

# Practical Utility of Complex System Governance

**Chuck Keating, Ph.D.**

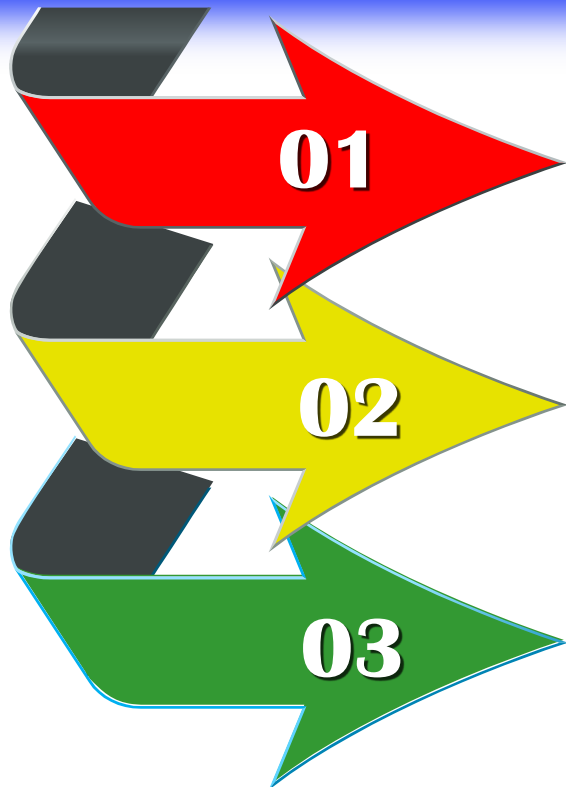
**November 6, 2020**



# ***Purpose and Scenarios***

**PURPOSE:** Explore 3 application scenarios to demonstrate practical utility of Complex System Governance as a response to increasingly complex systems and their problems

3 Scenarios



Workforce Capacity for dealing with complexity

System Failures resulting from flaws in governance functions

System Development investment of scarce resources

# 10 ways you do

Information  
support cons

Process for  
performance  
crises

Resol  
frequ  
temporary or p

Internal system  
factors,  
impede

Process for  
performance  
crises is inconsistent

## 10 REASONS Why System Governance Can Fail

... AND WHAT YOU CAN DO  
TO FIX IT!



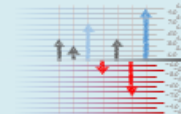
1) **Information flow does not support consistent decision and action**



Map information flows, mechanisms, and patterns related to support for analysis, decision, and evaluation



Assess information gaps and inconsistencies in appropriateness, accuracy, and accessibility



2) **Lack of coordination among entities produces uncertainty and incongruence**



Examine communication channels for their ability to dampen unnecessary oscillations with the system



Balance tensions between independence of system units and integration into the larger system



g, and

ination among  
uces uncertainty  
ence

ing and  
rrender to crisis  
responses

m development  
for near term  
demands

assessment, and  
environmental  
radic and ad hoc

nd monitoring  
strategic  
lacks emphasis

# ***Complex System Governance***

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

**(Keating, et al. 2014)**

# Cost Overrun

## Schedule Overrun

## OBSERVED FAILURE(s)

Missed  
Performance  
Target

4 High Employee Turnover

## UNOBSERVED FAILURE SOURCES

**Same underlying system pathology appears as ‘different’ surface issues** 

**Maps to Governance Functions**

The diagram illustrates a network of governance functions represented as nodes connected by lines. The nodes include:

- Mapping Monitoring (M0)
- Planning
- Learning
- Operations
- System Operations (M2)
- Environmental Scanning (M4)
- Strategic Planning & Performance (M1)
- Operational

The connections between these nodes represent the flow of information and coordination across different levels of the organization's governance structure.

[illegible]

**83 System Principles, Laws, Concepts**

The background image is a dense network diagram. It consists of many small, light-blue circular nodes arranged in a somewhat circular pattern. Each node is connected to several other nodes by thin, dark grey lines, creating a complex web of relationships. The nodes contain various terms related to systems thinking, such as 'sustainable environment', 'third cycle', 'transcendent', 'interior', 'capacity', 'least effort', 'patchiness', 'stability', 'phenomena', 'structures', 'environmental', 'reflexion', 'judgment', 'complexity', 'information', 'resilience', 'hierarchy', 'completeness', 'communication', 'control', 'morphology', 'ambiguity', 'diffusion', 'redundancy', 'potential', 'communication', 'control', 'morphology', 'ambiguity', 'diffusion'. The text '83 System Principles, Laws, Concepts' is superimposed in the center in a large, bold, red font.

[illegible]

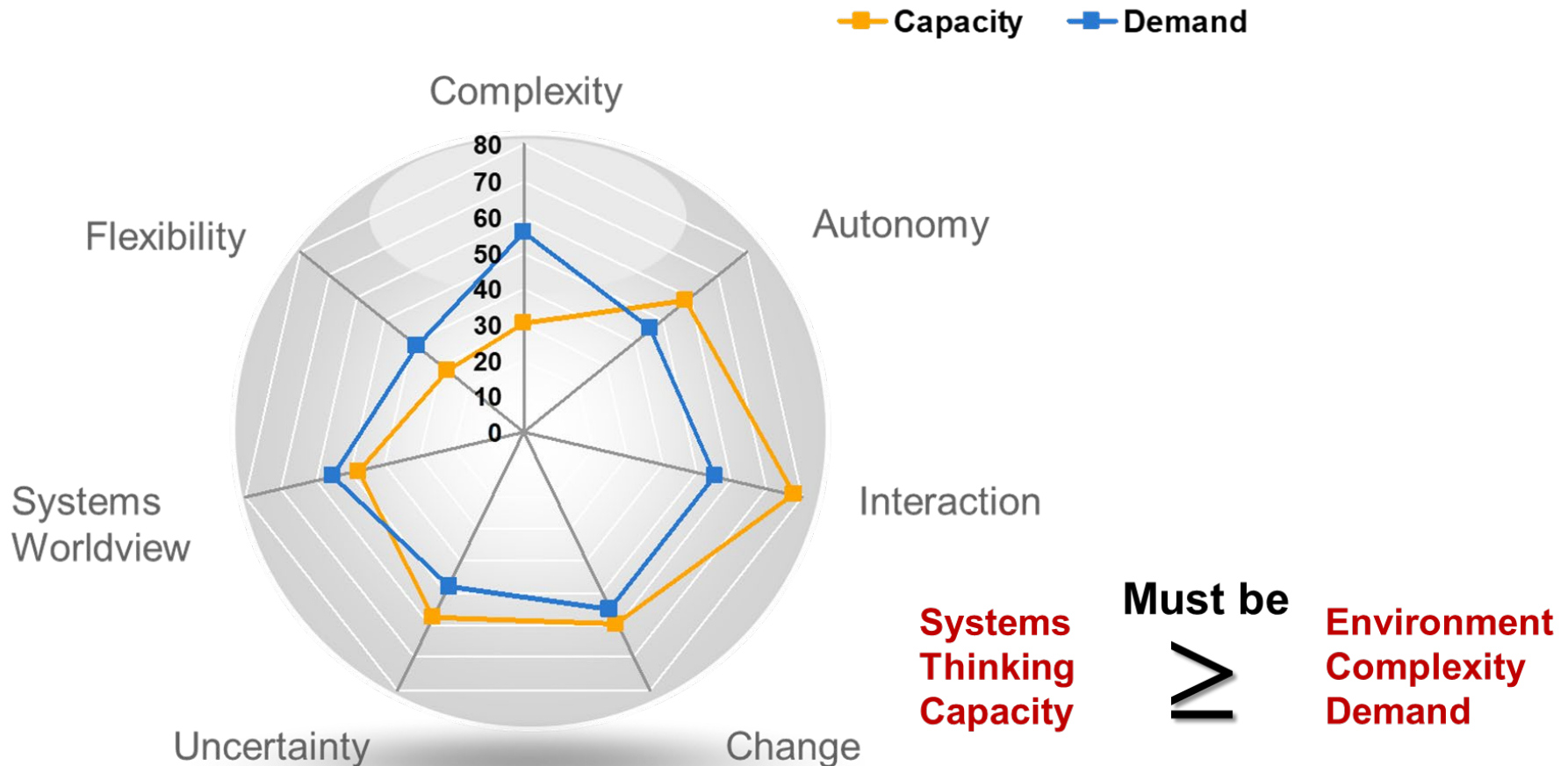
# Complex System Governance: Practical Utility



# Scenario 1: Workforce Capacity Sufficiency to Deal with Complexity

1

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

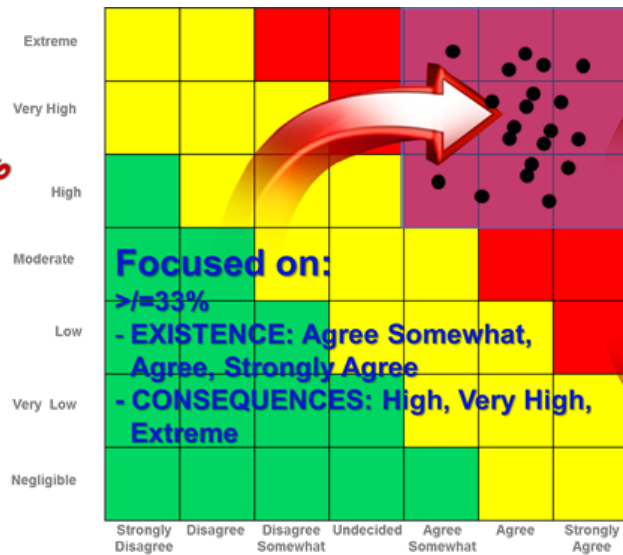


# Scenario 2: System Failures Resulting From Flaws in Governance Functions

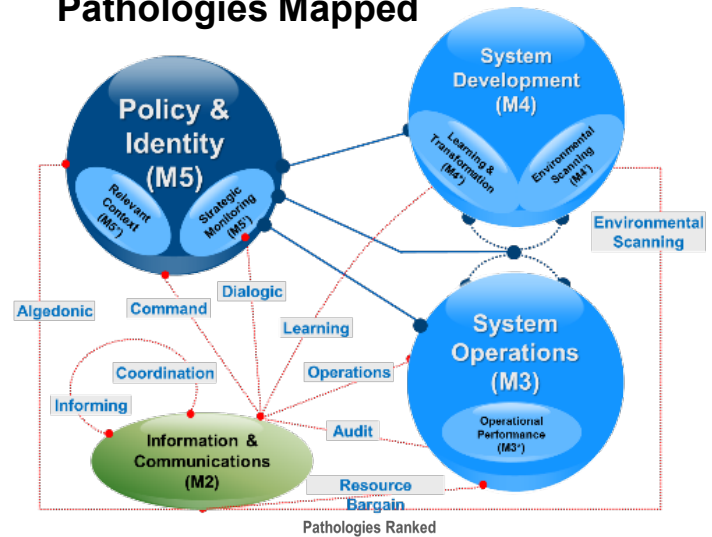
## 2

Identification, mapping, and prioritization of governance failure modes (pathologies)

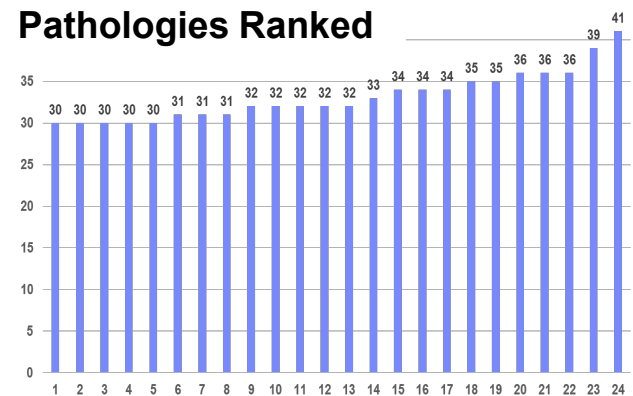
Pathologies Identified



Pathologies Mapped



Pathologies Ranked

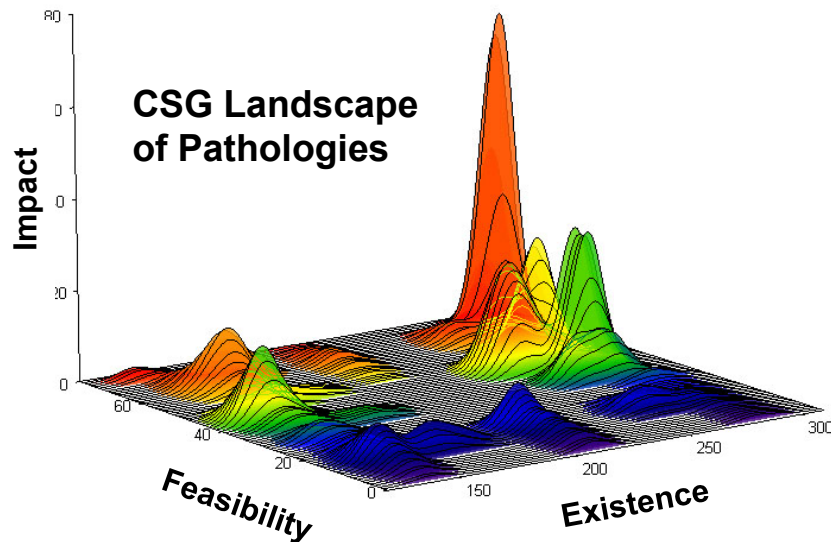




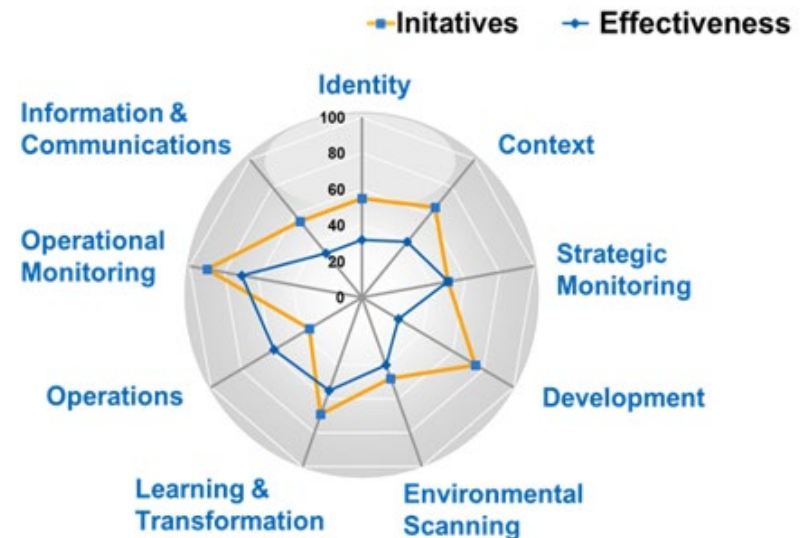
# Scenario 3: System Development reallocation of scarce resources

## 3 Definition of the CSG landscape of pathologies and mapping of initiatives against landscape

CSG Landscape Map to identify highest impact development areas.



## Governance Check Aggregate Profile



# 16 Point Complex System Governance Check for Jefferson Lab



**EMSE**  
Engineering Management and Systems Engineering



**NCSSSE**  
*National Centers for System of Systems Engineering*

# Open Discussion

