



The Collaboration Challenge of Critical Infrastructure

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Background

- EO13636 and PPD-21 call for substantial collaboration efforts between DHS and many different stakeholders, to help address the nation's critical infrastructure security and resilience challenges
- DHS S&T (CSD) supported NPPD in responding to the guidance of EO13636 and PPD-21
- At the same time, DHS S&T (CSD) was managing an applied research project that included NPPD/NCCIC and was conducted primarily through the Organizational Psychology school of GMU
- After discussions with NPPD (Bob Kolasky), CSD funded a small study project to see what the professional literature could provide with respect to collaboration



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Background (continued)

- The study led to academic publication in 2015
- “We developed a framework that assists in capturing the differences between two organizations. Collaborative distance captures the degree of similarity between the cooperating organizations across four separate levels of analysis: sector, organization, functional, and individual. Organizations that are very similar to each other are said to have “low collaborative distance” and organizations that differ on important characteristics are said to have “high collaborative distance”. We propose that this measure coupled with problem complexity ought to dictate the structure and safeguards for inter-organizational collaboration. We show a sample calculation of this measure.”



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Reference: “Collaborative Distance: Multi-Level Analysis Framework for Recommending Collaboration Structure and Safeguards,” Derrick, Ligon, Miles, Lundmark and Elson, University of Nebraska Omaha, 2015.

Background (continued)

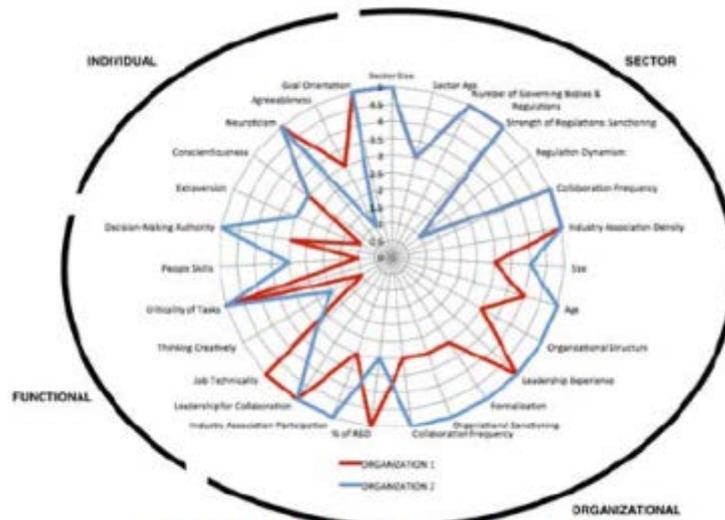
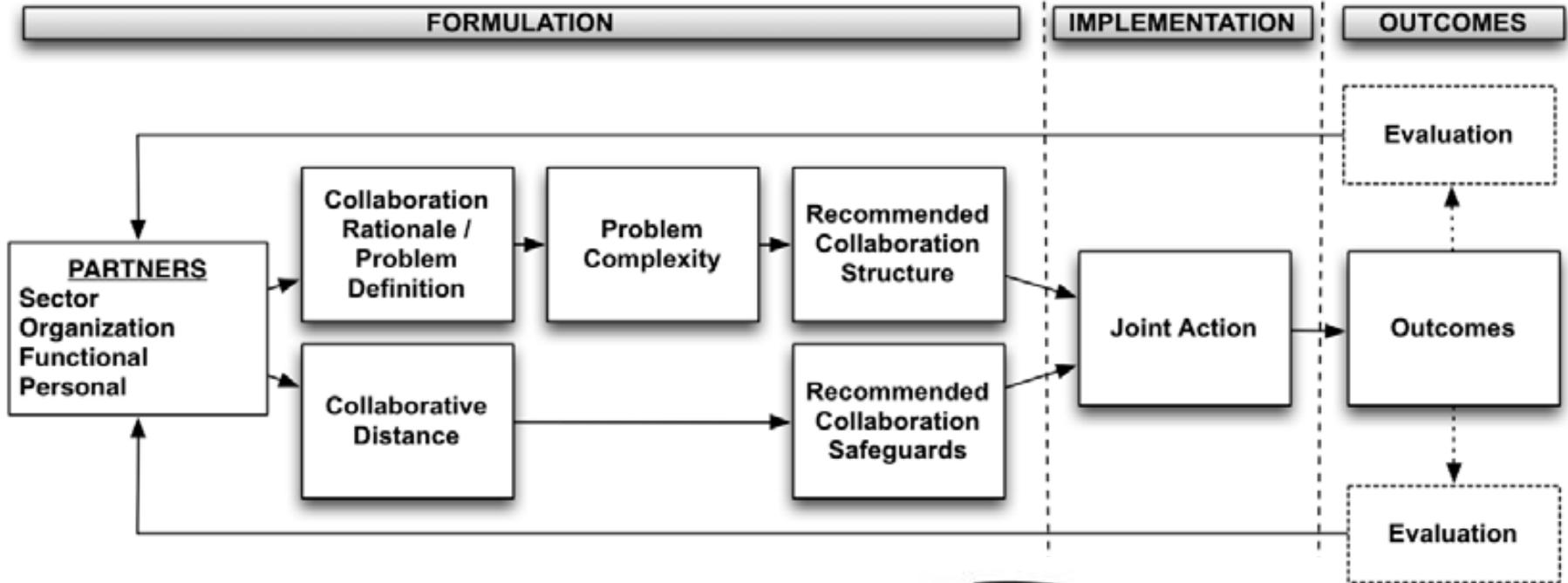


Figure 2. Collaborative Distance



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Problem Type

- Complex
 - Ill-defined and ambiguous
 - Requires tight integration
 - Technically challenging
- Straightforward
 - Well-defined
 - Little to no integration
 - Technically known

COMPLEXITY

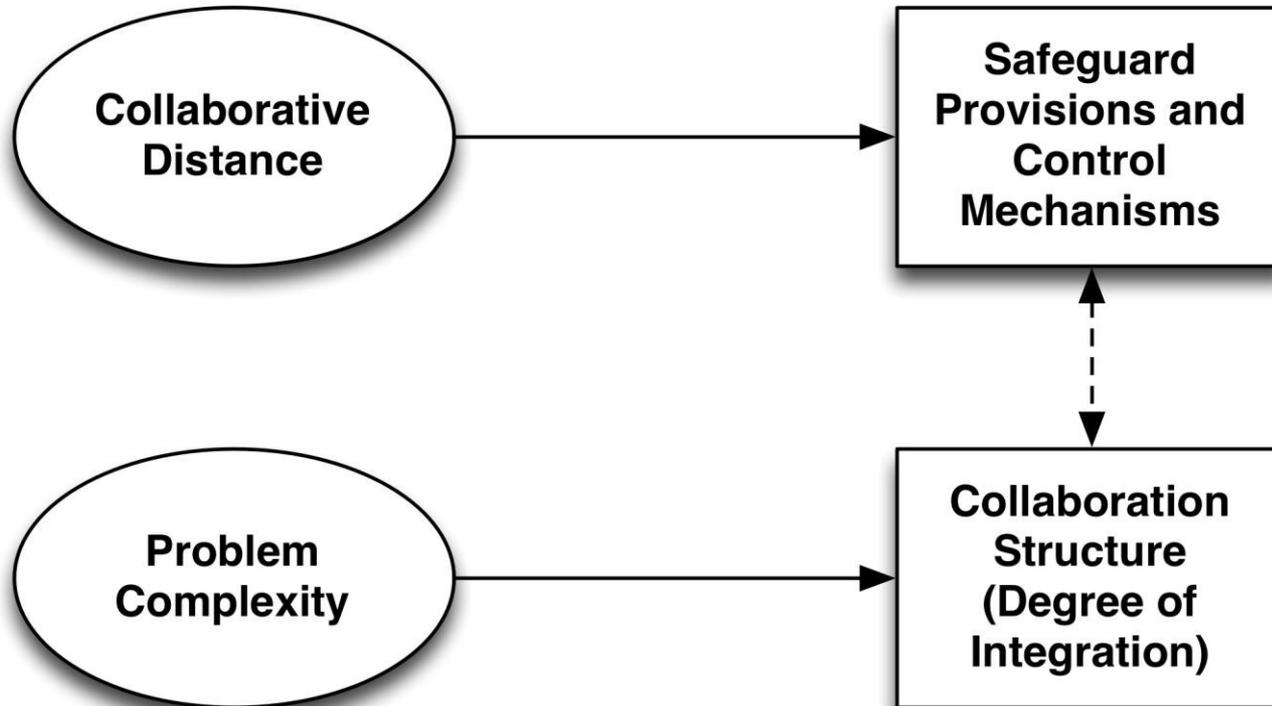
simplicity



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Relationship Between Distance / Complexity and Structures / Control Mechanisms



Overall Model for Distance and Complexity

	COLLABORATIVE DISTANCE				
	Very Close	Close	Somewhat Distant	Moderately Distant	Highly Distant
Straightforward / Decomposable Problem	Green	Green	Green	Yellow	Yellow
Fairly Decomposable	Green	Green	Yellow	Yellow	Yellow
Somewhat Complex	Green	Yellow	Yellow	Yellow	Red
Moderately Complex	Yellow	Yellow	Yellow	Red	Red
Highly Complex / Highly Integrated Problem	Yellow	Yellow	Red	Red	Red

Structure is Tighter and More Integrated



Control Mechanisms are More Formal and Rigid




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However, reality is more complex

- Most collaboration challenges are efforts involving more than two connected organizations

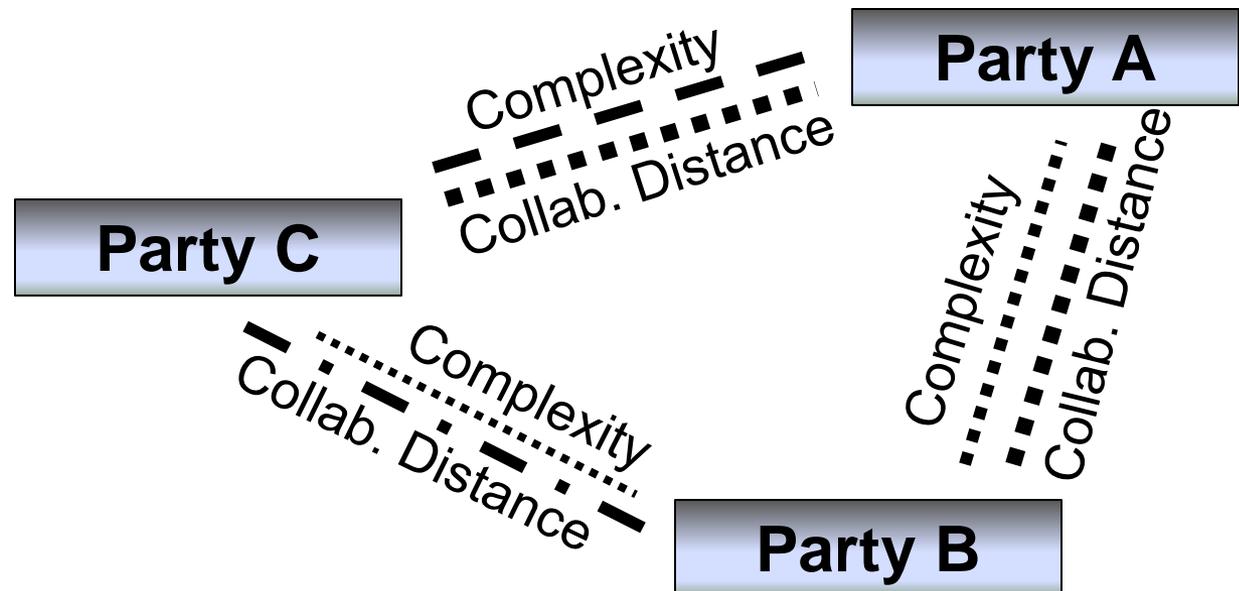


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Reality is more complex (examples)

- DHS, Sector Coordinating Councils, and many different companies
- SAFETY Act, Applicant, and major partners/support companies
- Government/Sector coordination, many different companies, and the entire supply chain foundation



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Why is this hard to analyze? (A)

- “Wicked Problems” are very complex situations where there is no real agreement on the core problem(s), and where any change or movement is met by multiple forces pulling the situation back towards the as-is condition.
- Wicked problems cannot be tackled by traditional approaches where problems are defined, analyzed and solved in sequential steps; achieving a shared understanding and commitment to solving a wicked problem is very time-consuming.
- “...in a four-year study of inter-organizational collaboration across public, private & voluntary sectors in the United Kingdom, steering by government (failed) a successful collaboration, causing organizational crisis and program collapse.”



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References: (A) “The Origin of ‘Wicked Problems’,” Andrejs Skaburskis, 2008; (B) “Dilemmas in a General Theory of Planning, HWJ Rittel, 1973.

Why is this hard to analyze? (B)

- Collaboration inherently includes Tension
 - Collaboration is not a vital component of most successful organizations
 - There is an inherent contrast at the heart of organizational collaboration, how to manage and control something that is by definition informal, ad hoc, spontaneous
 - Modern organizations have not generally resolved collaboration creativity versus structured collaboration

“At the heart of the collaboration dichotomy is the idea that the formal processes and structures employed by organizations only sporadically achieve the inherent benefits or opportunities from true collaboration. More often than not, because the organization is not accustomed or prepared for these instances, the potential benefits are lost in the organizational machine.”



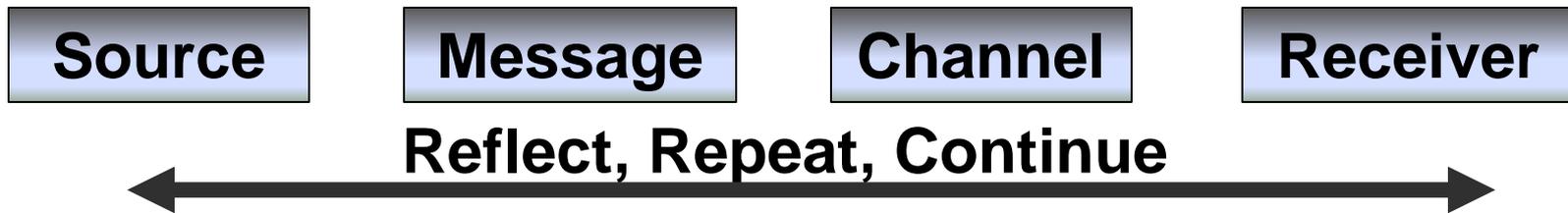
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References: (A) “The Tension in Collaboration,” Four Groups Ltd, London UK, 2008:
(B) “Governing by Network,” Goldsmith and Eggers, 2004

Why is this hard to analyze? (C)

- Communications model and organizational friction
- Source, Message, Channel, Receiver, Reflect/Repeat



- Consider the amount of organizational friction that develops and is continuously present in our collaboration



Why is this hard to analyze? (D)

- Nash theory: “Game theorists use the Nash equilibrium concept to analyze the outcome of the strategic interaction of several decision makers. The simple insight of John Nash’s idea is that one cannot predict the result of the choices of multiple decision makers if one analyzes those decisions in isolation. Instead, one must ask what each player would do, taking into account the decision-making of others.”



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Why is this hard to analyze? (E)

- Perceptions, Heuristics and Biases – Daniel Kahneman and Amos Tversky, “Thinking, Fast and Slow”
- People use a number of heuristics to evaluate information; these are usually useful shortcuts for thinking, but can easily lead to inaccurate judgments and cognitive biases
- Availability heuristic
- Anchoring and adjustment heuristic
- Gains/Losses asymmetry, and Threshold effects
- Why significant? Collaboration is led by expert individuals that bring these vulnerabilities to the collaboration effort



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Conclusions and takeaways

- The University of Nebraska Omaha Collaborative Distance, Problem Complexity model is both useful and simple
- DHS/Critical Infrastructure collaboration challenges are very complex, because of organizational complexities; social science research shows this is hard to analyze
- Time/Dynamics and Probabilities (rare event statistics and Bayesian analysis) are likely also significant factors
- **Can we develop a more complex, accurate and valuable collaboration model for DHS needs?**
- **This topic reflects the significant importance & value of complex social science research and analysis to DHS**



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