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System of Systems Navigator Foundations: The Dual Challenge

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Agenda

Systems of Systems and Their Issues

SoS Navigator Product Suite

SoS Navigator Foundations

Summary



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Systems of Systems and Their Issues

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Implications of Systems of Systems

Dynamism of the participating entities and the effects they are trying to achieve and the environment they are working in

- The participating organizations need agility along multiple dimensions
- The demand environment – where you're trying to have an effect – is at least as dynamic as the supplier environment

Autonomy of both the technical and organizational entities

- The organizations participating are not likely to be operating by the same rules—they have different, often incompatible, *governance frameworks*

Effects that cannot be generated from the designed repertoire of individual entities and are *only seen in the system of systems as a whole*

- Unanticipated behaviors could be positive or negative
- Impossible to trace the behavior back to a single entity

Common Issues in Dealing with SoS

No Global View

Unanticipated System Behaviors

Capabilities can't keep up with needs

Unknown Participants

Synchronization Challenges

Latent Incompatibilities

Latent Incompatibilities

"Common" Terms are understood differently



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SoS Navigator Product Suite

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SEI's SoS Navigator Product Suite

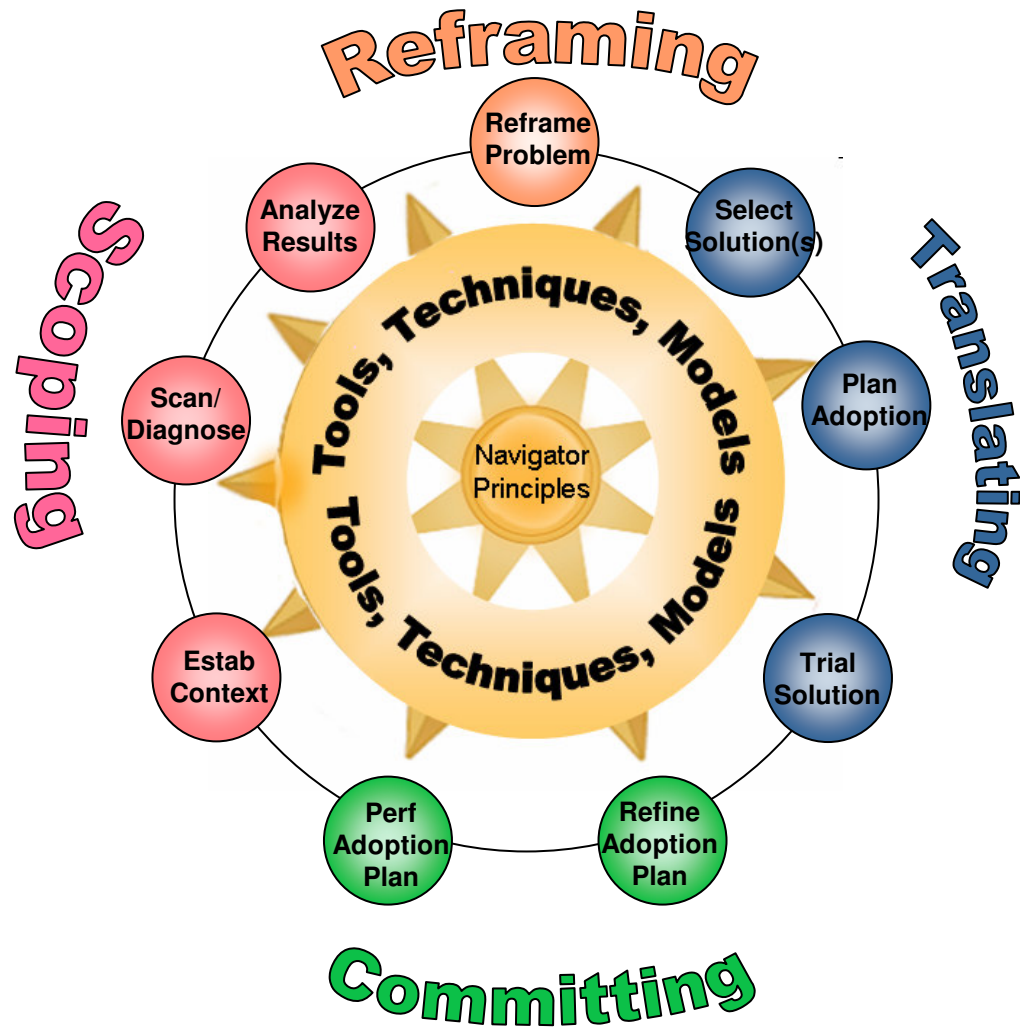
Dealing with Multiple Aspects of the SoS Challenges

SoS Navigator provides a context - sensitive approach to finding and introducing practices beneficial to working in a SoS context

SoS Navigator provides activities, tools and techniques to

- Understand how a stakeholder's context affects *and is affected by* their participation in a SoS
- Understand how the agility needed in a particular demand environment is constrained by the SoS approach being used
- Identify risks within a particular context to working in a SoS environment
- Prioritize multi-dimensional solutions to enhance chances of success
- Support the adoption of solutions recommended for a particular SoS environment

SoS Navigator Product Suite



SoS Navigator is scoped to deal with complex, multiple enterprise SoS contexts



The Three Areas of SoS Navigator

SoS Navigator Improvement Cycle

- A set of activities to guide organizations through diagnosing and characterizing complex SoS challenges, selecting and prioritizing solutions to meet them, and supporting those solutions with robust adoption guidance

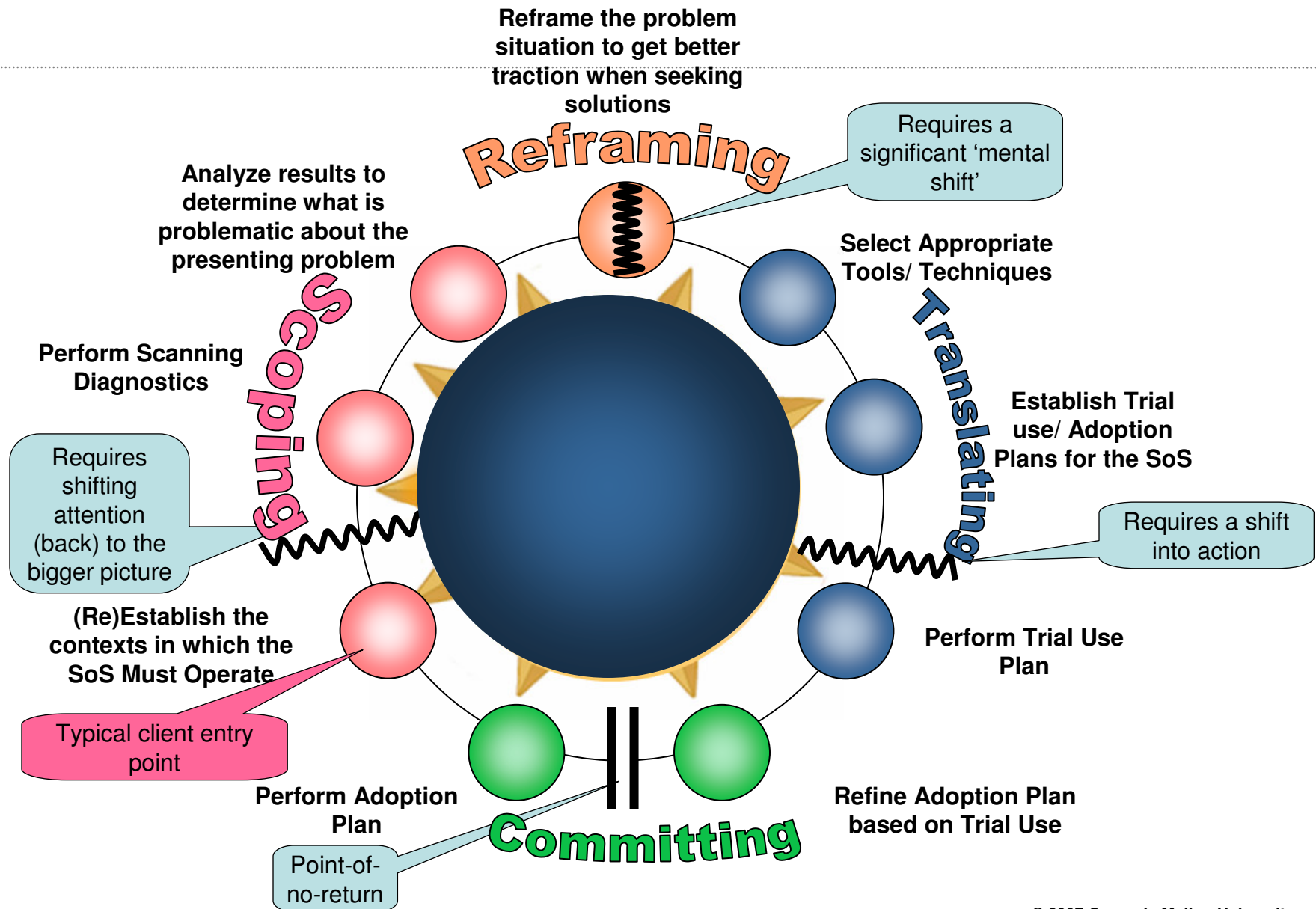
SoS Navigator Principles

- A set of SoS guiding principles used with SoS Navigator tools and techniques within the Navigator improvement cycle, that help organizations prioritize the changes they need to make to be more effective in their SoS context

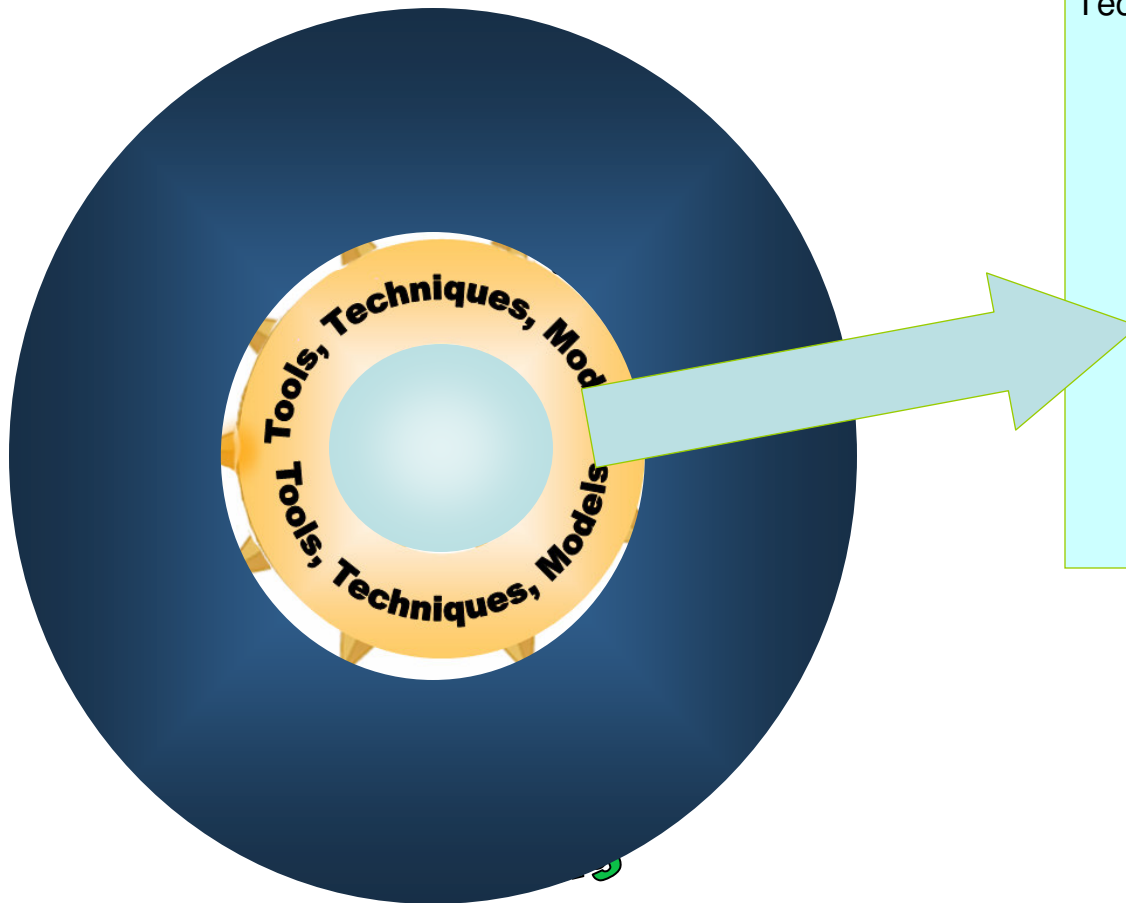
SoS Navigator Tools & Techniques

- A toolkit of tools and techniques that generally apply in multiple SoS contexts, particularly focused on scanning diagnostics and adoption support techniques tuned to systems of systems

Navigator Improvement Cycle



Navigator Tools, Techniques, & Models



Navigator's Tools & Techniques

- Draw from multiple bodies of knowledge
- Support moving through a Navigator improvement cycle
- Can be used independently or in conjunction with other tools/techniques (e.g. CMMI)
- Are consistent with Navigator Principles
- Will eventually include a library of models that represent emerging patterns in SoS

Currently Envisioned Tools for SoS Navigator (likely to change as we evolve)

Diagnostic/Prioritization Tools:

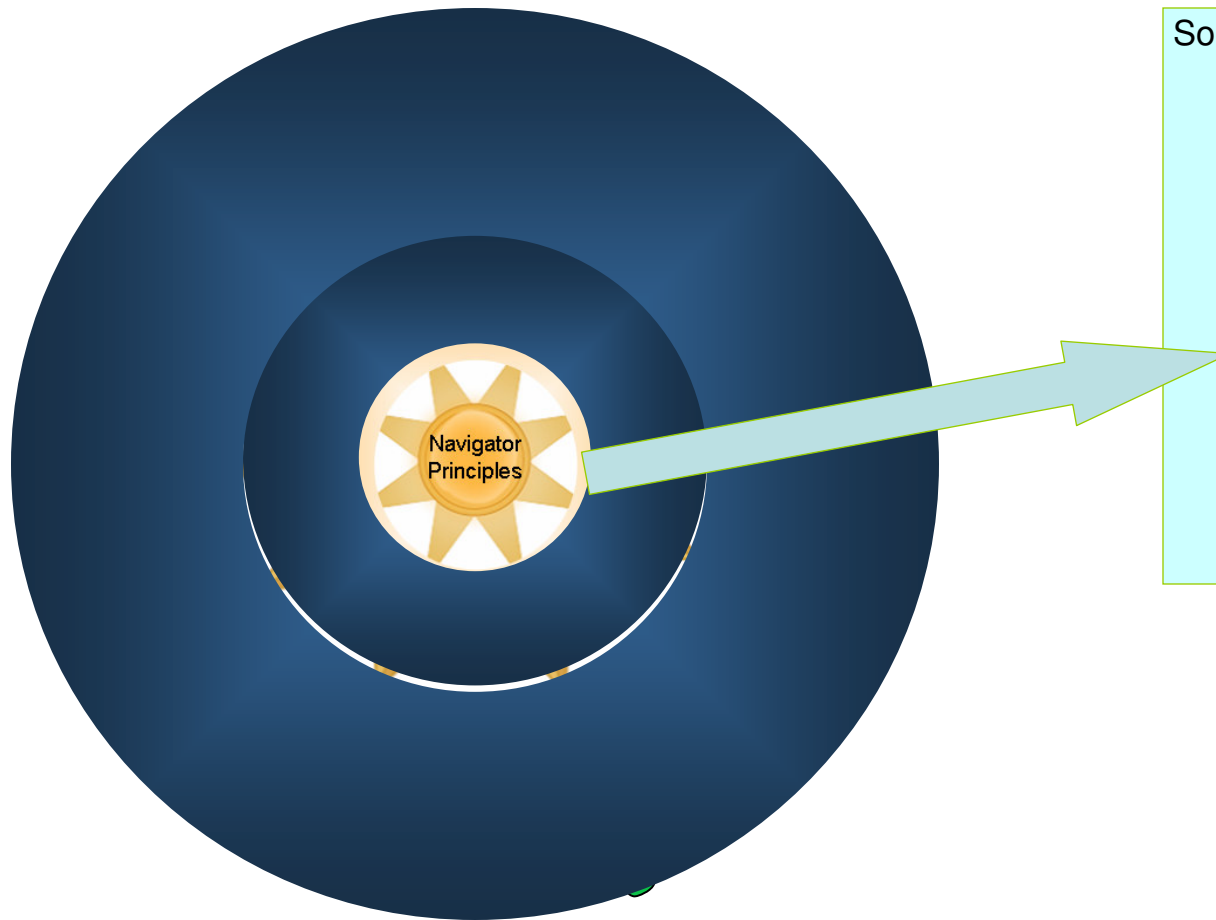
- Organization Scanning Diagnostics (avail for piloting)
- Organizational Modeling Diagnostics (IM, PAN, available for piloting)
- Risk Analysis (avail for piloting)

Adoption Support Tools:

- Scenario Generation to Support Shared Understanding of Purpose (avail for piloting)
- Piloting and Adoption Support Planning (avail now)
- Readiness/Fit Analysis (avail now)
- Adoption Measurement (avail for piloting)

These tools are supplemented by other tools and techniques that support specific practices (e.g. engineering-focused, governance-focused, acquisition-focused)

Navigator Principles



SoS Navigator's Principles

- Characterize different attributes of a SoS Context (i.e. "the double challenge")
- Support creating a profile of a SoS context
- Gaps between principles-in-use and Navigator principles are target areas for investigation
- Ultimately, Navigator principles layer could evolve into a catalog of recommended practices

Most of the rest of this presentation addresses foundational SoS principles that inform SoS Navigator



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SoS Navigator Foundations

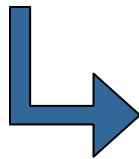
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Three Key Perspectives for Navigating Systems of Systems

Physical View
(product driven)



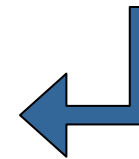
How do we get the platform with all the relevant bits and personnel in the right place at the right time and keep it there?



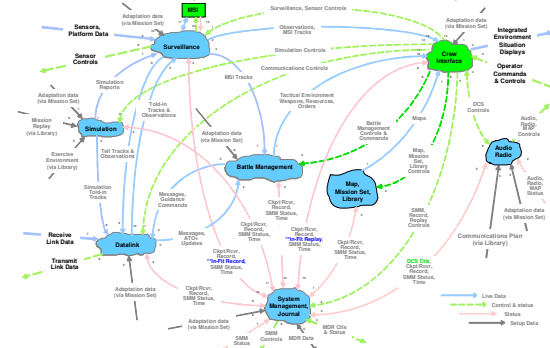
Effects-based View
(experience driven)



How do we draw upon the other two perspectives in support of generating desired operational effects.



Situational View
(solution driven)

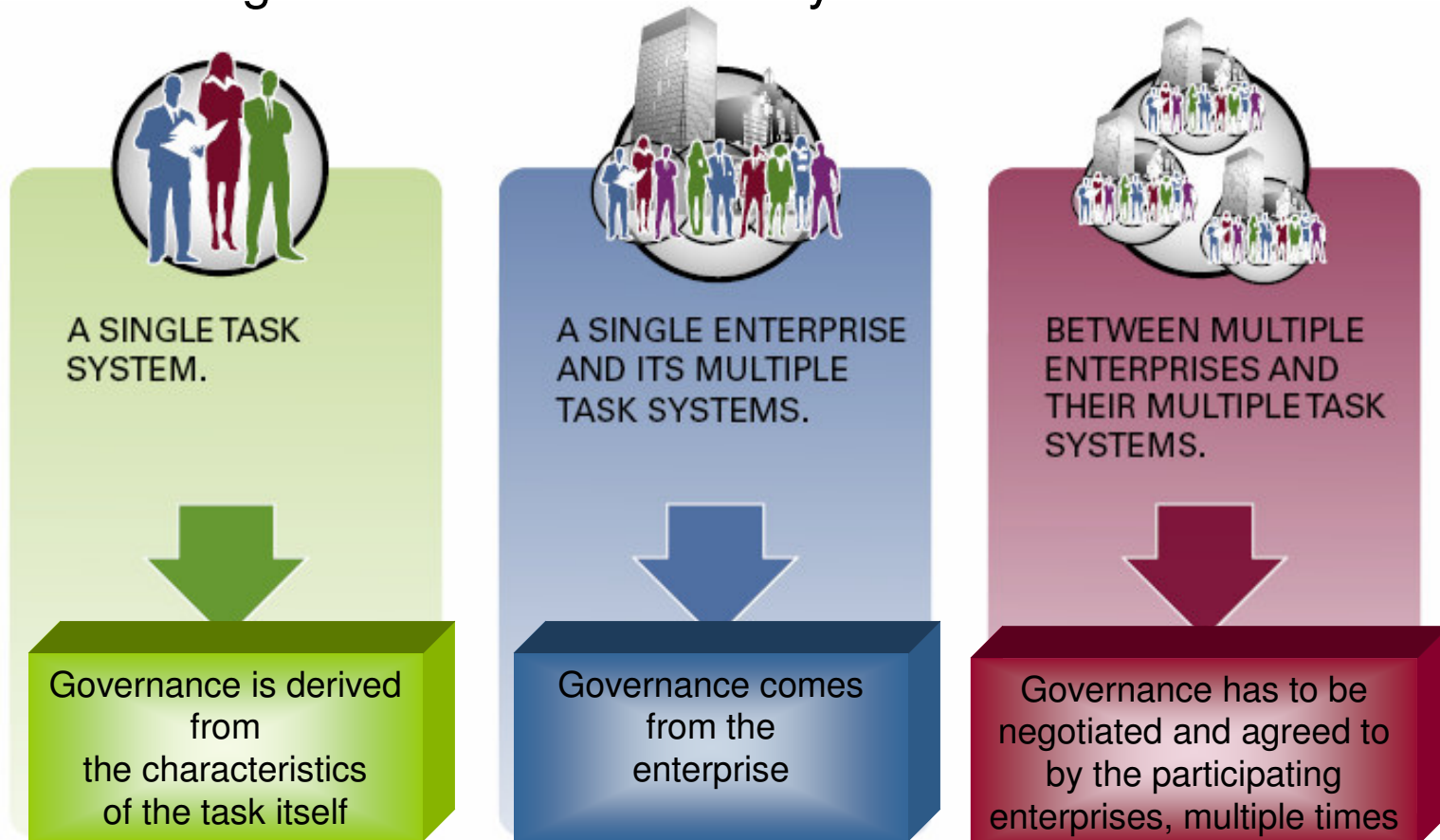


How do we get all the systems working together in such a way that the right pictures containing the right information can be put in front of the right decision-makers at the right time.

We have traditionally addressed Physical and Situational Views, but consistently ignore Effects-Based Views

Governance, Enterprises, and Conflict

Governance: the means by which an enterprise *secures the availability of capabilities* for its use when and where it needs them, including the decision making authorities and rules by which decisions are made



Where is Governance Needed?

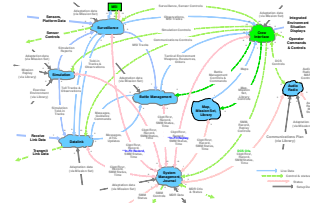
To direct how the bits, bytes and systems get the right capabilities to the right places at the right time and keep them there

I - Physical View



To direct how all the systems can work in concert to provide the right information to the right people at the right time

II - Situational View

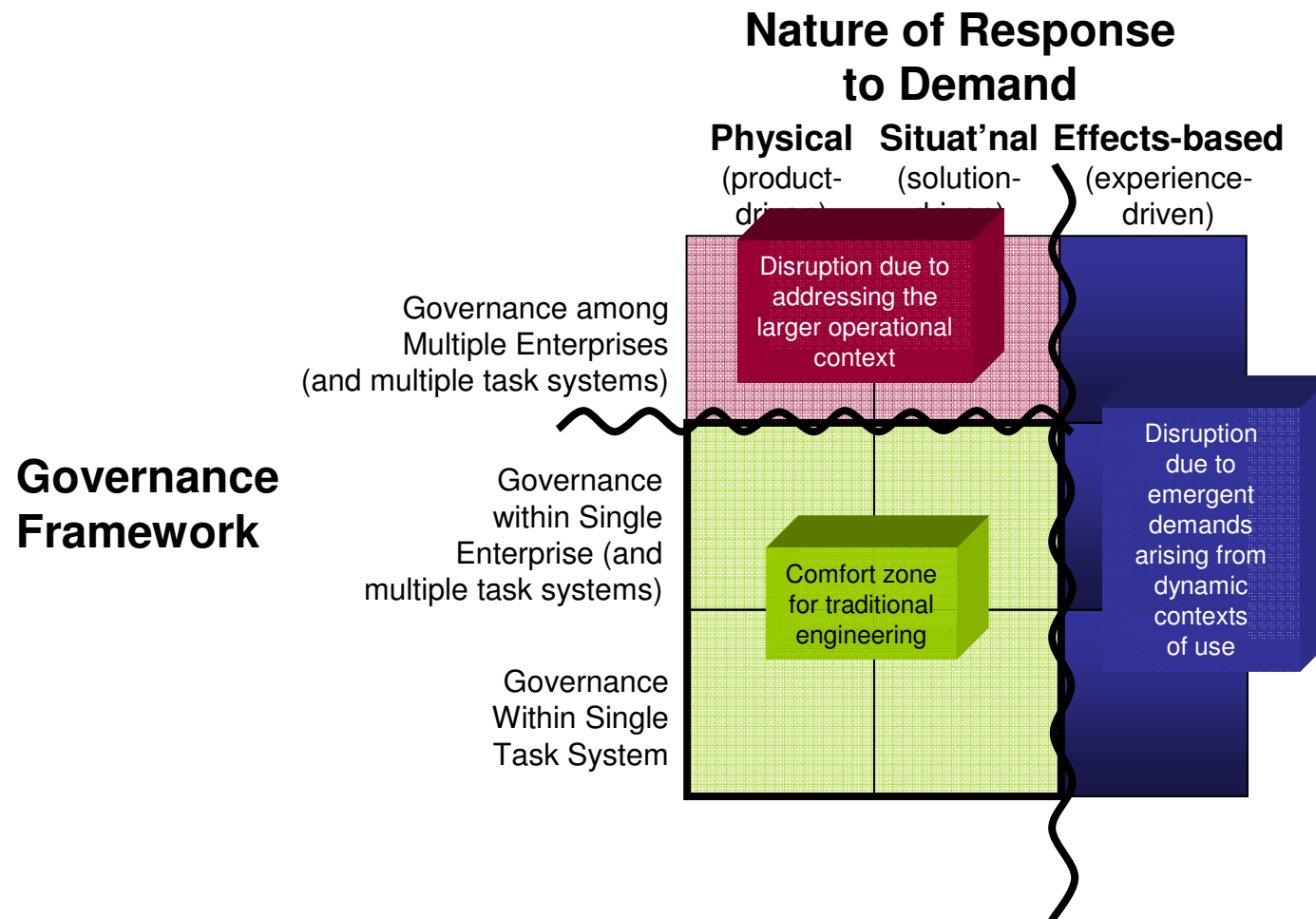


I - Effects-based View

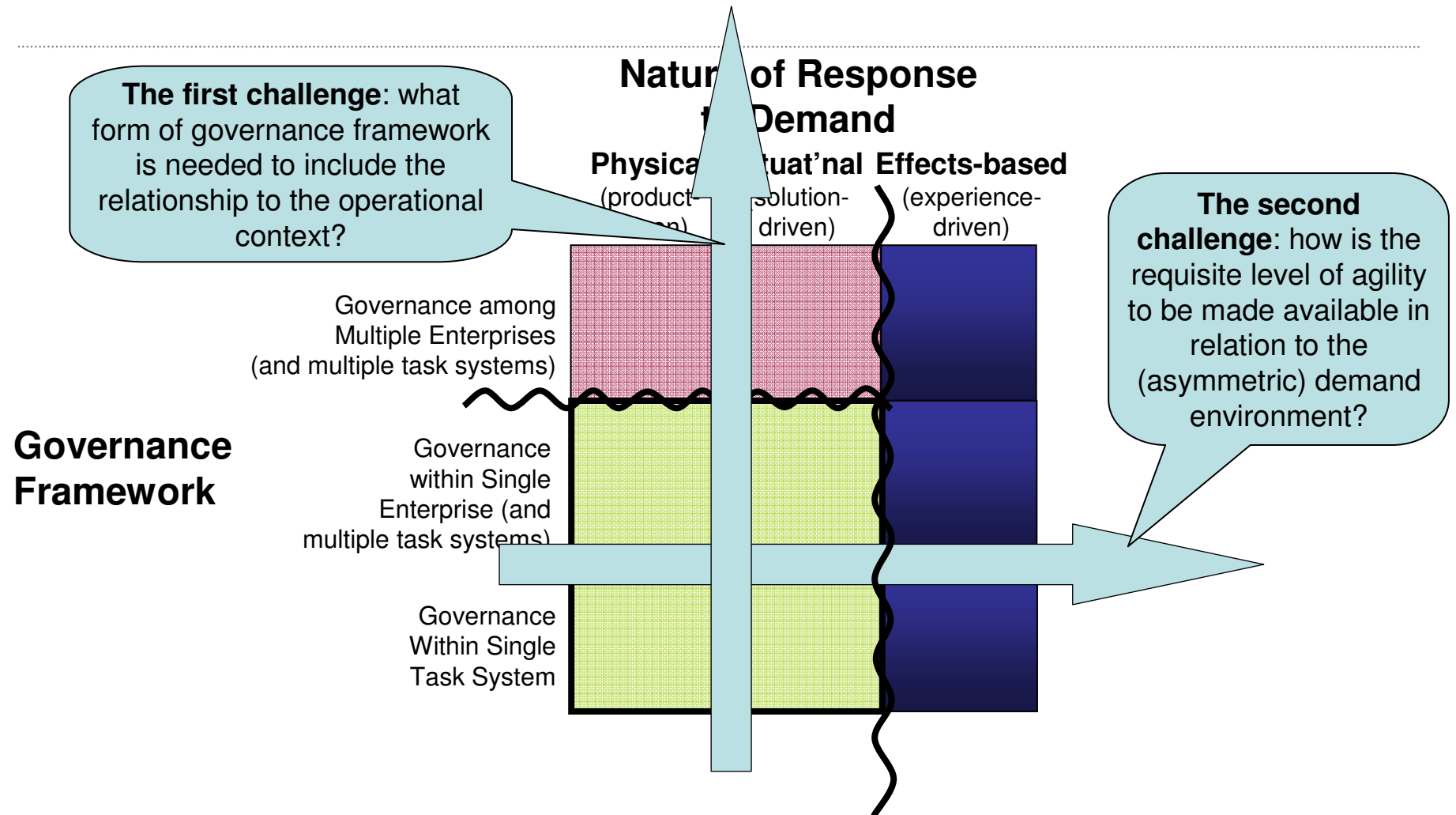


To direct how physical and capabilities views can be drawn on to support an *effects-based* view of achieving desired operational effects

Complex SoS Take Us Beyond Our Traditional Comfort Zone...



The 'double challenge'...





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Summary

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Intended Benefits of SoS Navigator

Tools and techniques based on SoS Navigator principles provide:

- Non-intuitive insights into ways your current strategy could be undermining your SoS efforts
- Tools and techniques to effectively communicate “the new reality” to your leadership and management staff
- Insights into how current practices and structures impact your ability to serve the dynamic environments you’re interacting with
- Tools and techniques to help you successfully adopt new practices to support your system of systems efforts
- Ways of describing your evolving, dynamic environment and relating them to the SoS participants that you’re working with

These can be used within an improvement cycle tuned to the unique challenges of complex systems of systems

How to Engage with SoS Navigator

The SoS Navigator team is looking for:

- Case study sites where effective SoS approaches are being used
 - To cull practice patterns and validate Navigator principles
- Pilot sites for Navigator's improvement cycle and tools and techniques
 - Long term engagements that allow us to exercise multiple elements of the improvement cycle and multiple tools/techniques are especially useful
- Affiliates willing to work closely with us (at least 50% Full Time Equivalent) to evolve SoS Navigator concepts, tools, techniques, and models

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Acronyms

SoS: System of Systems

IT: Information Technology

CMMI: Capability Maturity Model Integrated

IM: Influence Map

PAN: Projective ANalysis