Changing the value equation in engineering and acquisition to align systems of systems with dynamic mission needs: *The Value Stairs*

Philip Boxer, Suzanne Garcia, William Anderson, Pat Kirwan

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Agenda

- The demand for agility
- Managing alignment
- Creating value for the defense enterprise
- Changing the value equation

Modernization AND Stability/Counterinsurgency

I've spent much of the last year talking about irregular or asymmetric warfare, and making the argument in favor of institutionalizing counterinsurgency skills, and our ability to conduct stability and support operations.

The need for the state of the art systems – particularly longer range capabilities – will never go away, as we strive to offset the countermeasures being developed by other nations. But at a certain point, given the types of situations we are likely to face, it begs the question whether specialized, often relatively low-tech equipment for stability and counterinsurgency missions is also needed.

- **How do we institutionalize procurement of such capabilities – and the ability to get them fielded quickly?**
- **Why do we have to go outside the normal bureaucratic process** to develop counter-IED technologies, to build MRAPs, and to quickly expand our ISR capability? In short, why did we have to bypass existing institutions and procedures to get the capabilities we need to protect our troops and pursue the wars we are in?

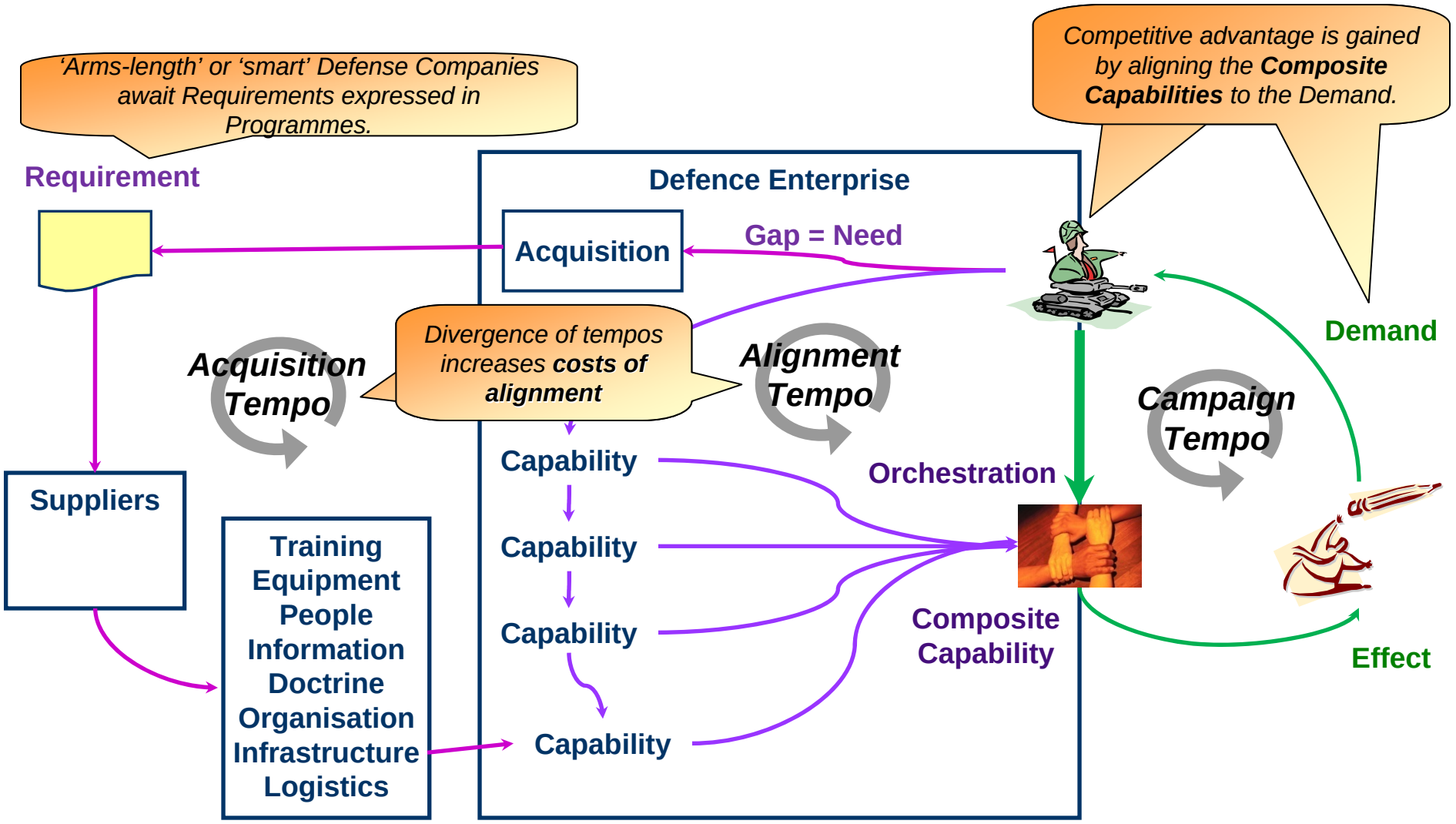
Our conventional modernization programs seek a 99 percent solution in years. Stability and counterinsurgency missions – the wars we are in – require 75 percent solutions in months.

- **The challenge is whether in our bureaucracy and in our minds these two different paradigms can be made to coexist.**
- The issue then becomes how we build this kind of innovative thinking and flexibility into our rigid procurement processes here at home. **The key is to make sure that the strategy and risk assessment drives the procurement, rather than the other way around**.

I believe we must do this. The two models can – and do – coexist.

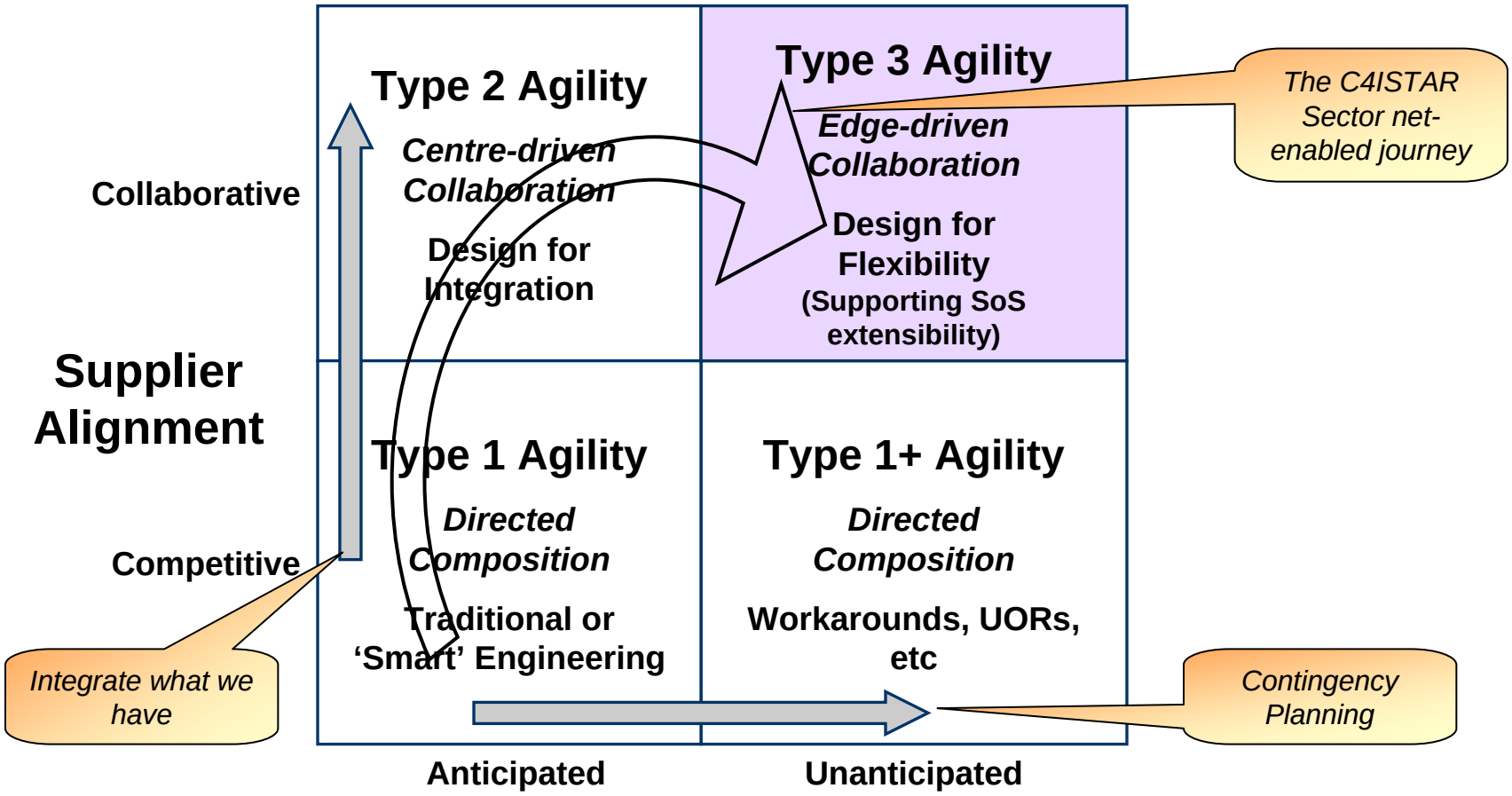
Extracted from speech delivered by Secretary of Defense Robert M. Gates, National Defense University, Washington, D.C. September 29, 2008
http://www.defenselink.mil/speeches/speech.aspx?speechid=1279

There are three diverging tempos



Adapted from: *Appropriate Collaboration and Appropriate Competition in C4ISTAR Transformation*, Dr Nicholas Whittall RUSI 2007

The divergence of tempos challenges the supplier to support Type III Agility



Derived from 'The Double Challenge', in Boxer, P.J. et al. (2008) *SoS Navigator 2.0: A Context-Based Approach to System-of-Systems Challenges* (CMU/SEI-2008-TN-001). Software Engineering Institute, Carnegie Mellon University, 2008. http://www.sei.cmu.edu/publications/documents/08.reports/08tn001.html

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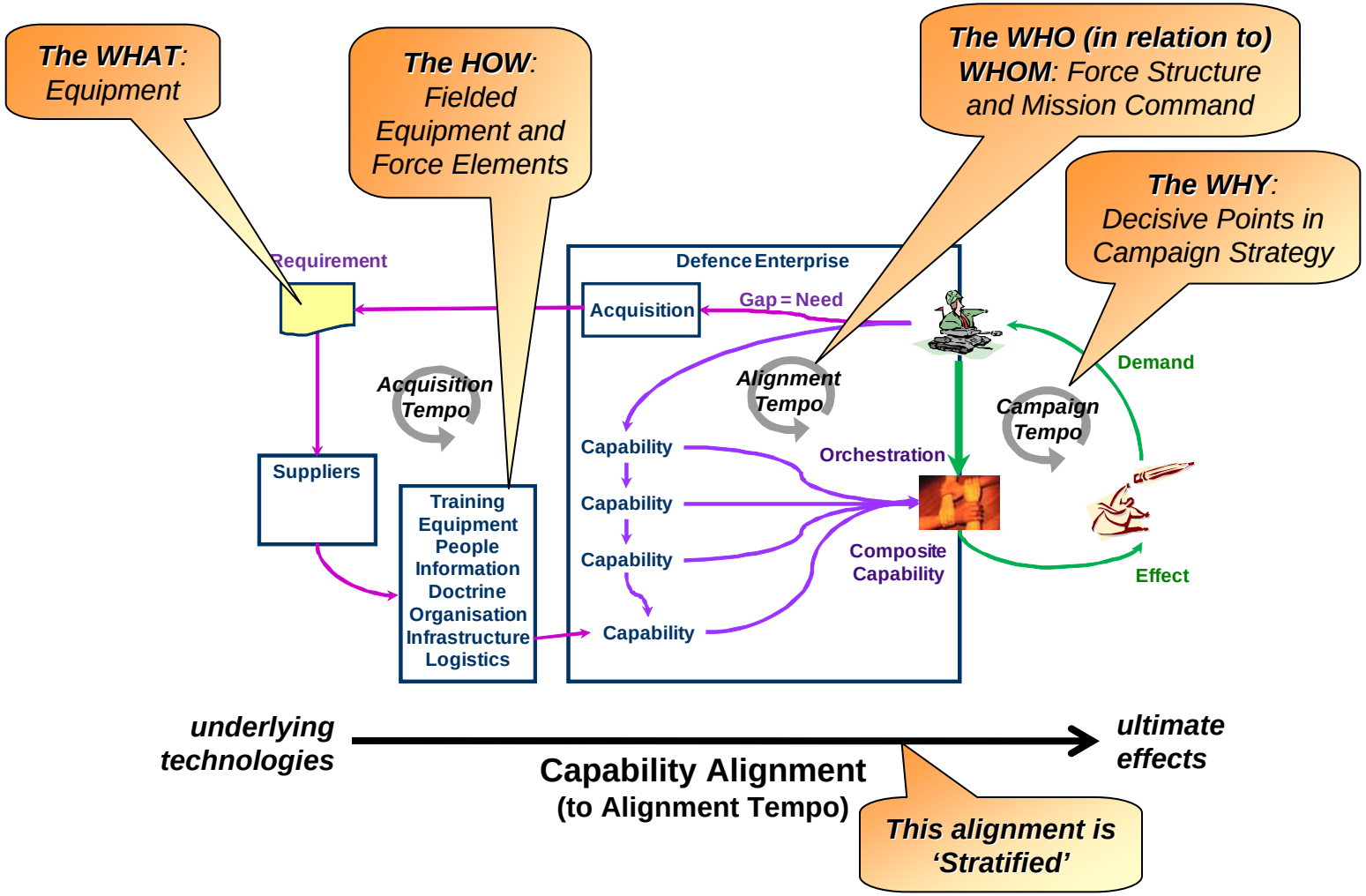
The approach to alignment is ‘stratified’



The divergence of these tempos creates new challenges for the Defense Enterprise

The Zachman framework assumes a static definition of the Enterprise

Supplier Alignment (to Acquisition Tempo)

Supplier Alignment	Anticipated	Unanticipated
Collaborative	**Type 2 Agility** *Centre-driven Collaboration* Design for Integration	**Type 3 Agility** *Edge-driven Collaboration* Design for Flexibility (Supporting SoS extensibility)
Competitive	**Type 1 Agility** *Directed Composition* Traditional or 'Smart' Engineering	**Type 1+ Agility** *Directed Composition* Workarounds, UORs, etc

Operational Alignment

What kinds of agility are needed from suppliers?

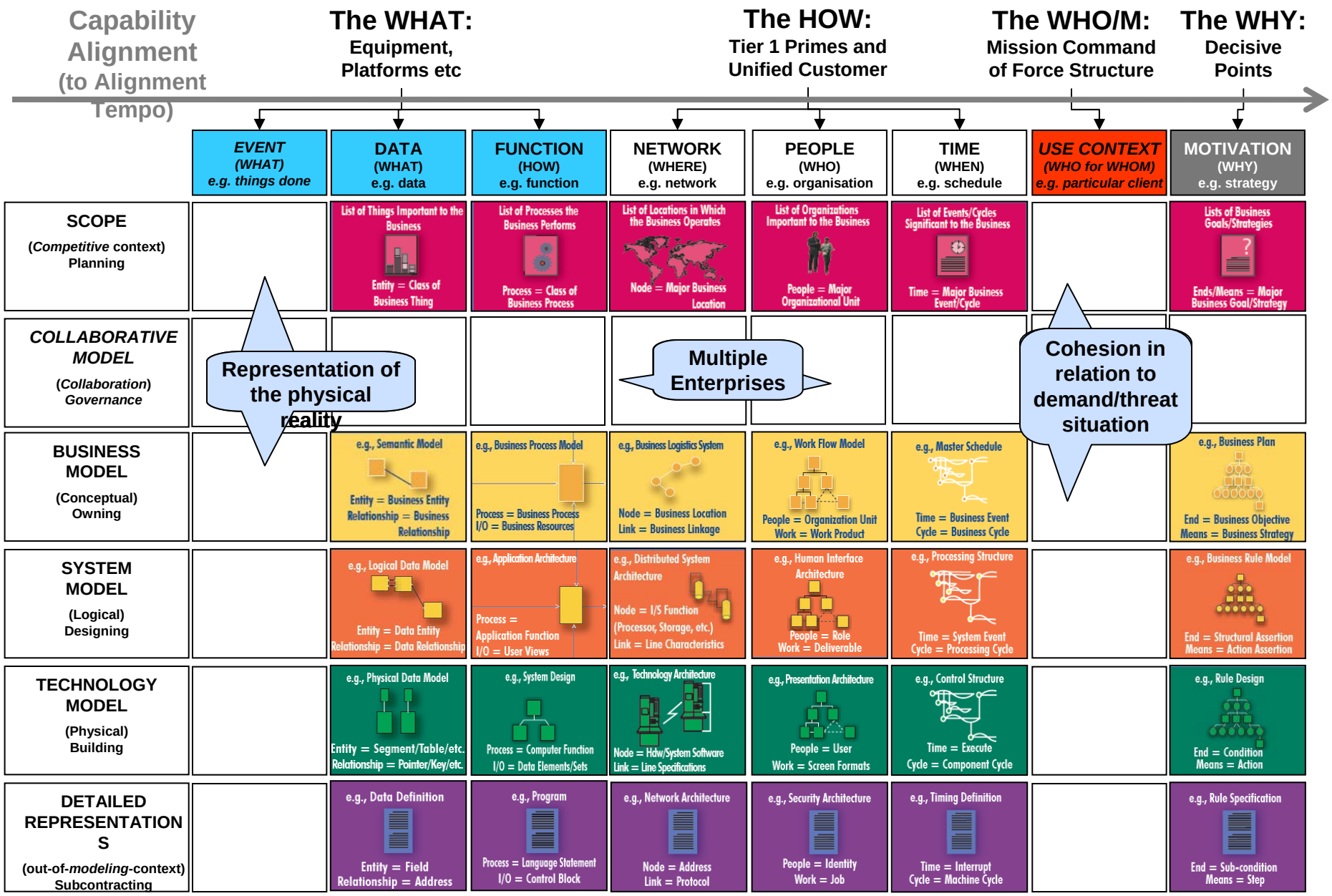
Operational Alignment (to Campaign Tempo)

Where does the role of the supplier fit in?

Capability Alignment (to Alignment Tempo)

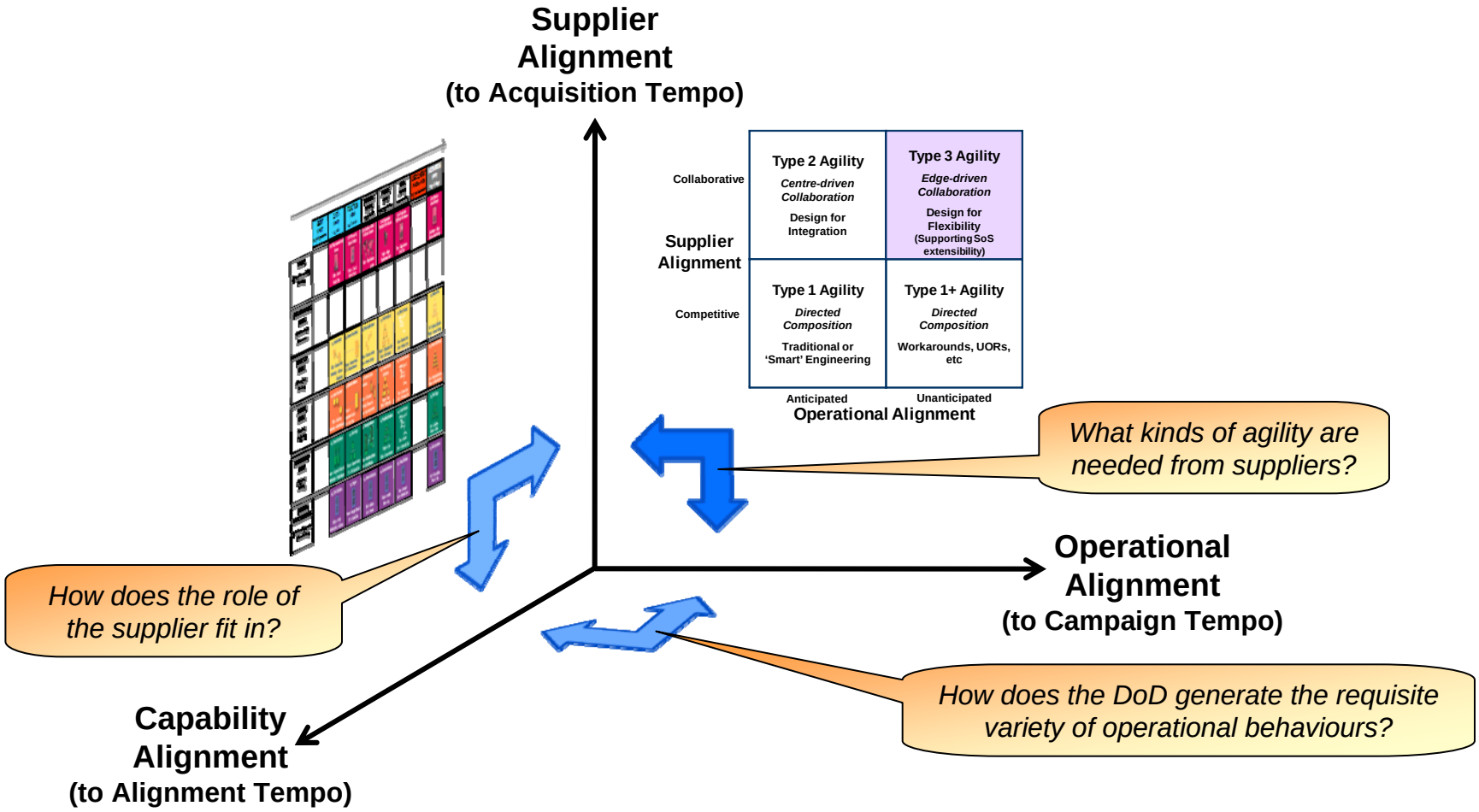
?

What kinds of value equation are involved here?



Source of coloured squares: Zachman Framework, www.zifa.com

The divergence of these tempos creates new challenges* for the Defense Enterprise



* For more on these, see Boxer, P.J. (2008) *SoS Navigator Principles for Sustaining Dynamic Alignment: The Example of U. S. Army Acquisition Strategies and Operational Realities*, Special Report, Software Engineering Institute, Carnegie Mellon University, CMU/SEI-2008-SR-027, September 2008

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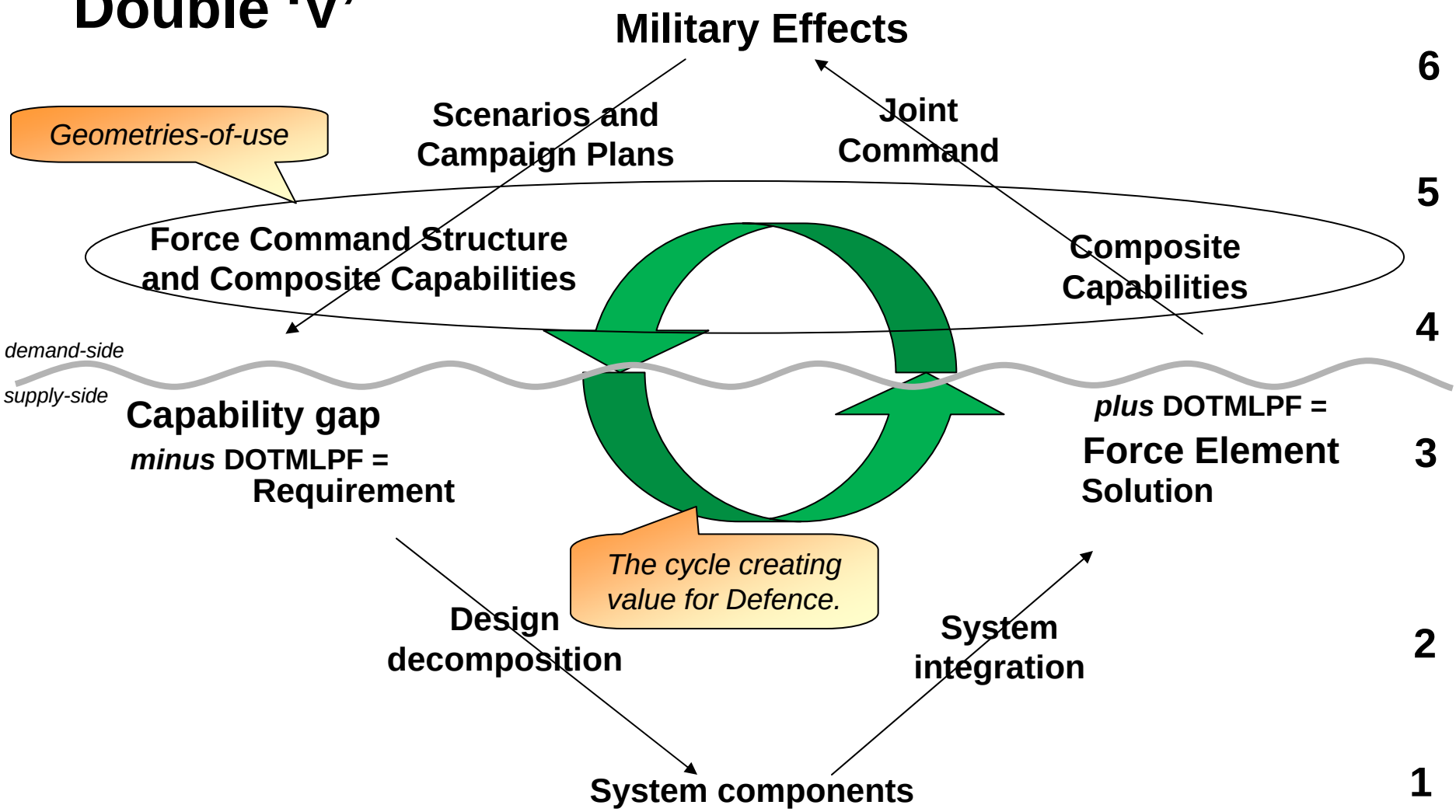
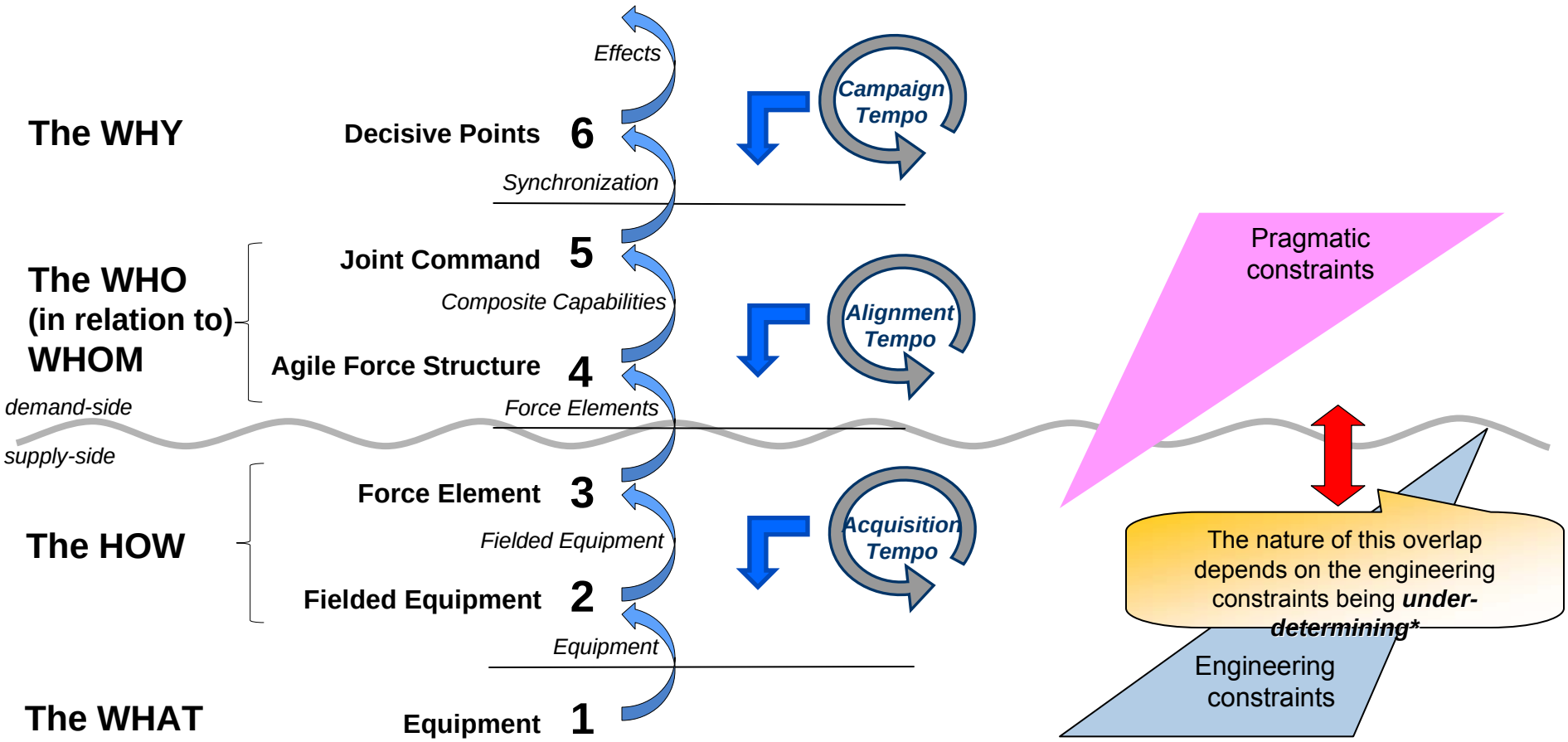
Value for Defense comes from managing a Double 'V'



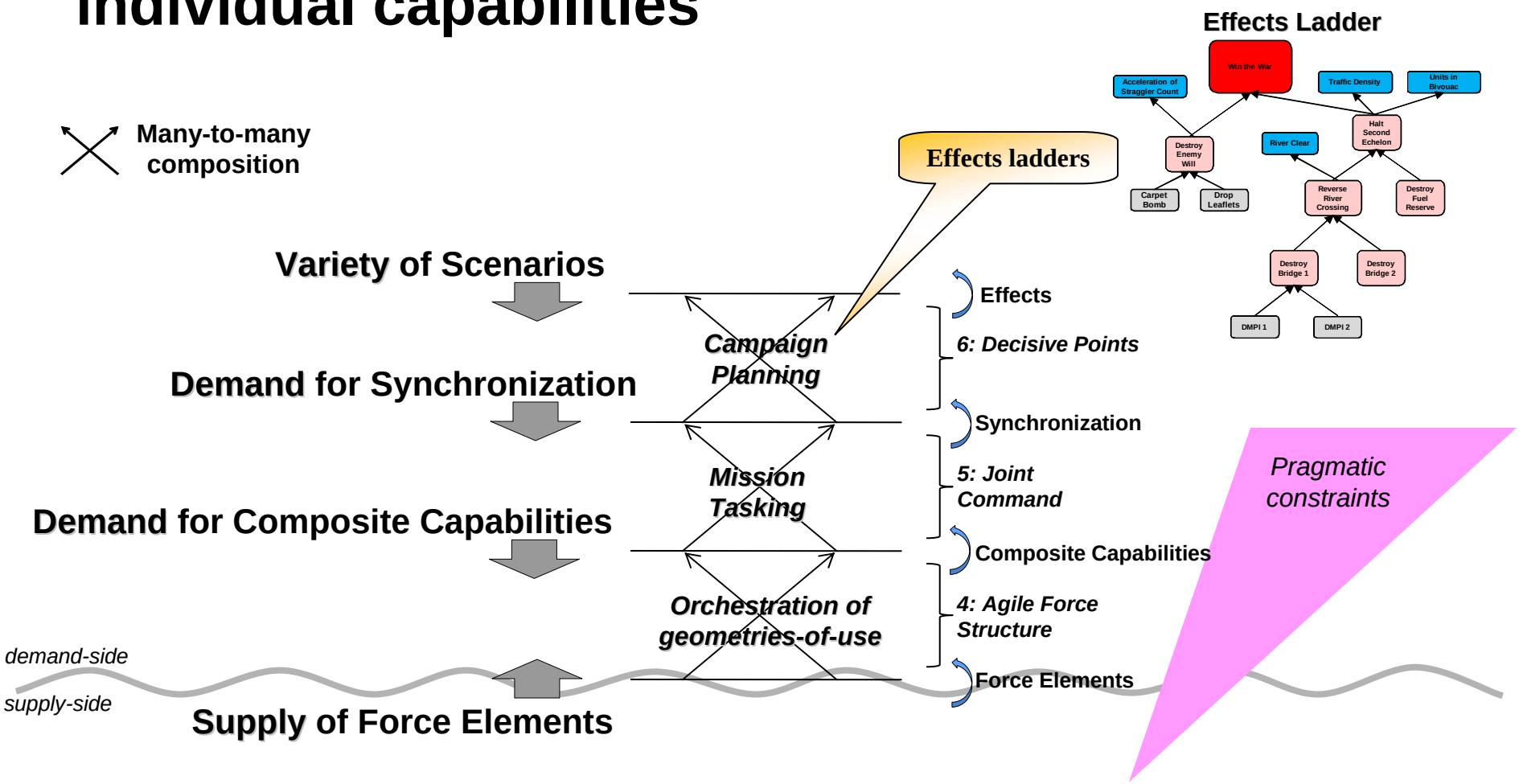
Boxer, P.J. (2007) *Managing the SoS Value Cycle*, January 2007, http://www.asymmetricdesign.com/archives/85

This double ‘V’ is layered, spanning the three different kinds of tempo



* Boxer, P.J. (2008) *Framework Architectures*, Navigator White Paper, Software Engineering Institute, Carnegie Mellon University, June 2008

These contexts-of-use have to be related to the individual capabilities

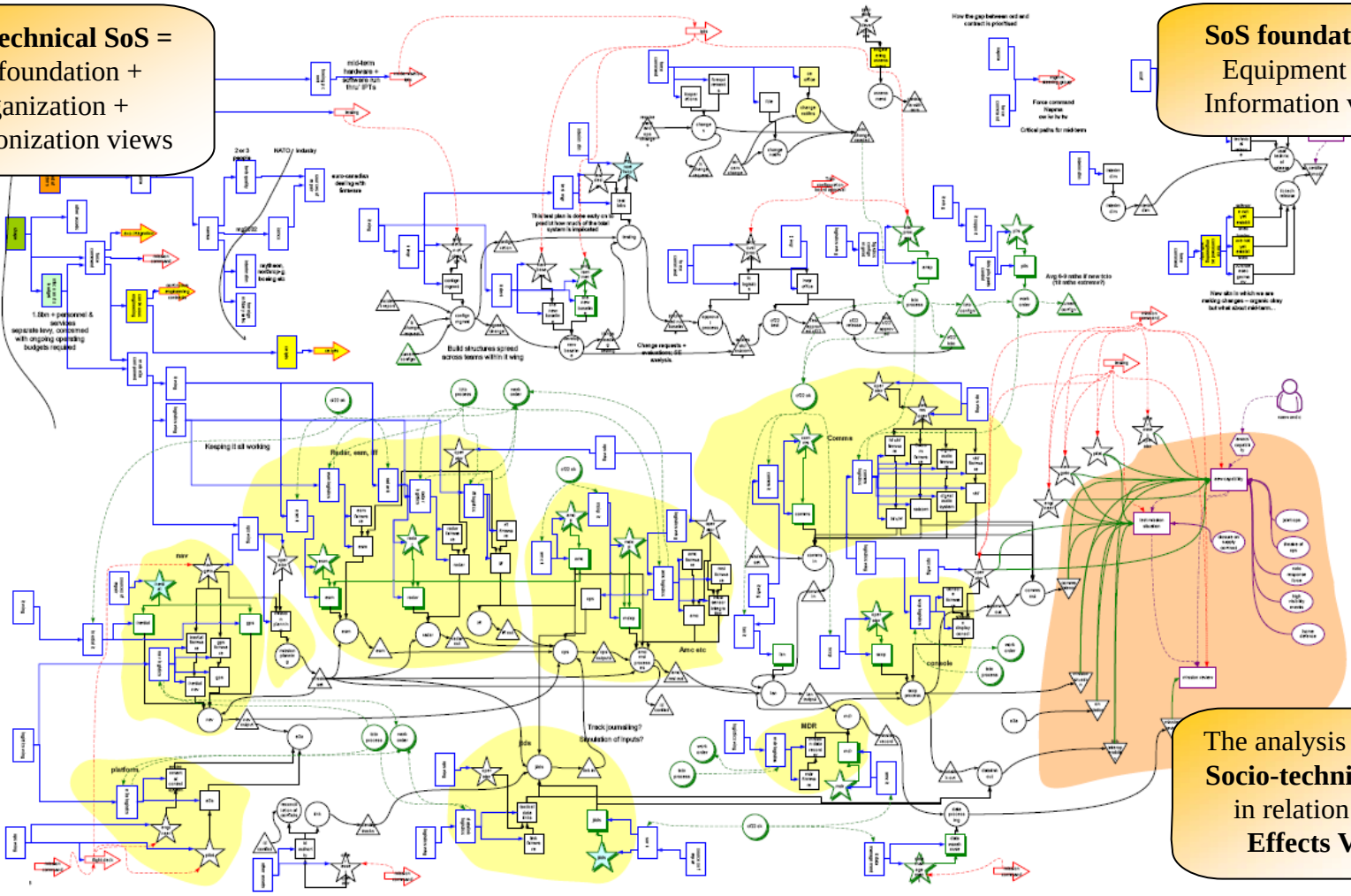


Boxer, P.J. et al (2008) "*Systems-of-Systems Engineering and the Pragmatics of Demand*," Proceedings of the Second Annual IEEE Systems Conference pp107. Montréal, Québec, Canada, April 7−10, 2008. IEEE, 2008. http://www.ieeexplore.ieee.org/xpl/freeabs_all.jsp?isnumber=4518971&arnumber=4519030&count=89&index=58

Adding the socio-technical perspective in relation to demand extends the analytical space

Socio-technical SoS =
SoS foundation +
Organization +
Synchronization views

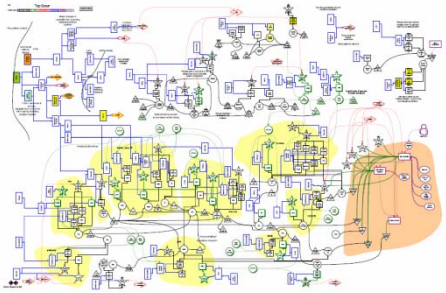
SoS foundation =
Equipment and
Information views



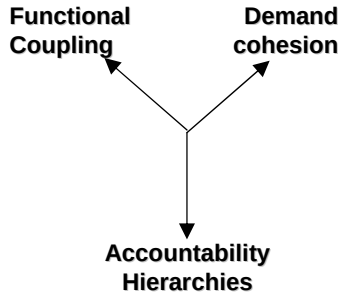
The analysis puts the **Socio-technical SoS** in relation to an **Effects View**

This leads to a different kind of analysis of interoperability…

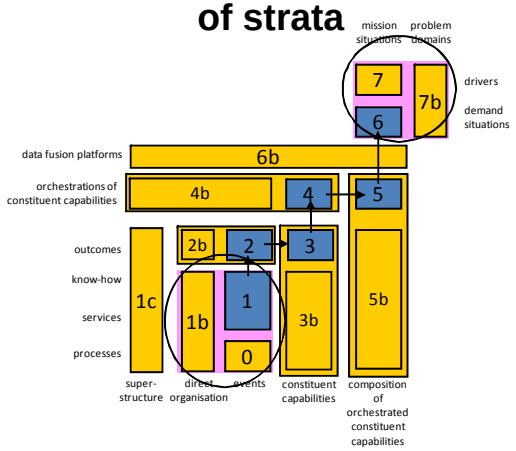
Socio-technical SoS in relation to Demand



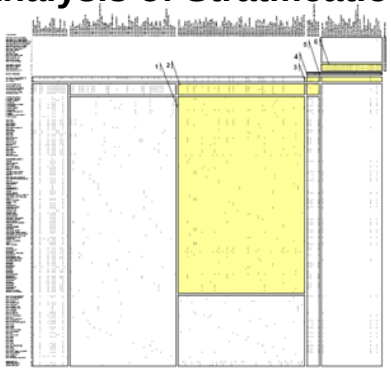
Distinguishing three different kinds of path



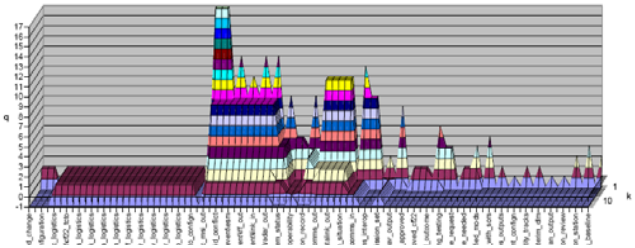
Analyzing alignment of strata



Analysis of Stratification



Identifying Interoperability Gaps in the different strata



Source: Anderson, Boxer & Browsword (2006) *An Examination of a Structural Modeling Risk Probe Technique*, Special Report, Software Engineering Institute, Carnegie Mellon University, CMU/SEI-2006-SR-017, October 2006. http://www.sei.cmu.edu/publications/documents/06.reports/06sr017.html

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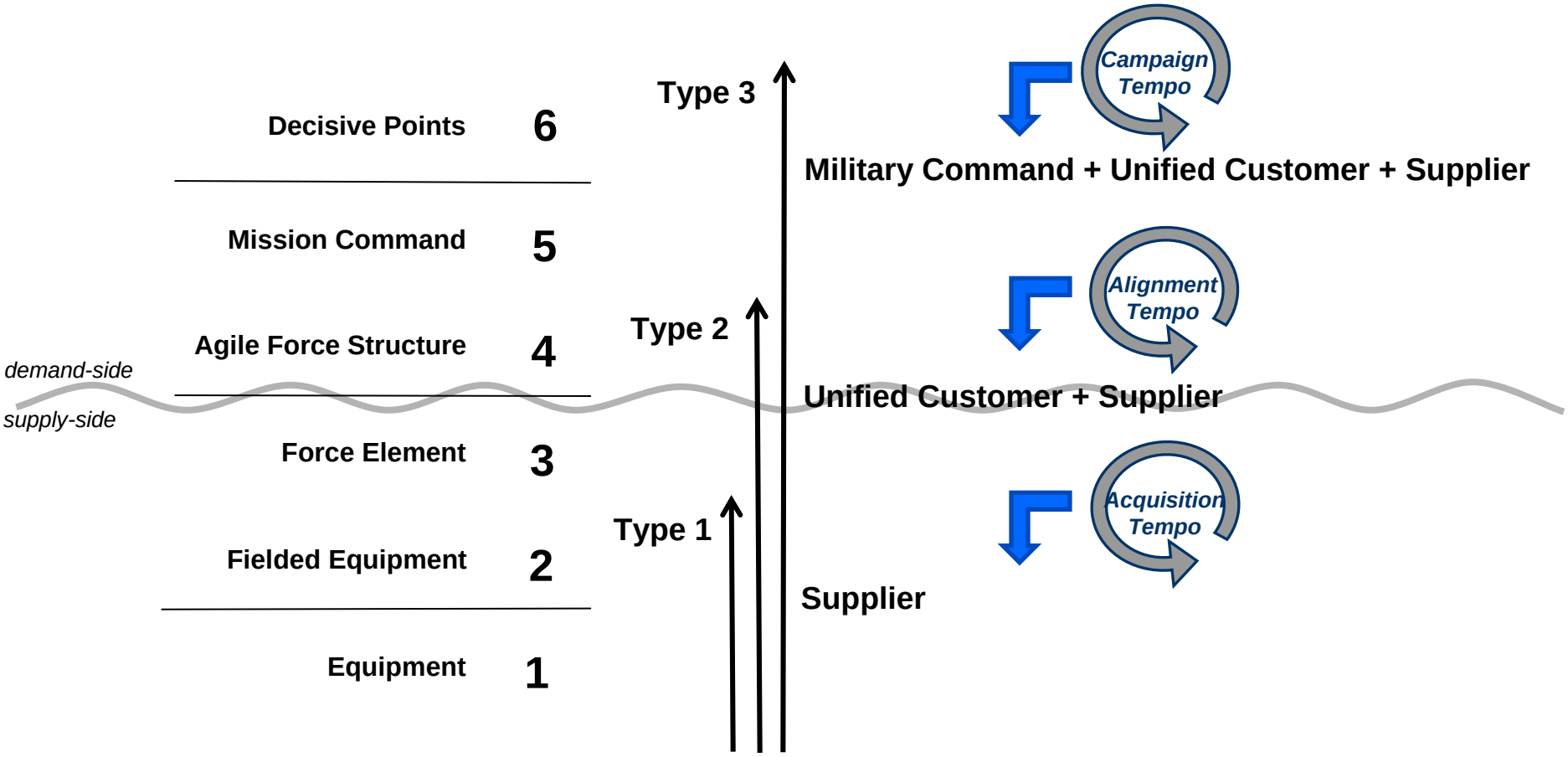
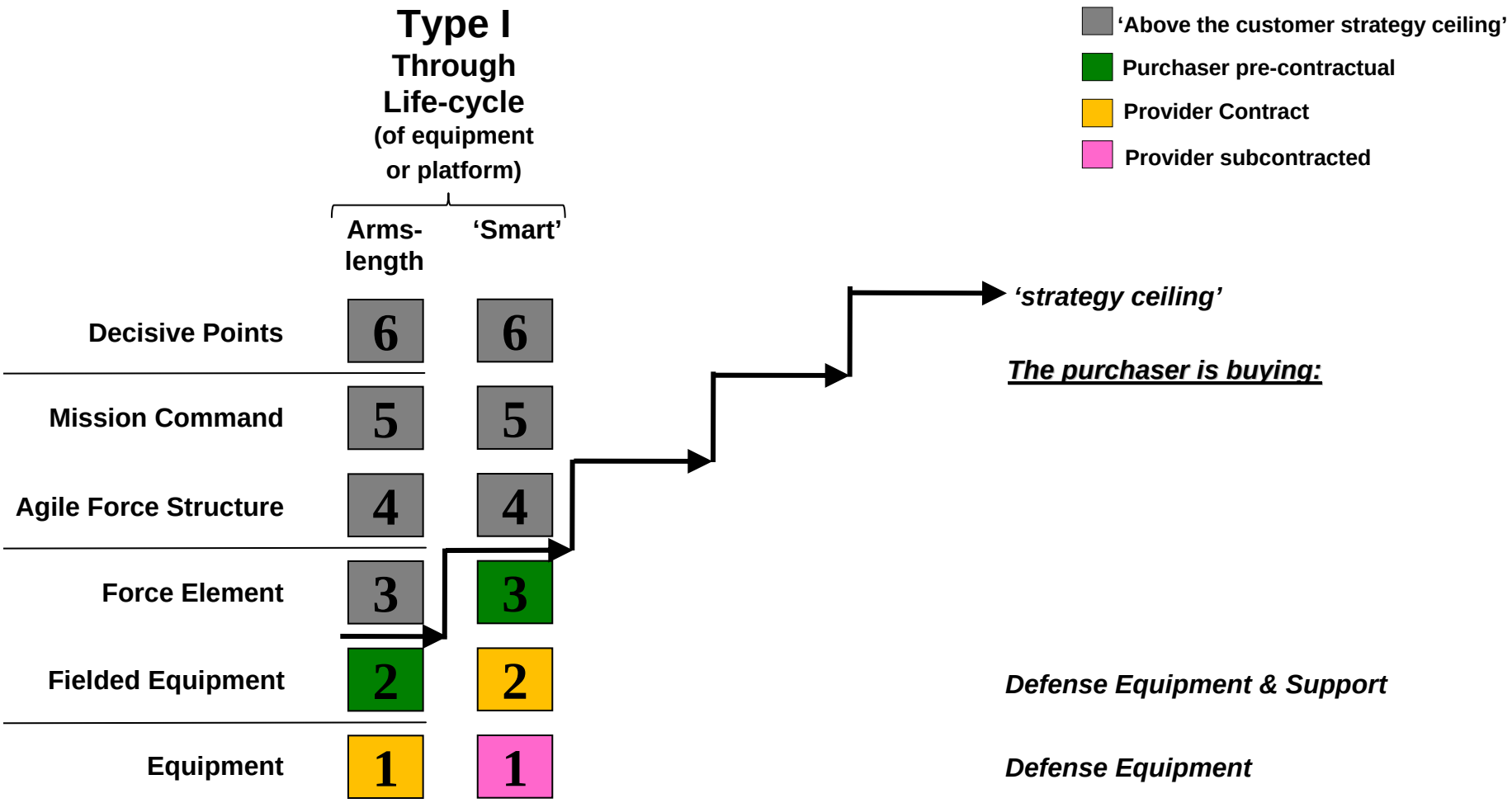
➪ Changing the value equation

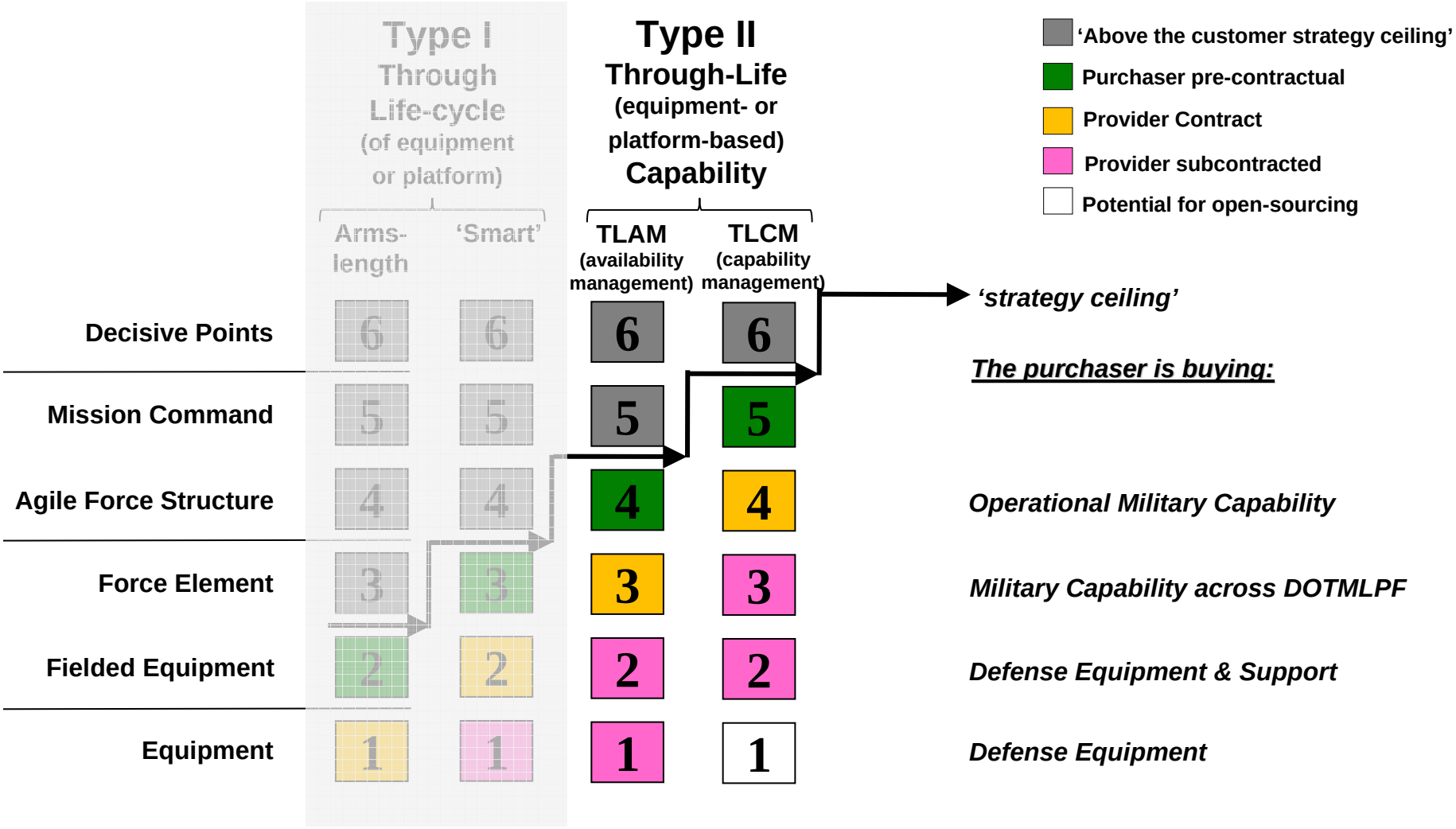
Spanning the layers means managing different kinds of value equations



The Value Stairs: a progressive development of the value equation model

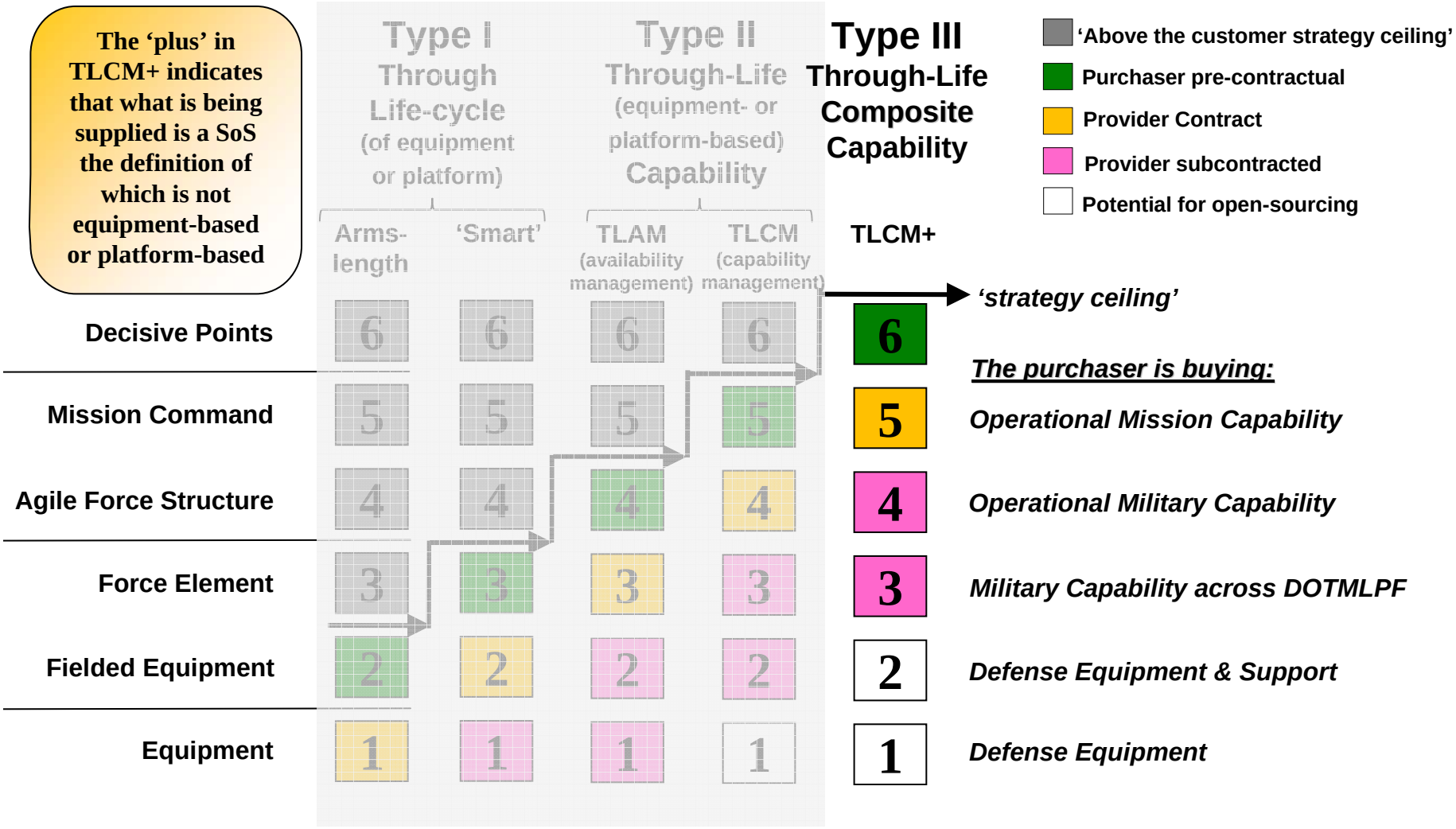


The Value Stairs: a progressive development of the value equation model

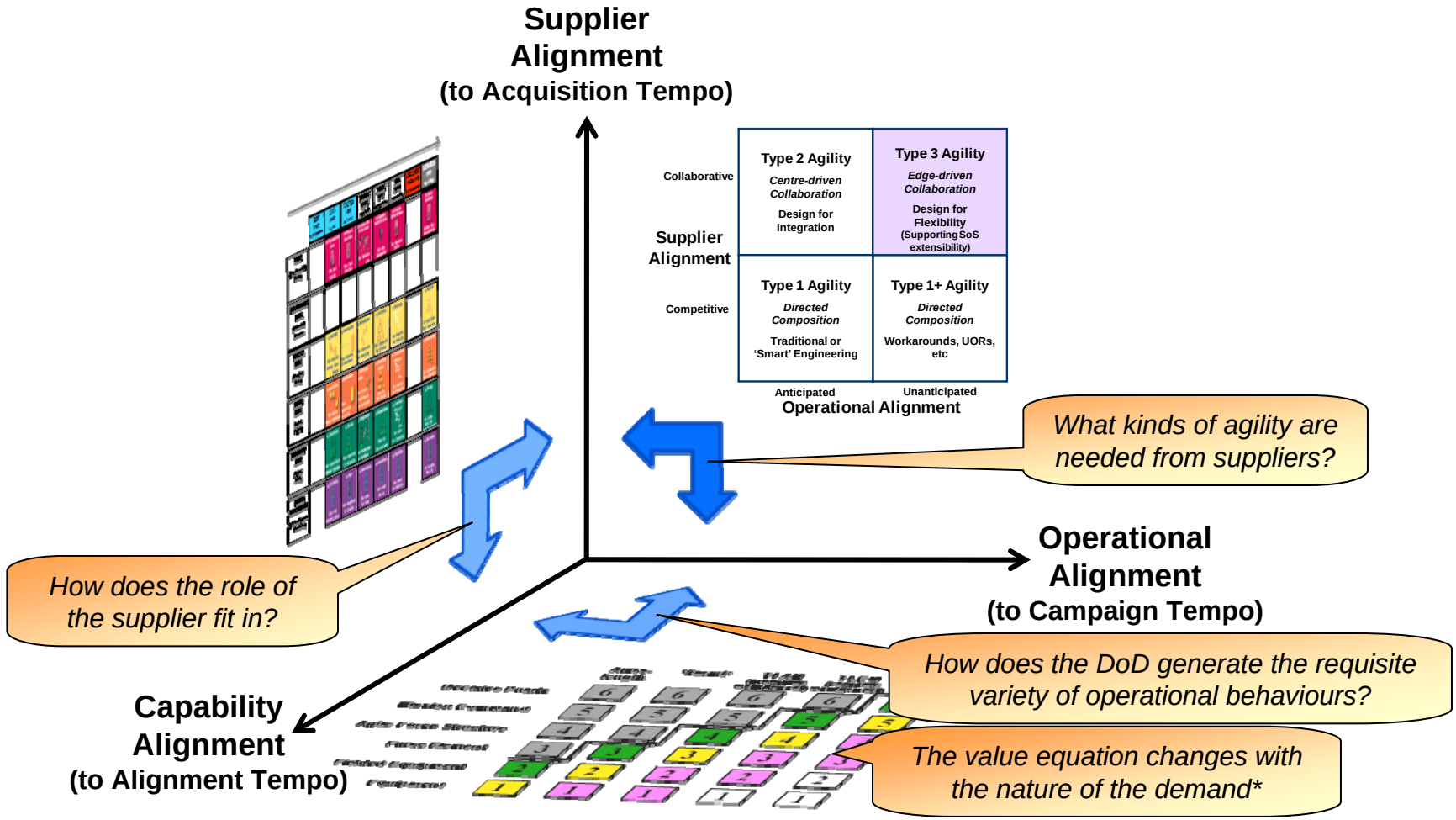


The Value Stairs: a progressive development of the value equation model

The 'plus' in TLCM+ indicates that what is being supplied is a SoS the definition of which is not equipment-based or platform-based



The value equation must evolve as the demand for the variety of operational behaviors changes



* See Boxer, P.J. (2008) *What Price Agility? Managing Through-Life Purchaser-Provider Relationships on the Basis of the Ability to Price Agility*, Navigator White Paper, Software Engineering Institute, Carnegie Mellon University, September 2008

Making the two models coexist

Talking about irregular or asymmetric warfare and institutionalizing counterinsurgency skills, …

- **How do we institutionalize procurement of such capabilities – and the ability to get them fielded quickly?**
- **Why do we have to go outside the normal bureaucratic process?**

…

The challenge is whether in our bureaucracy and in our minds these two different paradigms can be made to coexist.

- **The key is to make sure that the strategy and risk assessment drives the procurement, rather than the other way around**.

….

Extracted from speech delivered by Secretary of Defense Robert M. Gates, National Defense University, Washington, D.C. September 29, 2008

- These forms of warfare, skills and abilities demand Type III Agility.
- This means modernization '+', in which
  - Campaign Strategy and Interoperability Risk Assessment drive procurement.
  - The full Double 'V' cycle is managed to create value for Defense.
  - Suppliers support different value equation models on the value stairs depending on the nature of the demand.

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Abstract

1. New kinds of threat and much wider varieties of demand on mission capabilities are requiring the military to achieve unprecedented levels of agility and responsiveness, and are driving the transformation of military capabilities.

2. The great benefit of net-enablement in this new strategic environment is that it enables mission capabilities to be orchestrated and composed from constituent capabilities within the context of systems of systems.

3. The presentation will outline three essential ways in which the foundational nature of the systems engineering task needs to be transformed to take advantage of these new possibilities, and will use examples from various military contexts to illustrate their applicability.

- First, the definition of systems-of-interest also has to give an explicit account of the contexts-of-use from which emerge new forms of demand for mission capability.
- Second, the definition of systems-of-interest has to be extended to include their socio-technical nature.
- Third, it has to be possible to analyze how these new forms of demand translate into new patterns of interoperability (geometries-of-use) across systems of systems, thus defining the agility of systems of systems in terms of the required varieties of geometry-of-use that they must support.

4. The presentation will conclude by considering the impact this has on the suppliers' role, the acquisition process, and in particular the changes it introduces into how value is defined.

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