Complex Systems Governance: A New Approach for Addressing the 'Messes' and 'Wicked Problems' that are By-product of Modern Projects which Overwhelm PM Practitioners

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EMSE Engineering Management and Systems Engineering

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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*

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Topics

01 World of the Modern PM

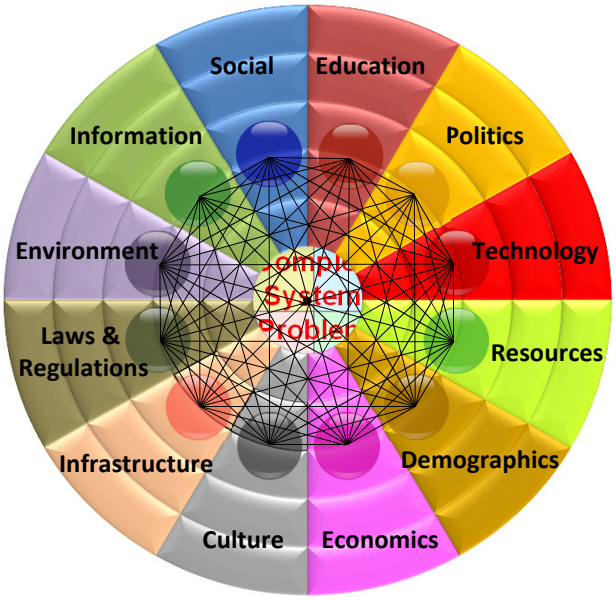
02 The CSG View

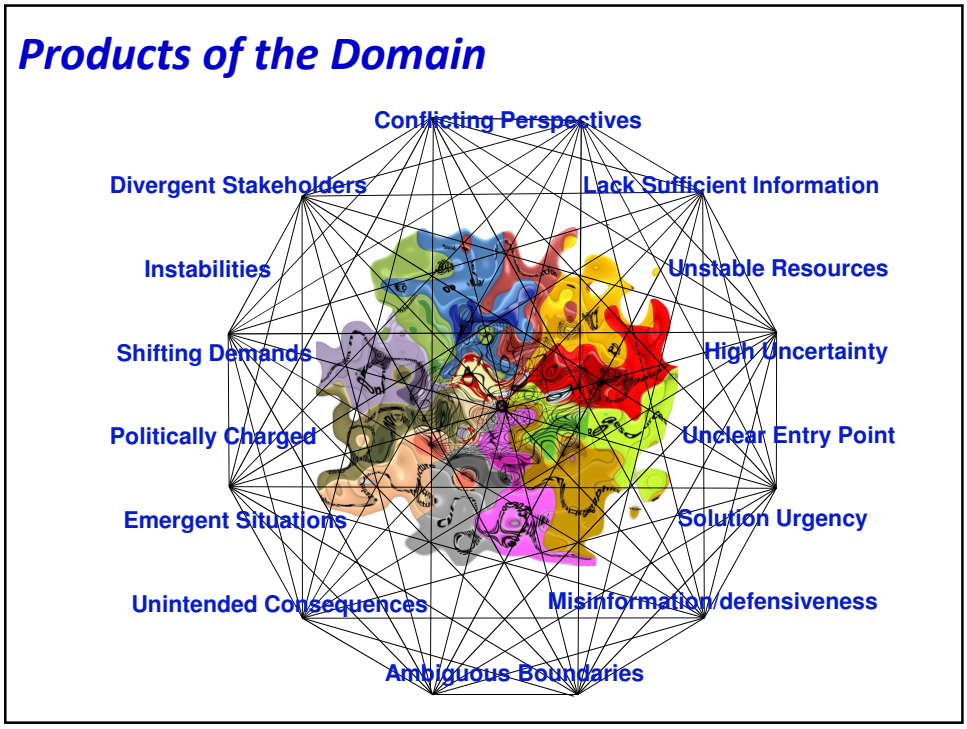
03 Utility of CSG

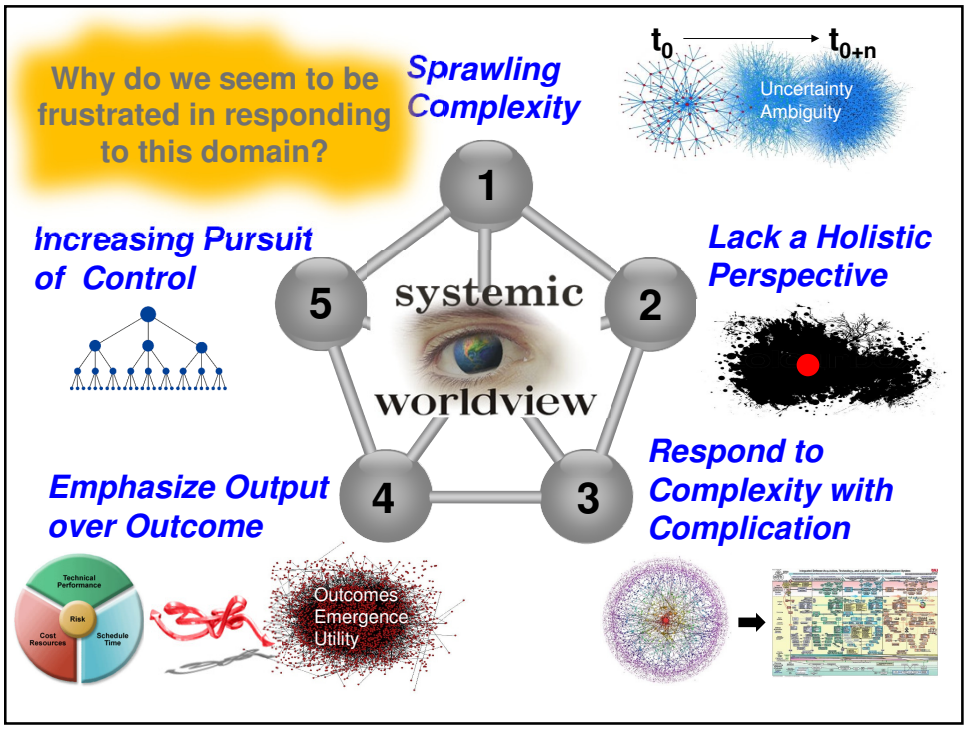
04 Instructive Example & Challenges Moving Forward

World of the Modern PM

Wicked Problems and Messes


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


Products of the Domain
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

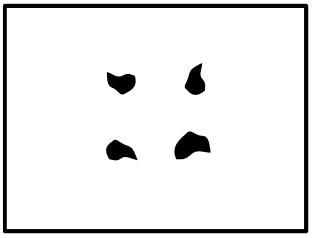

Why do we seem to be frustrated in responding to this domain?
Sprawling Complexity
t_0
t_{0+n}
Uncertainty
Ambiguity
Increasing Pursuit of Control
Lack a Holistic Perspective
1
2
3
4
5
systemic
worldview
Emphasize Output over Outcome
Respond to Complexity with Complication
Technical Performance
Risk
Cost Resources
Schedule Time
Outcomes
Emergence
Utility

The CSG View

Connecting the dots differently

The Flatland Dilemma

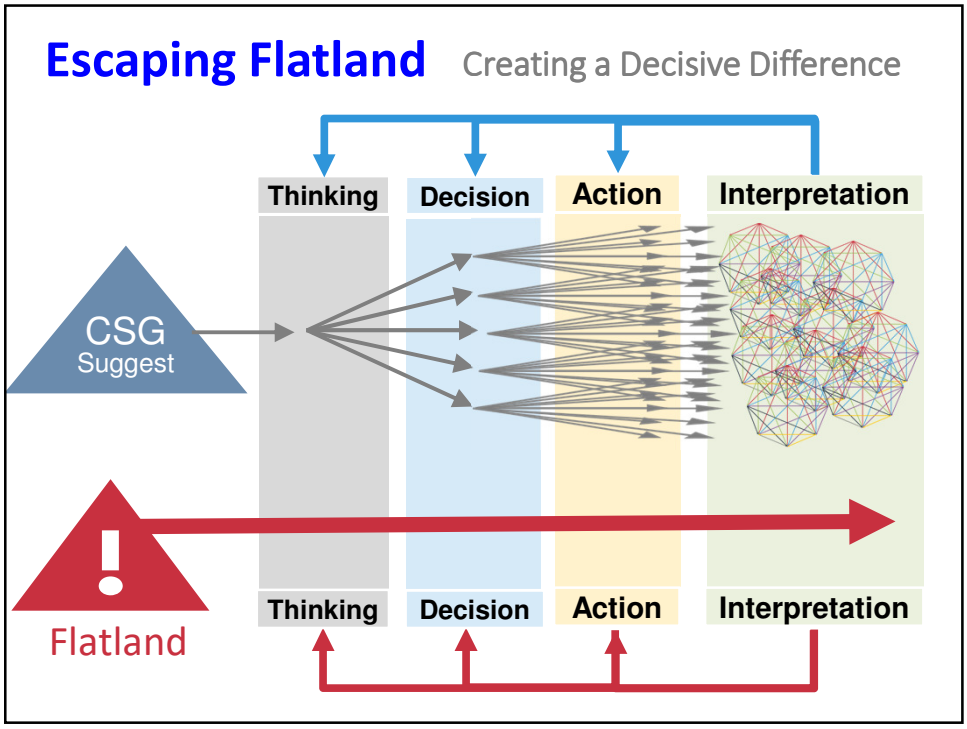
Flatland View



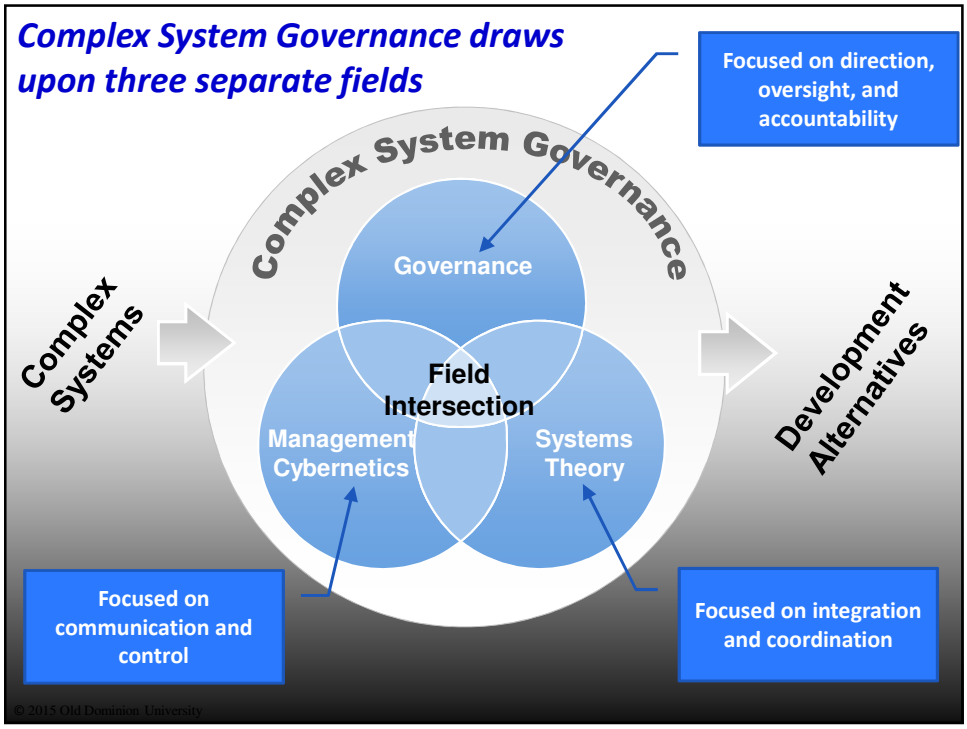
Beyond Flatland View

Result of addressing complex systems in flatland

Solving the wrong problems precisely in the most efficient way possible – Mitroff's Type III Error


Escaping Flatland
Creating a Decisive Difference
Thinking
Decision
Action
Interpretation
CSG
Suggest
Flatland
Thinking
Decision
Action
Interpretation


CSG: "One"
Escape from
Flatland
Complex System Governance
Mastering Complexity by Design



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 laws
- 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.

Complex System Governance

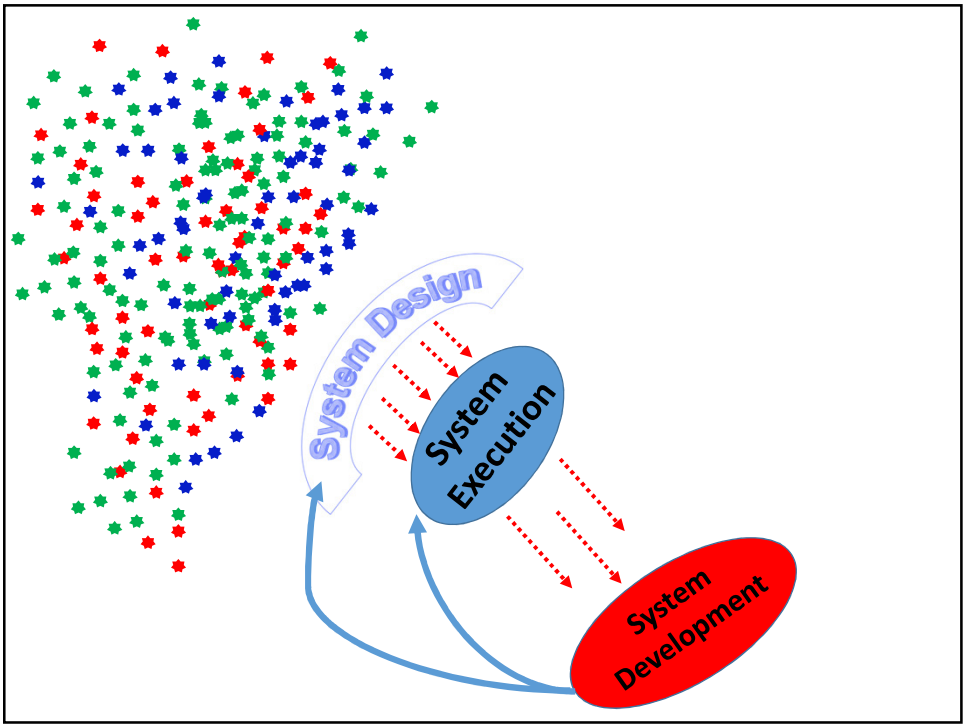
1

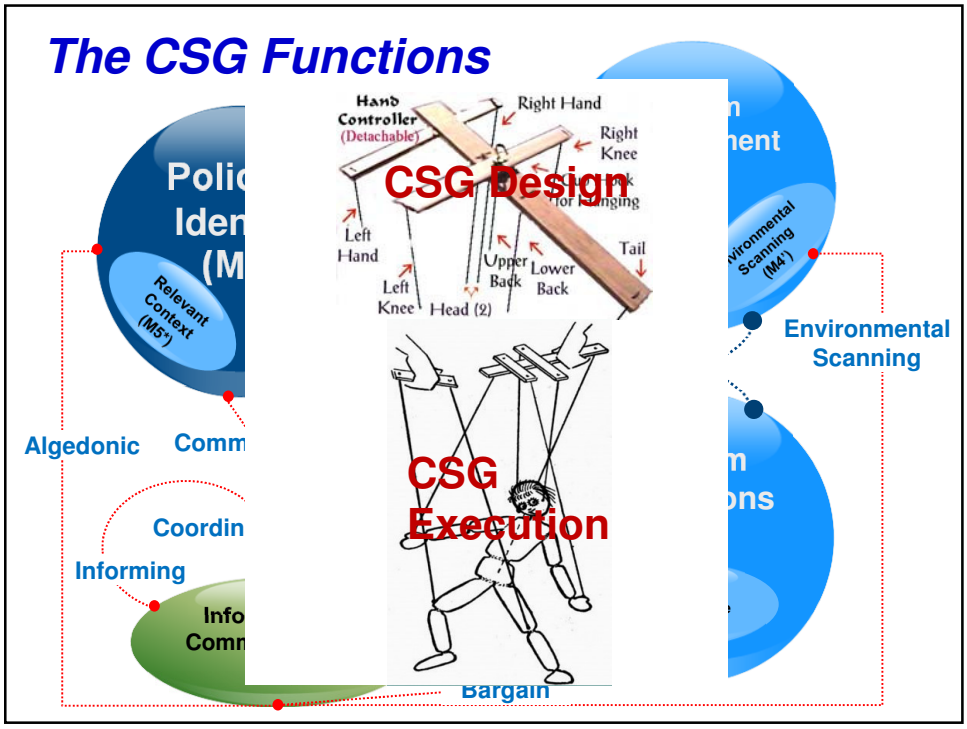
The design, execution, and evolution of the [nine] metasystem functions necessary to provide control, communication, coordination, and integration of a complex system

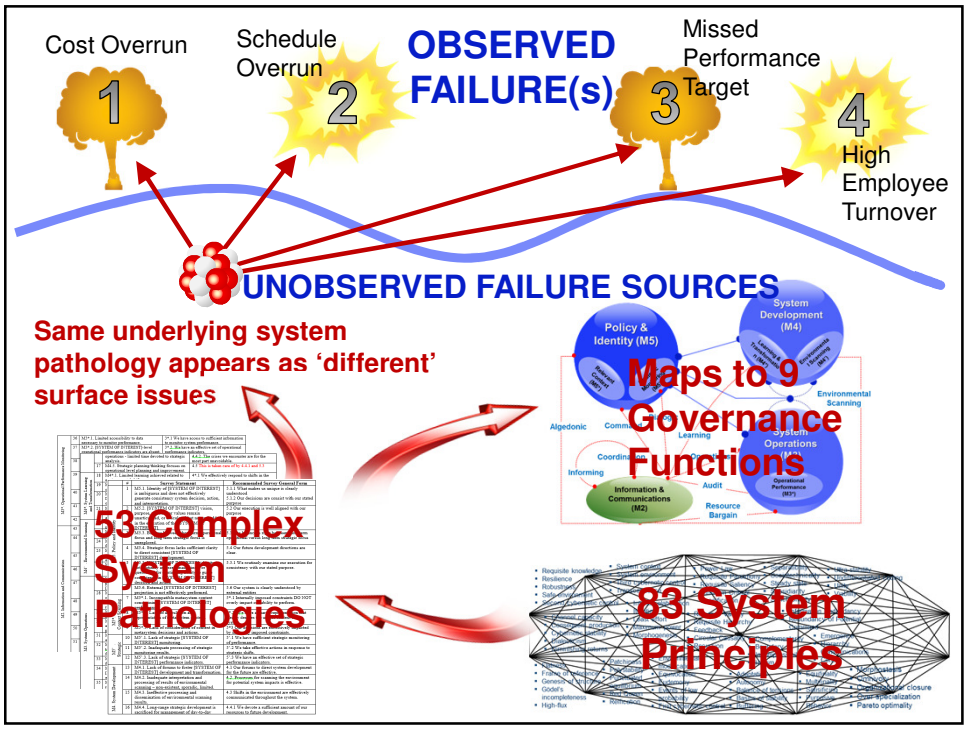
2

3

(Keating, et al. 2014)

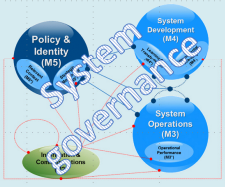



The CSG Functions
CSG Design
CSG Execution
Hand Controller (Detachable)
Right Hand
Right Knee
Left Hand
Left Knee
Head (2)
Upper Back
Lower Back
Tail
Environmental Scanning
Algedonic
Coordin
Informing
Bargain


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

A "Fun" 14 – Point Governance Check

SYSTEM GOVERNANCE
A 14 Point Check-up



… execution of essential functions necessary to ensure present Performance and future System sustainability

ASSESSMENT

Less 1 2 3 4 5 More

1 We have a comprehensive model that shows a mapping of how our system functions to produce value.

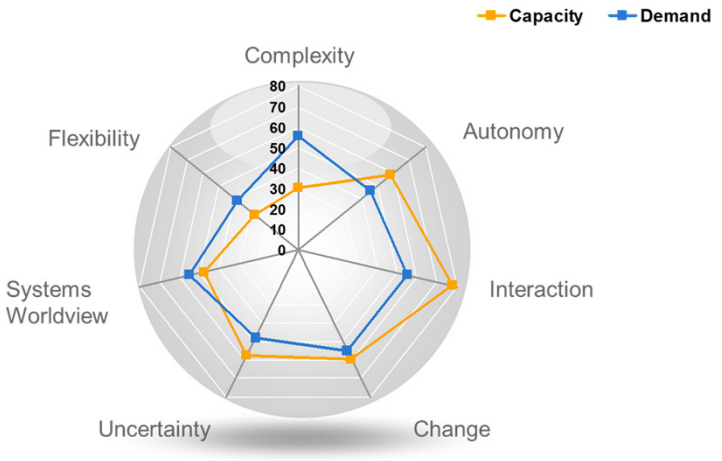
This is like a system owners manual – it shows the precise detail, like a set of blueprints that show precisely how the system elements fit together and operate to produce value

The Utility of CSG

Potential Value and Some Results

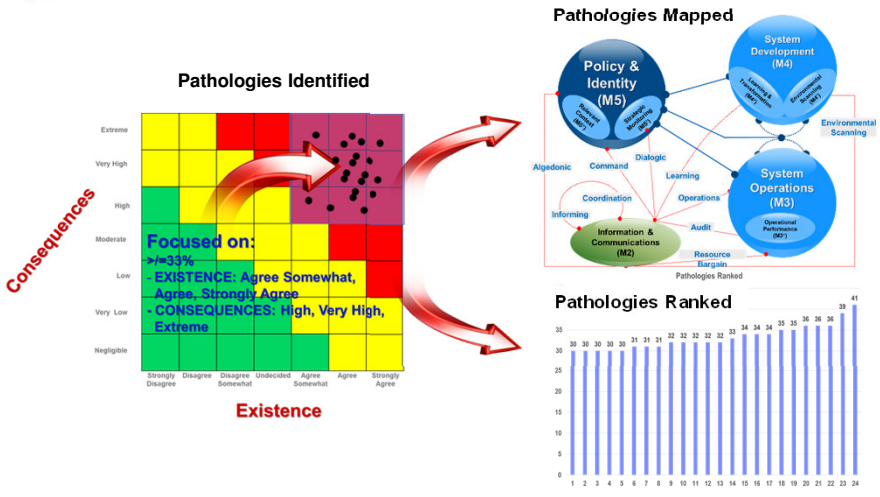
Results: What we have been able to do

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



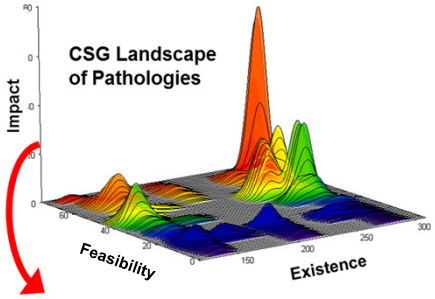
Results: What we have been able to do

2 *Identification, mapping, and prioritization of (metasystem) pathologies for a system of interest*



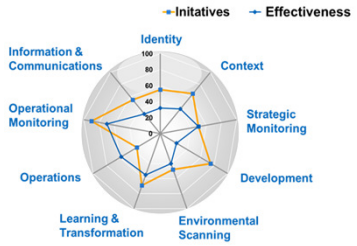
Results: What we have been able to do

3 *Definition of the CSG landscape of pathologies and state of CSG …..*



Governance Check Aggregate Profile

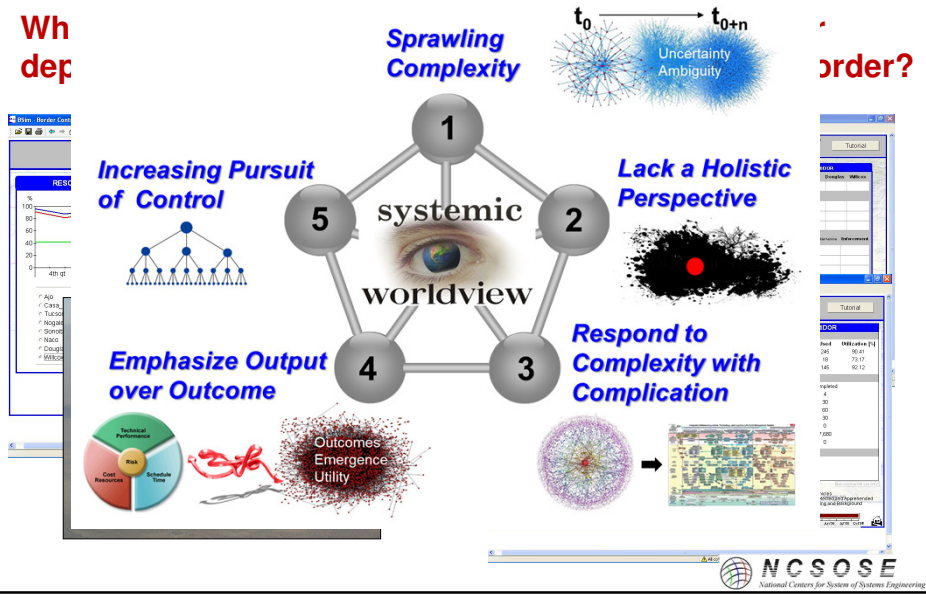
4 *….. in contrast to system development initiatives*



Moving CSG Forward

Instructive Example and Challenges

Example: Border Security



4 Challenges to Move the Needle

1. Perceived risk and threat to status quo
2. Limited patience for the long view and immersive study
3. Preference for tools/apps over deep thinking/analysis
4. Overcoming the "In Addition To" Syndrome

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