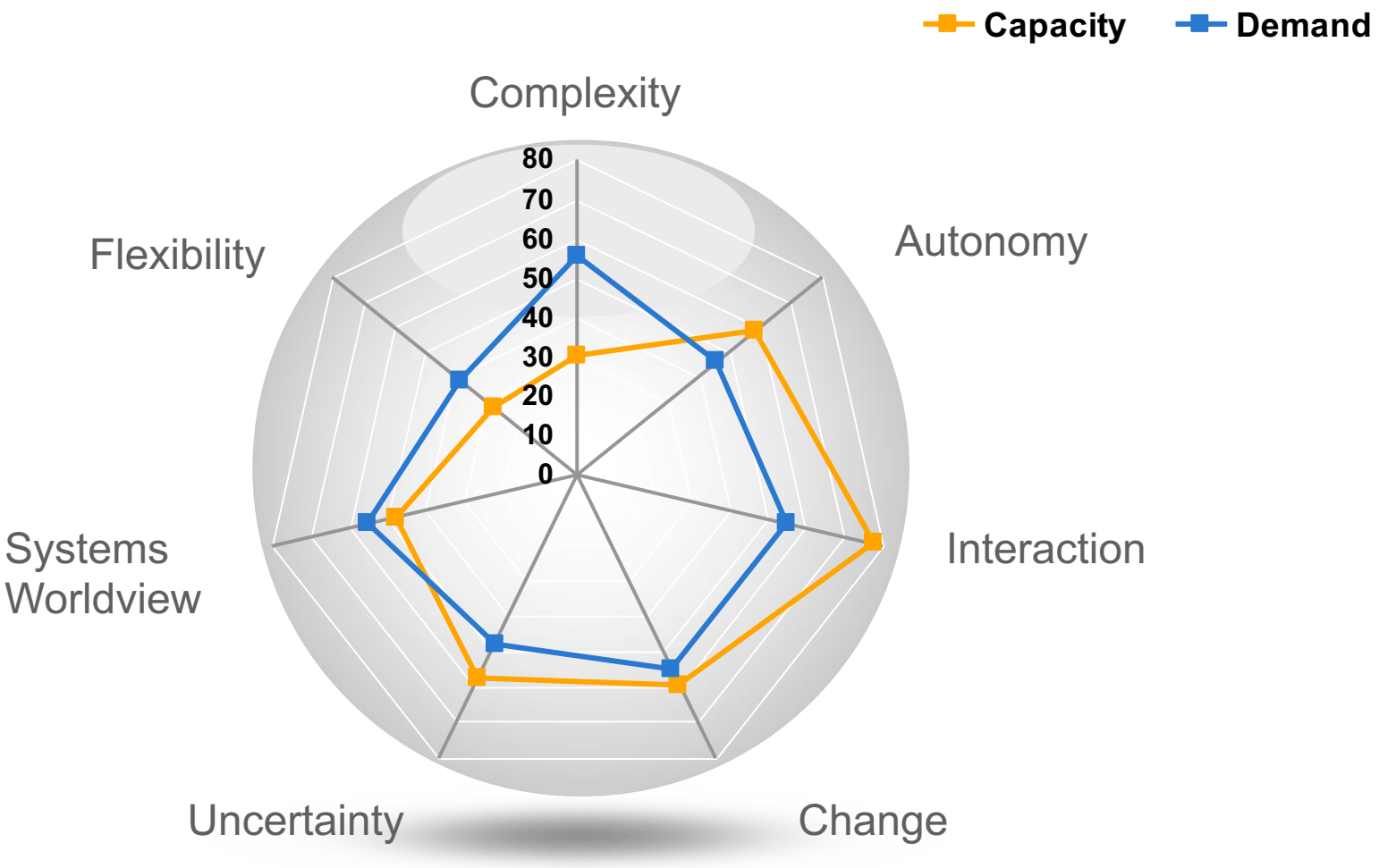
What is our current level of systems thinking?

What level of systems thinking is demanded by our environment?



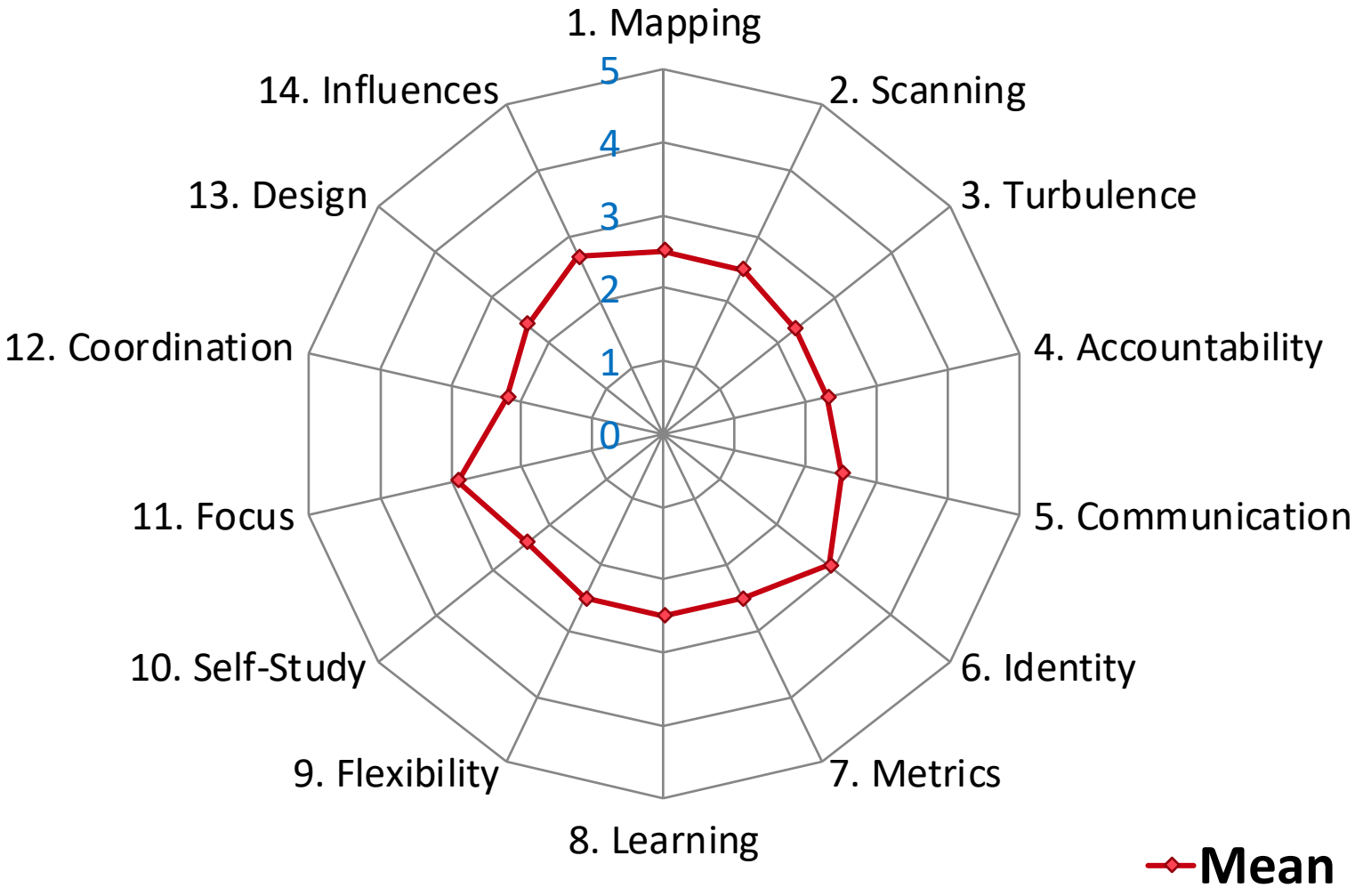
What is the preliminary state of our system governance?

Composite Systems Thinking Capacity and Environment Complexity Demand



14 Point Governance Check

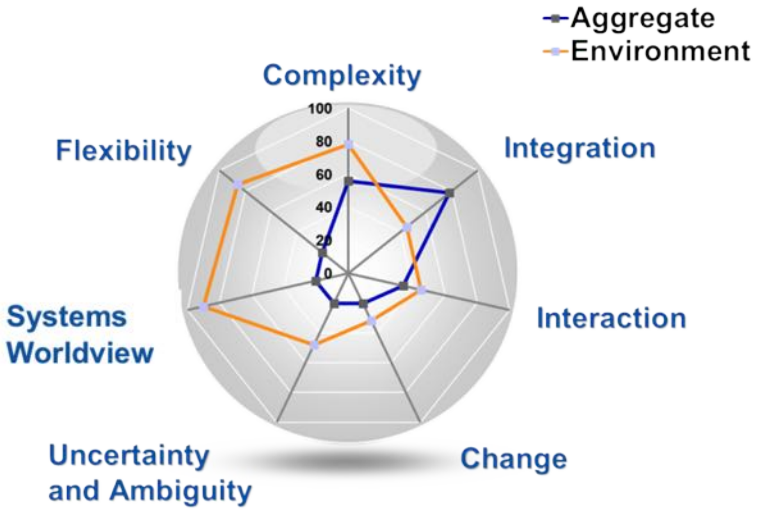
(1 less effective, 5 more effective)



Results: What we have been able to do

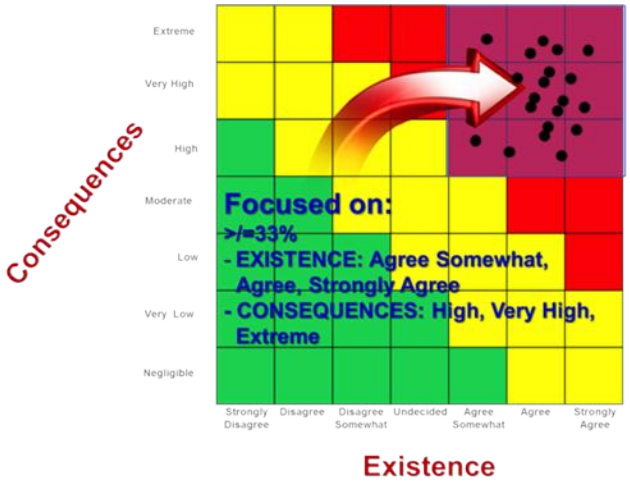
1

Identification of gaps between workforce systems thinking capacity and complexity demanded by the environment

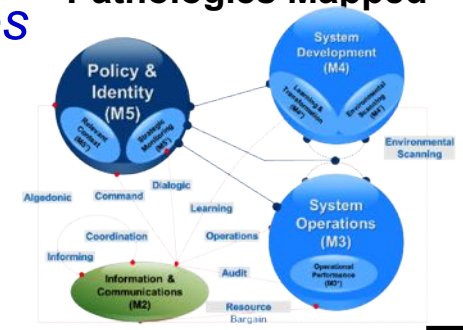


2

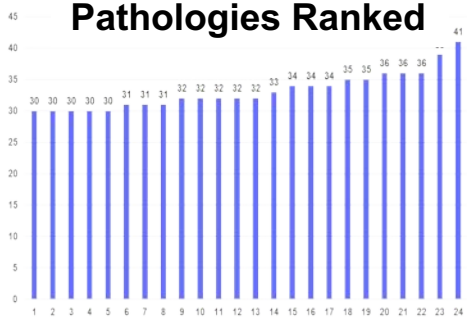
Identification, mapping, and prioritization of pathologies for CSG landscape

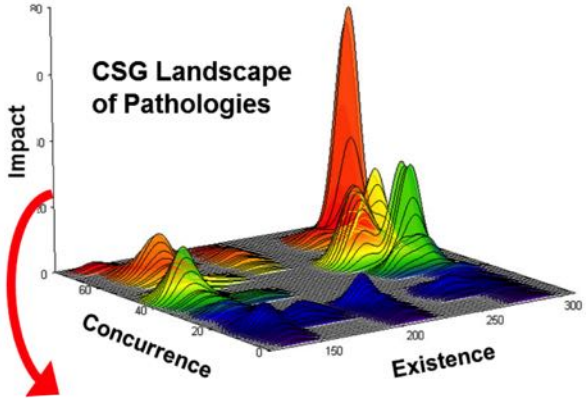


Pathologies Mapped

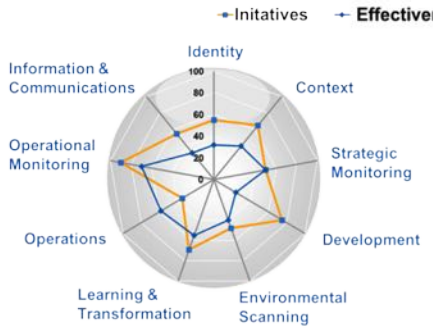


Pathologies Ranked





Governance Check Aggregate Profile



Lessons Learned and Challenges

Lessons Learned: 5 Take Aways

1. CSG is not the entry point; system concerns are the entry point
2. CSG value potential is shown by translation into operational and strategic concerns
3. CSG engagement is not a binary proposition – but a spectrum of focus, activity, and value
4. CSG cannot be cast as “in addition to” (IAT), but amplifying effectiveness of what is already being done
5. CSG Engagement time & risk must initially fall on CSG Facilitator(s)

8R Framework for Systemic Intervention

Rigidity

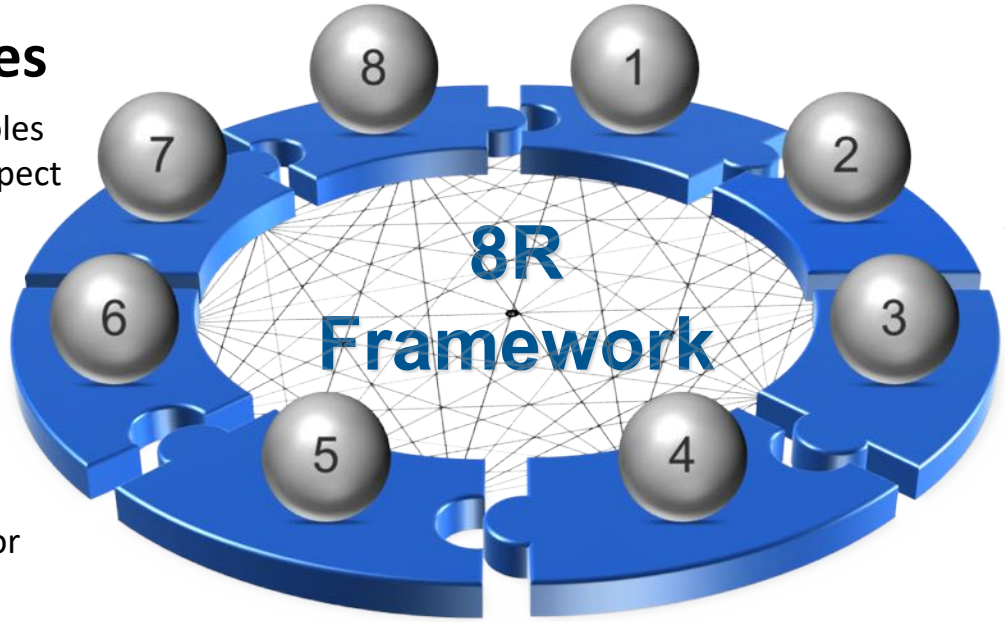
Flexibility in design and execution of system development effort

Relevance

Recognition of need, measurable value, comprehensive nature, and relationship to other development efforts

Responsibilities

Clarity in definition of roles and obligations with respect to the system and effort



Realism

Consistency between expectations and feasible system development activities

Rigor in Execution

Adherence to the design to create feasible alternatives for development

Resolve

Institutional will and commitment to the effort and system development sustainment

Resources

Provision for sufficient resources and access necessary to engage in the effort

Requisite Compatibility

Congruence in worldview, support infrastructure, approach, context, and risk-threat-reward balance

Chuck Keating, Ph.D., ckeating@odu.edu

Old Dominion University
Engineering Management & Systems Engineering
National Centers for System of Systems Engineering