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When Do Organizations Need to Change (Part I)? Coping with Incongruence

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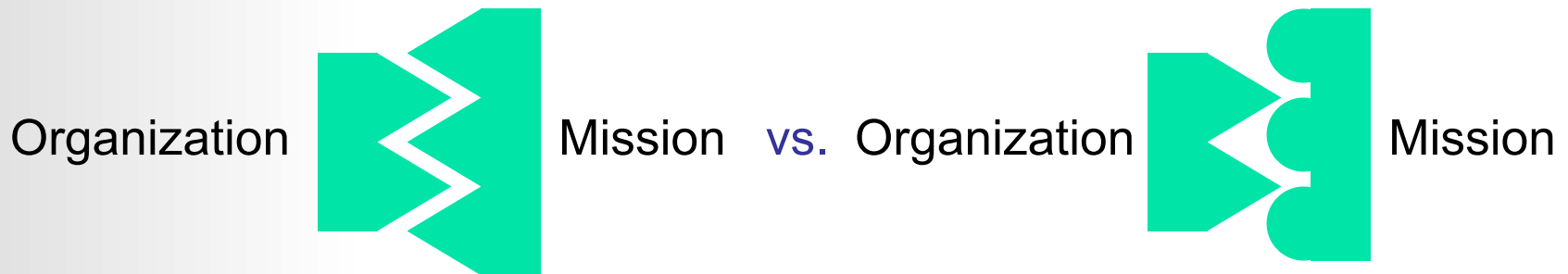
¹Aptima, Inc. and ²Naval Postgraduate School

The Command & Control Research &
Technology Symposium
NDU, Washington D.C.
June 17- 19, 2003

*Sponsored by the Office Of Naval Research,
Contract No. N00014-02-C-0233, COTR Gerald Malecki

Questions & Objectives

- Do model-based predictions of (in) congruence produce measurable difference in process and outcome?



- Measure the effects of congruence on organizational performance and processes
- Lay the foundation for further work on adaptation
 - Establish the conditions for change
 - Identify leading indicators of incongruence
 - How do we support/induce adaptation?



Organizational Structures

Divisional (D)

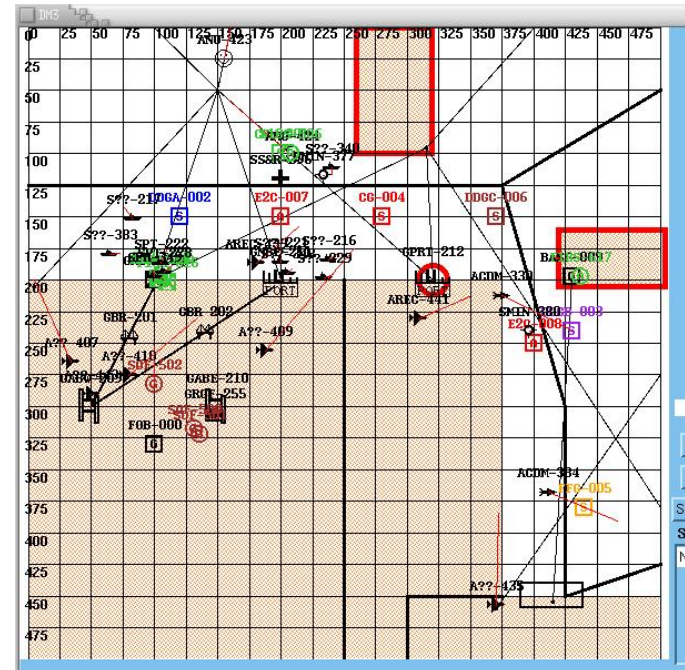
Functional (F)

		1	2	3	4	5	6
	Platform	STRIKE	BMD	ISR	AWC	SuWC/MINES	SOF/SAR
1	CVN	2F18S	xxx	1UAV	2F18A, E2C	1FAB, 1MH53	1HH60
2	DDGA	8TLAM	3ABM,4TTOM	1UAV	6SM2	1FAB, 2HARP	1HH60,1SOF
3	DDGB	8TLAM	3ABM,4TTOM	1UAV	6SM2	1FAB, 2HARP	1HH60,1SOF
4	CG	8TLAM	3ABM	1UAV	6SM2	1FAB,2HARP,1MH53	1HH60
5	FFG*	2F18S	xxx	1UAV	2F18A,E2C,4SM2	1FAB,2HARP,1MH53	1HH60
6	DDGC	8TLAM	3ABM,4TTOM	1UAV	6SM2	1FAB, 2HARP	1HH60,1SOF

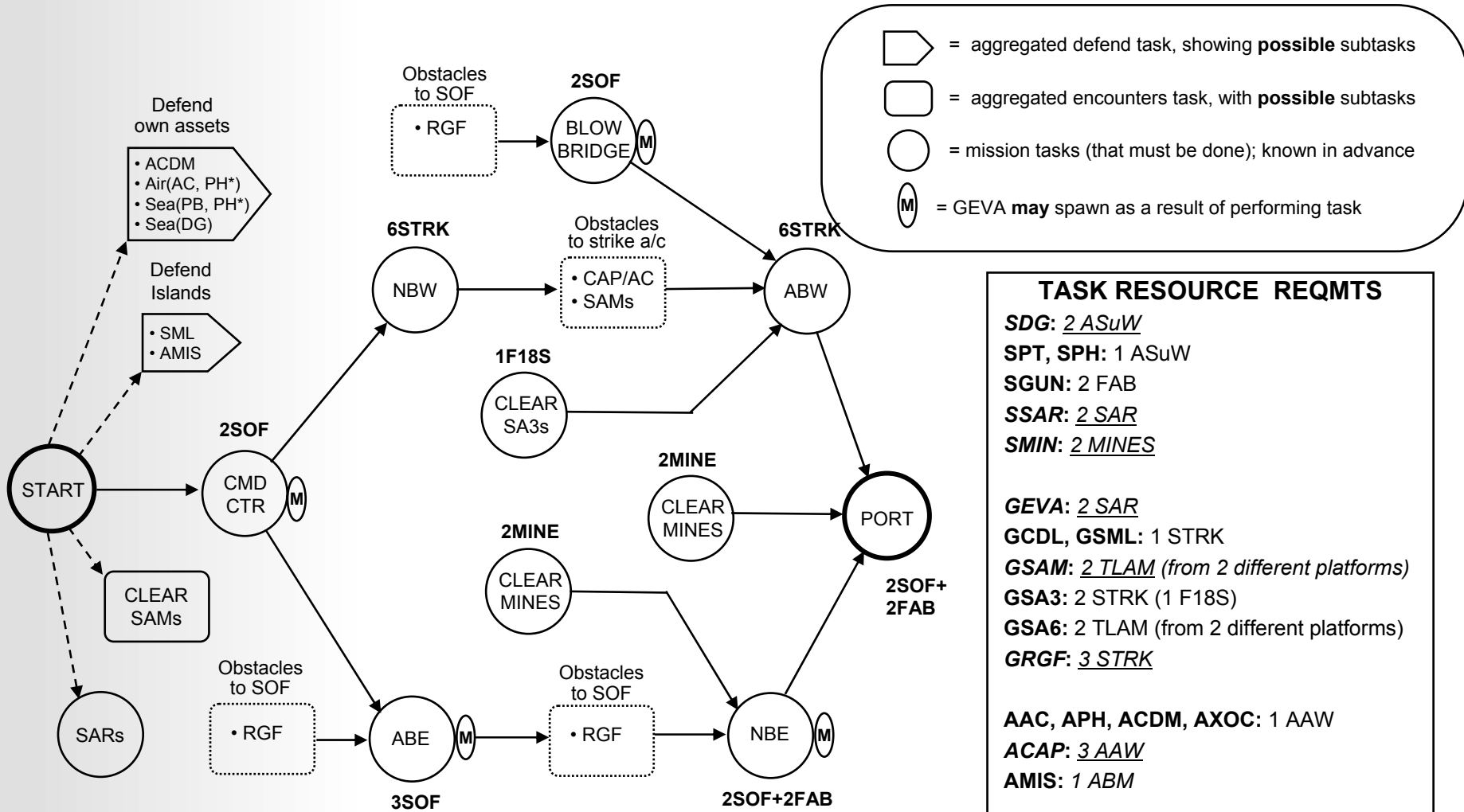
- Asset “ownership” and control shape team structure:
 - Multi-function vs. single-function responsibilities
 - Geographic Area of Responsibility: Local vs. Global
- Heterarchical, not Hierarchical, organization



- Congruence Manipulation
 - Capitalizes on Roles and Geography (task and asset locations)
- Strategies for Manipulation of Congruence
 - Coordination Requirements
 - Task Phasing
 - Boundary Splitting
 - Limited Assets



Functional (f) Scenario



* indicates that these must be distinguished from neutral (or decoy) counterparts

TASK RESOURCE REQMTS

SDG: 2 ASuW
SPT, SPH: 1 ASuW
SGUN: 2 FAB
SSAR: 2 SAR
SMIN: 2 MINES

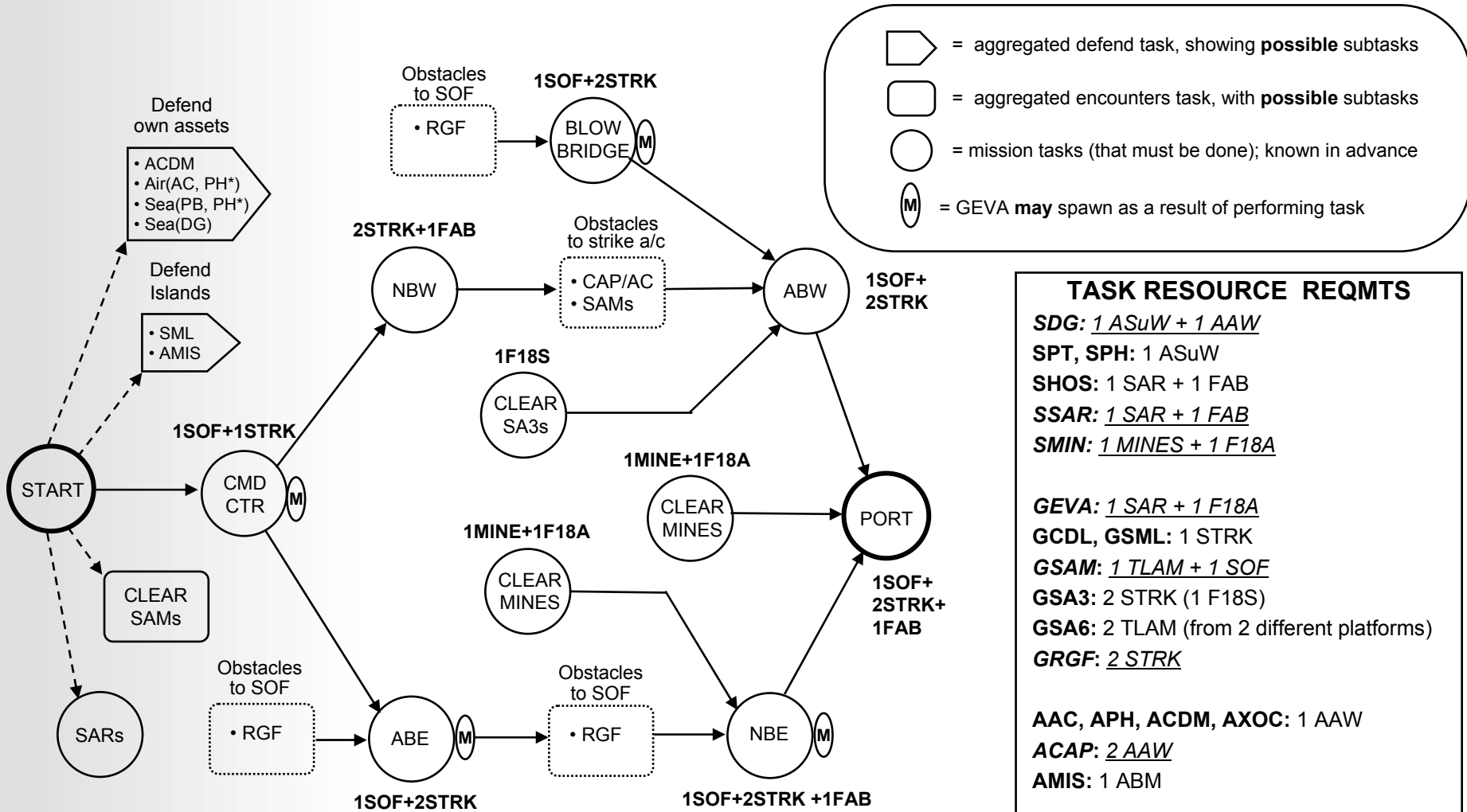
GEVA: 2 SAR
GCDL, GSML: 1 STRK
GSAM: 2 TLAM (from 2 different platforms)
GSA3: 2 STRK (1 F18S)
GSA6: 2 TLAM (from 2 different platforms)
GRGF: 3 STRK

AAC, APH, ACDM, AXOC: 1 AAW
ACAP: 3 AAW
AMIS: 1 ABM

- other unanticipated tasks via HELP



Divisional (d) Scenario



* indicates that these must be distinguished from neutral (or decoy) counterparts



- 48 participants organized into eight 6-person teams
 - Independent Variables
 - Structure is a between subjects variable
 - Divisional (D) vs. Functional (F)
 - Scenario is a within subjects variable
 - Divisional favoring (d) vs. Functional favoring (f)
- Congruence is the interaction of structure and scenario.



Experimental Design

- Procedure
 - “Buttonology” (2 hours)
 - “Hash” (2 hours)
 - First Replication (2 hours)
 - Second Replication (2 hours)
- Design

Scenario

Structure	D	4 Teams	d	f	f	d
		4 Teams	f	d	d	f
	F	4 Teams	f	d	d	f
		4 Teams	d	f	f	d

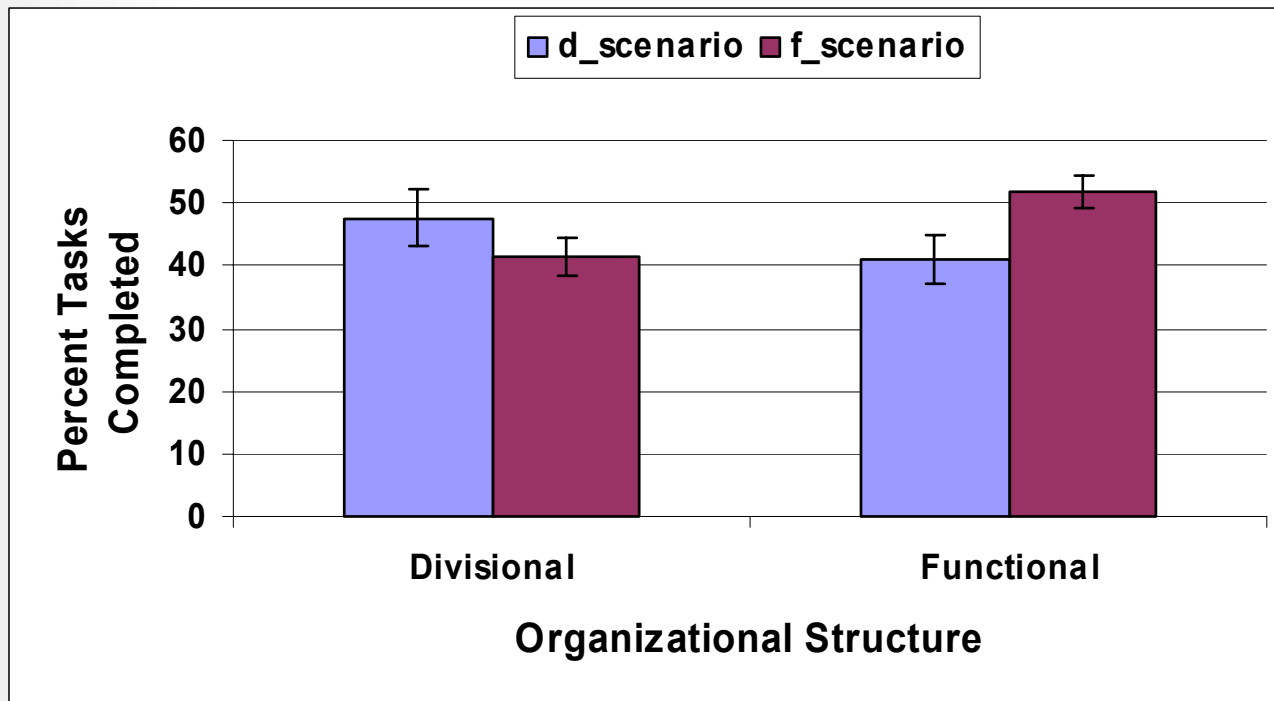


- Analyses focused on communications, workload, and performance.
 - Emphasis on **model-based** predictions
 - Emphasis on **patterns**
 - Emphasis on **communications** because they directly reflect strategy adaptations, and are thus a strong candidate for **leading indicators**
- Overall, results showed that in the incongruent cases, communications increased, workload increased, and performance worsened.
- However, the context mattered.
 - Structure/scenario pairings influenced reaction to incongruence.



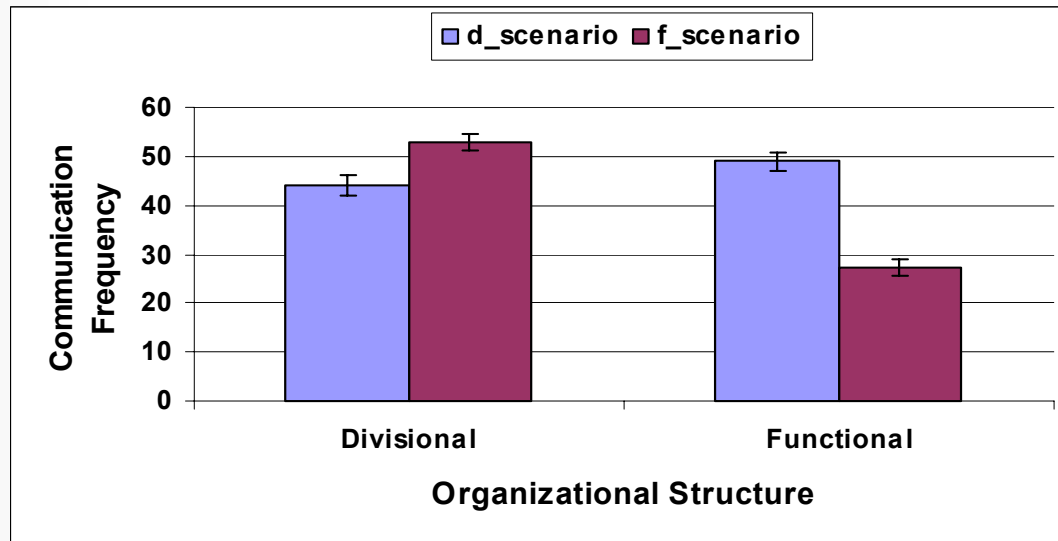
Overall Performance

- As predicted based on the model design process, performance was worse in the incongruent cases.



Communications (Talking More?)

- The manipulation of congruence hinged on coordination requirements.
 - Model-Based Prediction: Since more coordination required in incongruent cases, there should be more communication in incongruent cases.



→ Bigger change in Functional



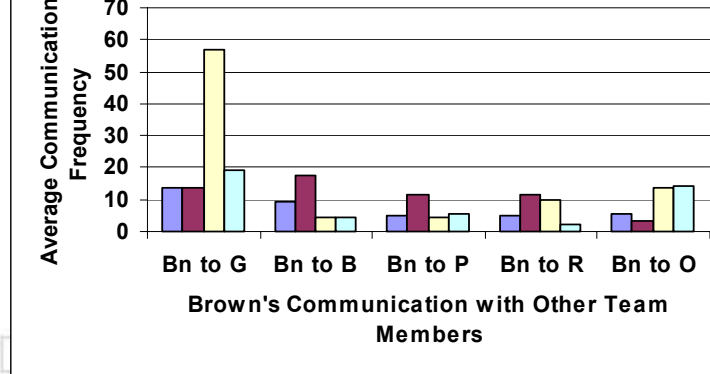
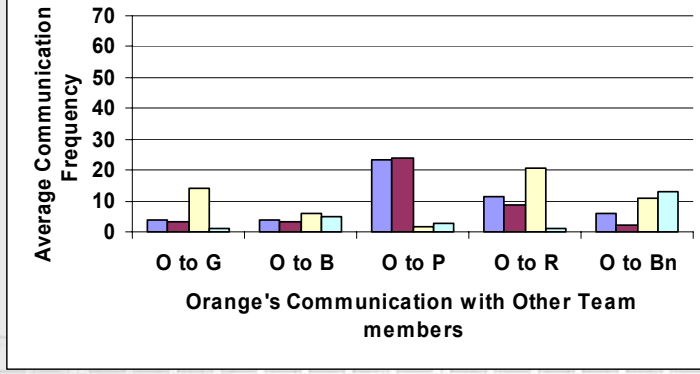
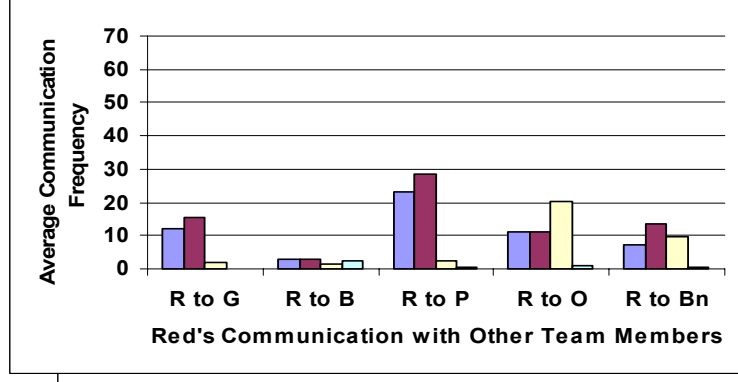
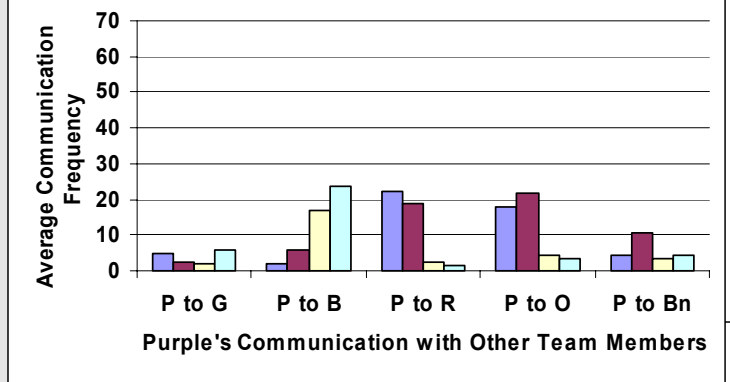
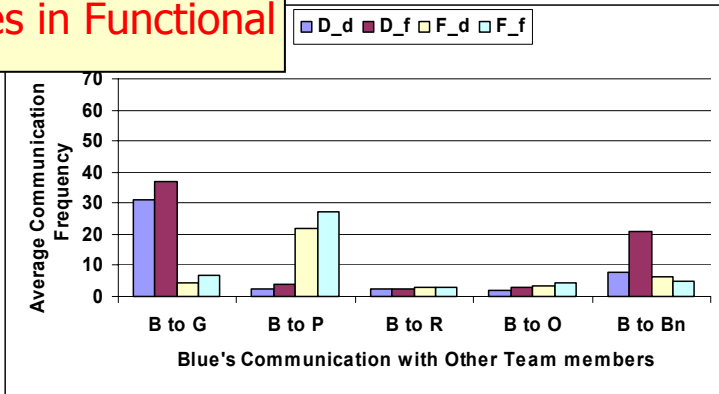
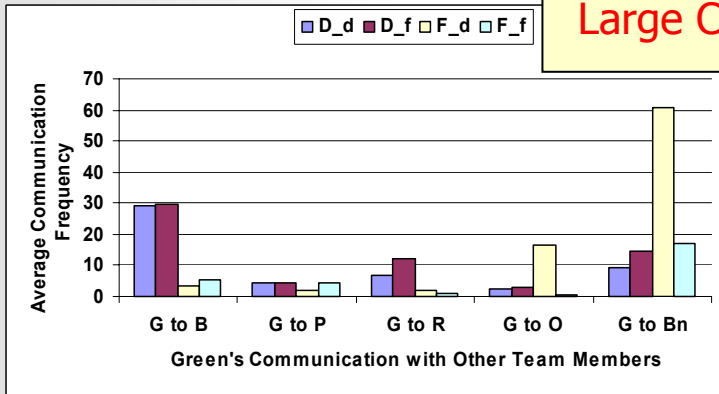
Communication Patterns

- Organizational Structure Mattered
 - In response to incongruence:
 - Divisional teams talked more.
 - However, Functional teams talked a lot more, and there were stronger differences in who talked to who about what.
 - The context of structure and scenario mattered.



Communications: Who is Talking to Who?

Large Changes in Functional



Communications: Talking About What?

- Incidence Rate Analysis of Communication Patterns

- For Divisional, the “role-relative” incidence rates for communications by player and type did not change drastically between the congruent and incongruent conditions.

Divisional RIR-I/RIR-C Ratio

(Indicates change in role-relative communication probability from congruent to incongruent scenarios)

DM	All	Task	Asset	Req	Xfer
Green					
Blue					
Purple			-		
Red					
Orange				-	
Brown					

- For Functional, there were strong changes in communication types for many players → Talking about different things...

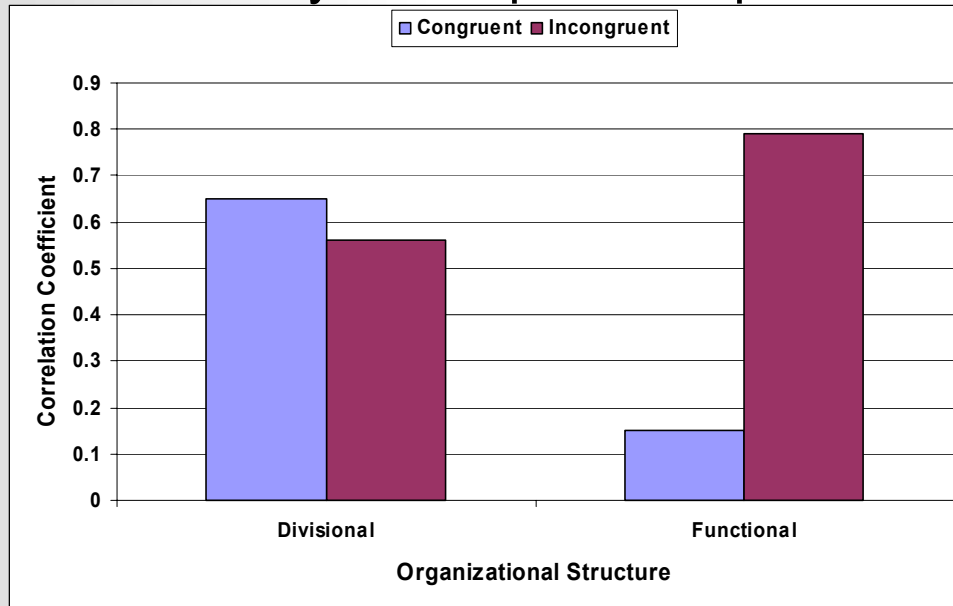
Functional RIR-I/RIR-C Ratio

DM	All	Task	Asset	Req	Xfer
Green	+	+	+	+	+
Blue	--	-	-	--	-
Purple	-		--	--	-
Red	++	++		+++	++
Orange		+		+	
Brown			+++		



Communications: Talking About What?

- Communication & Cooperation Networks illustrate interaction patterns within the team
 - Player-Player networks are created when:
 - A Player sends a communication to another Player
 - Players cooperate to process a task



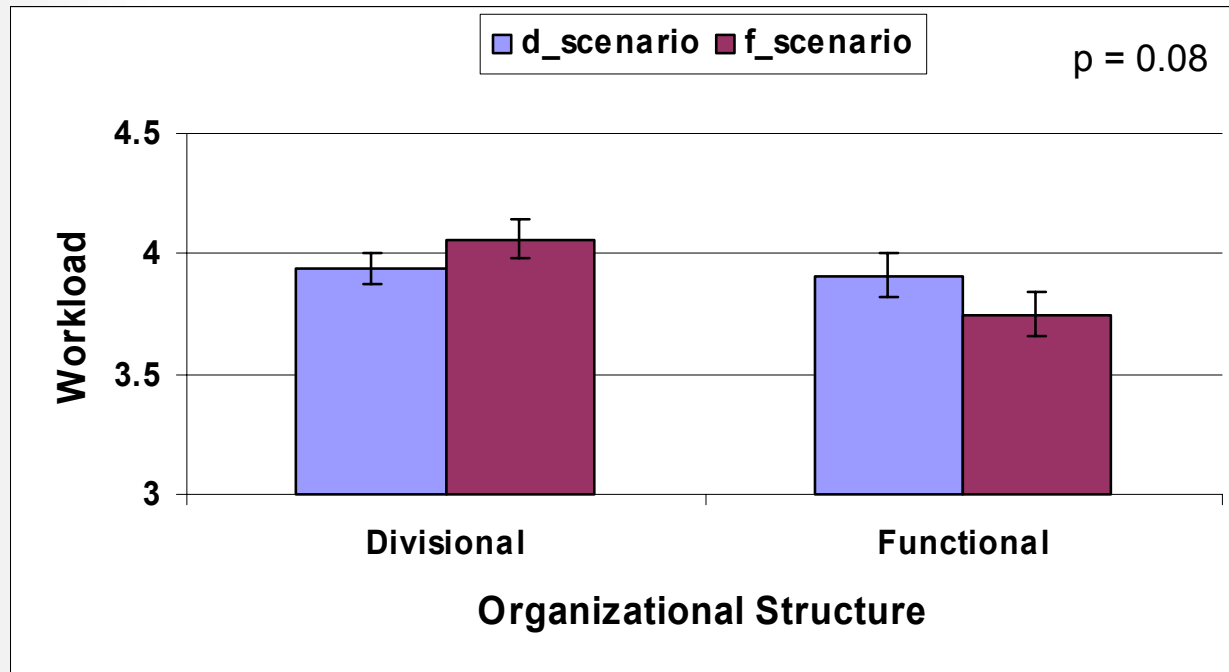
- For the Divisional structure the association is about the same in congruent and incongruent conditions
- For the Functional structure the association is quite different between congruency conditions and largest in the incongruent condition

- In Divisional there is little evidence for strategy adaptation. However, in Functional there is a radical change in the association of communication and cooperation



Perceived Workload

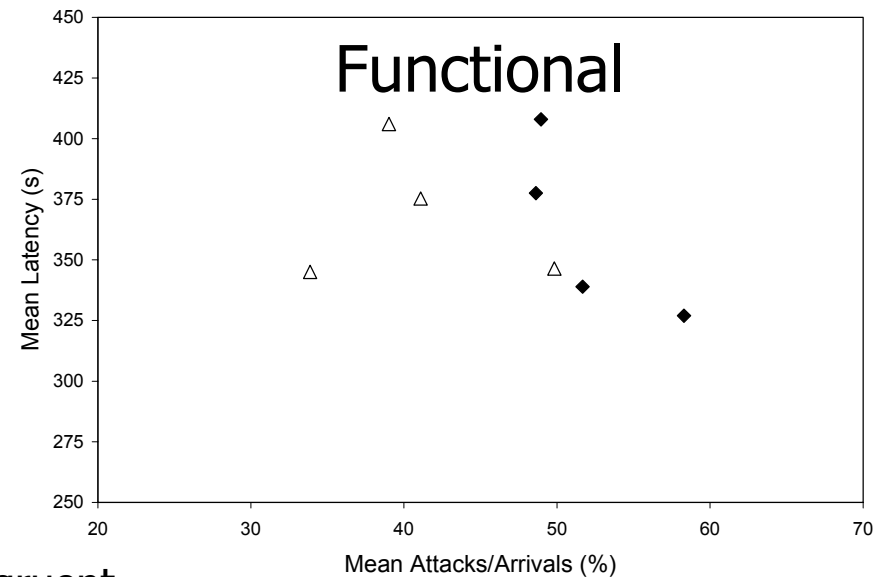
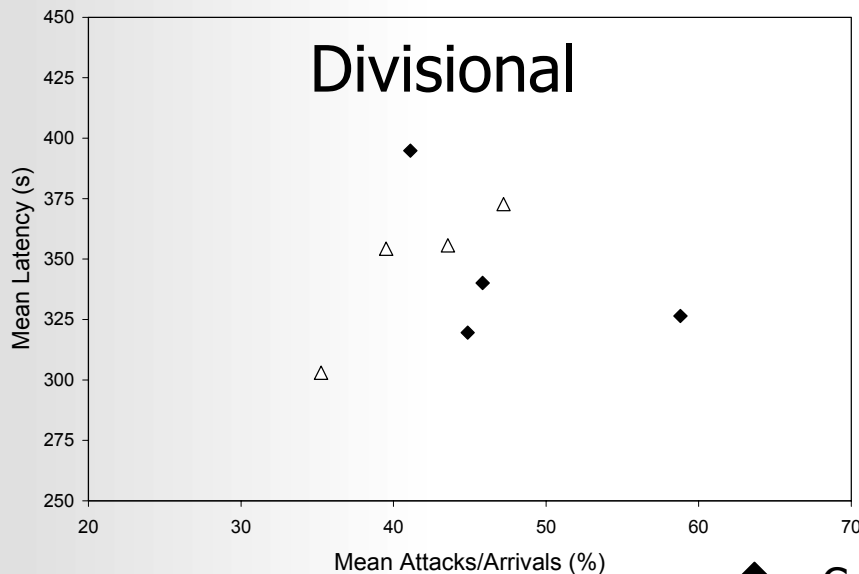
- The manipulation of congruence hinged on coordination requirements.
 - Model-Based Prediction: Since more coordination in incongruent cases, there should be a higher perceived workload in incongruent cases.



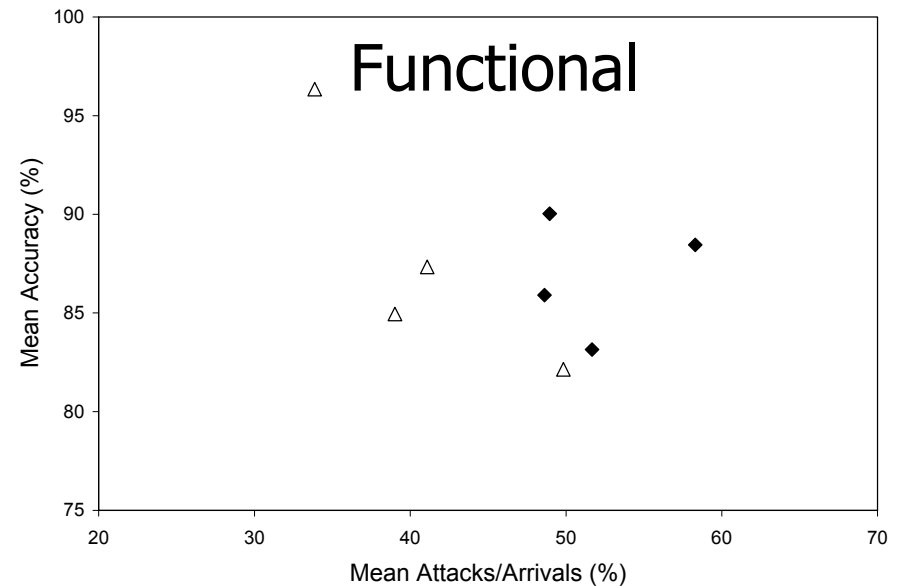
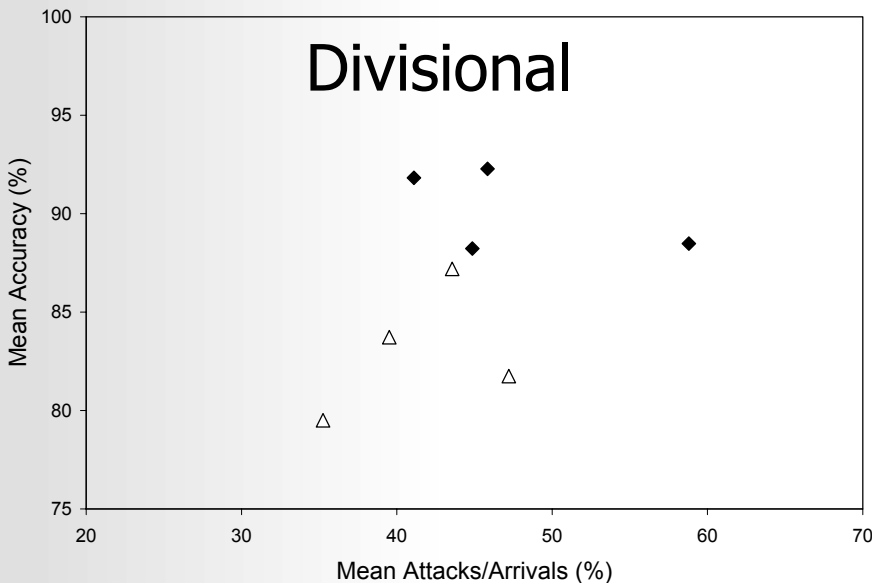
- The manipulations of congruence were successful in changing communications and perceived workload.
 - These changes were predicted by the model-based manipulation of coordination requirements.
- Given these changes in response to coordination needs, we expected performance to be worse in the incongruent conditions.
 - Will performance be different across the structure and scenario pairings?



- When coping with incongruence, performance changes were dependent on the structure & scenario pairings.
 - Percent of attacks processed by latency for tasks processed
 - Changes in tasks processed for each structure
 - No changes in latency for either structure



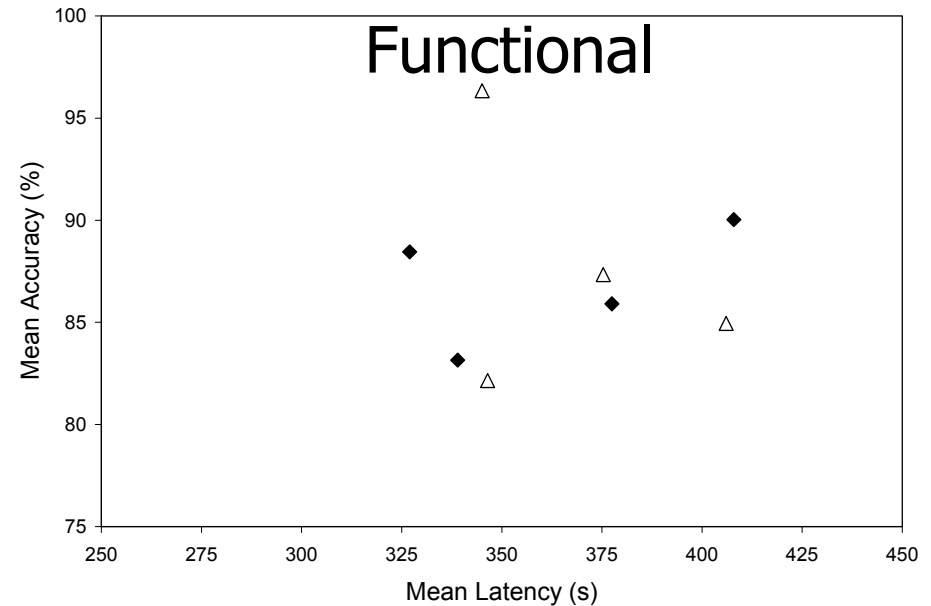
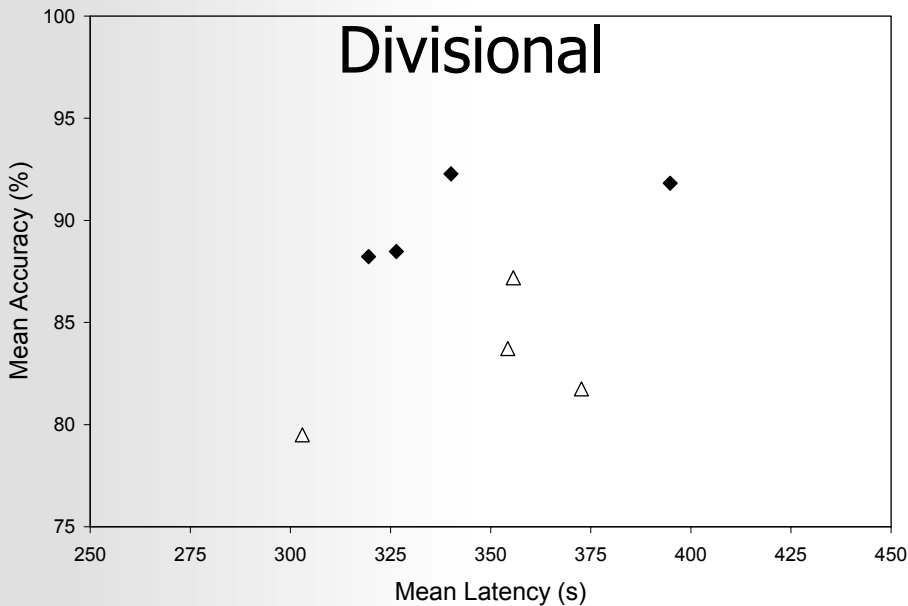
- Percent of tasks processed by accuracy for tasks processed
 - Changes in tasks processed for each structure
 - Changes in accuracy for Divisional only



◆ Congruent
△ Incongruent



- Accuracy by latency for tasks processed
 - No changes in latency
 - Changes in accuracy for Divisional only



◆ Congruent
△ Incongruent



- The organizations and scenarios studied here set the stage for further work on structural adaptation.
 - Based on modeling work we successfully created the conditions under which change is needed.
- The strategic adaptations to incongruence depended on the organizational structure & scenario pairings.
 - The leading indicators may be complex and context dependent, especially when larger and more complex command and control organizations are considered.

