

Adaptive Communication Patterns in Different Organizational Structures

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Abstract

How do organizations cope with missions that are not well matched to their architectures, and consequently, what behaviors signal the need for structural adaptation? To explore this issue, we used model-based organizational design techniques to create mission scenarios that were either congruent (matched) or incongruent (mismatched) with two organizational structures. We focused our analyses on the role of communications by comparing the communication patterns occurring in the congruent conditions to those produced in the incongruent conditions. Results indicated that, for both functional and divisional organizations, communications increased when faced with incongruence. However, beyond volume of communications, there were differences in communication patterns. In the functional organizational structure team members changed their communication patterns (i.e., who talked about what), while in the divisional organizational structure team members did so to a much lesser degree. These data showed that strategy adaptation depends on the nature of organization's structure operating within particular mission environments.

Introduction

It has been observed that high performing organizations are adept at sensing changes in their environment and altering their strategies to accommodate these changes without compromising performance (LaPorte & Consolini, 1988; Entin & Serfaty, 1999). In fact, organizations that can adapt to internal changes or changes in their environment have a much better chance at achieving their mission and performing well. Hence, as part of our ongoing work related to the engineering of adaptive structures for command organizations, we are now in the process of empirically determining the variables that signal the need for structural adaptation (i.e., changes in the organizational design). Our goal is to understand the processes that underlie performance as teams attempt to cope with misalignment to their missions (incongruence). By understanding the behaviors that organizations exhibit when faced with a need to structurally adapt in order to maximize mission effectiveness, our goal is to detect and then direct attention toward the critical variables that signal the need for change, thereby facilitating the structural change process.

The research presented here is derived from a successful manipulation of organizational congruence (Diedrich et al., 2003), which used model-based organizational design techniques to create scenarios that were either congruent or incongruent with two organizational structures. Building on previous work (e.g., Hollenbeck et

al., 1999; Moon et al., 2000; Diedrich et al., 2002), the two organizational structures that were explored are commonly referred to as functional (F) and divisional (D). The functional structure was organized such that each participant specialized in one aspect of a mission such as Strike using assets that were distributed on multiple platforms (ships) across the entire area of operations. In contrast, in the divisional structure, each participant had control over a multifunctional platform that to a large extent was able to process a variety of functional tasks within a bounded geographical region. In the functional organization, each of the six commanders had control over one or two functional areas (i.e., Strike, Ballistic Missiles Defense, ISR, Air Warfare, Surface Warfare/Mines, Special Forces/Search & Rescue), with appropriate assets assigned across all of the geographical areas (e.g., F18S, Anti-ballistic missiles, Unmanned Air Vehicles, F18A, etc.). In the divisional organization, each of the six commanders controlled assets across almost all of the functional areas, but these assets were concentrated in proximity to their primary platform.

Congruence between these organizations and the mission scenarios was manipulated by varying coordination requirements and task phasing. Relative to the congruent case, the incongruent case required greater between-commander coordination, that is, mission tasks required more than one commander for successful mission task prosecution. In addition, within the incongruent

cases, mission tasks were phased so as to overwhelm particular commanders (e.g., a wave of hostile aircraft across the area of operations to overwhelm the functional Air Warfare commander).

Results reported by Diedrich et al. (2003) indicated that, relative to the congruent conditions, performance suffered significantly in the incongruent conditions, as demonstrated by the proportion of mission tasks processed. In addition, compared to the congruent conditions, self-reported workload was higher and the volume of communications increased in the incongruent conditions, especially for communications specifically addressing coordination actions. Collectively, these results were consistent with the model-based manipulations of congruence. As noted above, when a match existed between the organizational structure and the mission scenario tasks to be performed, a particular commander within the organization whose job it was to process the task actually possessed the appropriate assets to do so. When a mismatch existed, the commander that had to perform the task did not possess all the required resources, thus entailing coordination and communication overhead to amass the correct mix to perform the task. The additional overhead encountered in the mismatched condition likely generated additional workload and workload induced stress that lowered performance (Entin & Serfaty, 1999).

Based on these findings, in this paper we address the process of strategy adaptation with respect to communication patterns. Our goal is to understand how organizations adapt their communications when faced with incongruence between their structures and mission scenarios. Through such an understanding, we hope to detect and measure these strategy adaptations, in order to then direct attention to the need for structural change, that is, the realignment of the organization with respect to responsibilities and assets controlled. In other words, if we can recognize what incongruence looks like in action, we might then be able to promote structural change by directing attention to the need for structural change, thereby enhancing organizational performance. Note, that we distinguish between structural adaptation and strategy adaptation. In our terms, strategy adaptation refers to changes such as communication patterns, work pace, etc., that typically occur when organizations are stressed

(Payne, Bettman, and Johnson, 1986). We believe that these strategy changes generally precede structural changes, for organizations are comparatively resistant to structural changes (Hollenbeck et al., 1999). Hence, initial strategy changes may signal the need for structural change when these strategies are not sufficient to insure mission effectiveness.

More specifically, we focus on communications because we hold that a primary process reflecting the need for change is communication. Organizations and teams typically coordinate the reallocation of assets, the redistribution of workload, and joint processing of tasks via voice communication (Orasanu, 1990; Entin & Serfaty, 1999; Entin, 1999). Moreover, the major conduit for the sharing of information is typically by voice communication. Thus, we expect that the pattern of communication will differ between congruent and incongruent conditions. Indeed, overall our results indicated that communication volume increased in the incongruent conditions. However, in the work reported here, we also address how the communication patterns changed when faced with incongruence, thus facilitating our understanding of what incongruence looks like in action.

Method

The participants, representing all services, consisted of 48 officers in attendance at the Naval Postgraduate School. The sample was organized into eight teams of six individuals each. Each team spent four hours in training and four hours in data collection. The primary task was to perform scenarios that were implemented within the Distributed Dynamic Decision-Making (DDD) Simulation using a Joint Task Force mission model.

The first of two independent variables was manipulated as a between-subjects factor and comprised two relatively common disparate organizational structures: functional (F) and divisional (D). As described above, the functional structure was organized such that each participant specialized in one aspect of a mission such as Strike using assets that were distributed across multiple platforms (ships). In contrast, in the divisional structure, each participant had control over a multifunctional platform that to a large extent was able to process a variety of tasks (e.g., air and surface).

The second independent variable was scenario, which was manipulated as a within-subjects factor. Two scenarios were developed, “d” that matched the divisional organizational structure but that was mismatched with the functional organizational structure, and “f” that matched the functional organizational structure but that was mismatched with the divisional organizational structure. Manipulation of the two variables produced two conditions: One where the organizational structure and the scenarios were congruent (D_d and F_f) and one where the organizational structures and the scenarios were incongruent (D_f and F_d).

Dependent measures were derived from instruments completed by trained observers (e.g., communications, performance outcome) and measures derived from the DDD simulator (e.g., percent tasks completed, task accuracy, task latency) in a manner similar to that described by Entin (1999). The coding of communications was performed by two trained and experienced observers who coded in real time all the communications occurring among team members (Entin, Serfaty, and Kerrigan, 1997; Entin, 1999). Using handheld computers with touch sensitive screens one observer focused on the communications uttered by half the team, while the other observer coded the utterances of the other half. The software allowed the observers to record all utterances according to one of 13 categories of communication type and who communicated with whom. This collection method provided for the analysis of communication networks, in addition to individual-level analyses. In general, the types of communications were divided into three basic categories: transfers (e.g., provision of information), requests (e.g., demands for information), and acknowledgements (e.g., “aye”). Both transfers and requests were, in turn, classified as requests/transfers for/of information (e.g., “Where is the enemy aircraft”), action (e.g., “Take the bridge”), or coordination (“I need your help on the air base”). The 13 communication categories are shown in Table 1. Raters were trained prior to the experiment using taped materials. Average correlation between observers was $r = 0.76$.

Results and Discussion

To explore the content of communications, we used survival analysis techniques (Carroll, 1983). In brief, by looking at the lengths of time between each player's initiation of communications, we

Table 1. Communication Categories

Communication Category	Abbreviation
Info request	Inforeq
Info on task request	Infotkr
Info on asset request	Infoassr
Info on action request	Infoactr
Resource request	Resur
Coordination request	Coordr
Info transfer	Infotran
Info transfer about task	Infotkt
Info transfer about asset	Infoasst
Have/will perform action	Perfactt
Resource used to perform action	Userest
Have/will coordinate	Coordt
Acknowledgement	Ackn

derived role-specific as well as condition-specific waiting time distribution functions (Tuma and Hannan, 1984), which in turn yielded incidence rate estimates for communication initiations. We statistically compared the congruent and incongruent conditions for each team structure using the Mantel-Haenszel test (Dupont, 2002). This analysis once again showed significant differences between congruent and incongruent communication rates in both team structures, controlling for role-specific effects (for the D structure: $X^2(5) = 32.40, p < 0.0001$; for the F structure: $X^2(5) = 206.95, p < 0.0001$).

Building on these data, additional insight into general communication patterns as well as topic-specific communication patterns was achieved by analyzing both an aggregation of all communication types and different types of communication categories separately. We looked for changes in an individual player's rate of initiating communications relative to that of his or her team between the congruent and incongruent conditions. First, we constructed each player's role-relative incidence rate for communication as the ratio of an individual player's communication incidence rate within one experimental condition to the entire team's communication incidence rate for that condition (including the focal individual). Then, we looked at the change in this ratio from the congruent condition to the incongruent condition. Figures 1 and 2 illustrate large ratio changes (absolute value $\geq 50\%$) for the D and F structures, respectively (the larger the increase or decrease, the more +’s or -’s, respectively). Note, the columns in Figs. 1 and 2 refer to the different types of communications: all communications (All), communications about enemy tasks (Task),

communications about friendly assets (Asset), requests for information (Req), and non-requested transfers of information (Xfer).

This analysis revealed a strong distinction in the nature of communication strategy adaptations in response to incongruence. For the D structure, the role-relative communication rates by team member for communication type did not change drastically between the congruent and incongruent scenarios. Of the 30 observed changes in relative incidence rates (6 team members by 5 communication types), Fig. 1 shows there were large changes for only two conditions. In contrast, for the F structure, there were strong changes in communication types between the congruent and incongruent scenarios for many categories. Of the 30 observed changes in relative incidence rates, Fig. 2 shows there were large changes for 21 conditions. These data indicated that when teams in the F structure went from the f to d scenarios, the content of communications changed substantially. However, when teams in the D structure went from the d to f scenarios, communications content changed in more subtle ways.

Accordingly, the above analyses of the communications data showed that when D structures went from congruent to incongruent situations, they reacted by talking more. However, the changes in the likelihood of particular pairs of team members talking to each other were relatively small as were the changes in communications content. In contrast, when F structures went from congruent to incongruent situations, they reacted by talking more and making substantial changes in what they talked about. These data suggest that the context of being in a particular organization given a particular mission influences how organizations react when trying to cope with incongruence.

To further examine the communication patterns used by teams in the congruent and incongruent conditions, a one-way ANOVA was computed for each of the 13 communication categories. Results of these analyses are summarized in Fig. 3.

Only the communication category information transfer on task failed to yield a significant F value. Scrutiny of the patterns in Fig. 3 show that teams indeed altered their communication patterns in terms of the communication categories utilized between the congruent and incongruent conditions. Contrasting the means for the

congruent and incongruent conditions for teams assigned to the D structure, we see significant increases in the incongruent means for only five of the communication categories. The same contrast for teams assigned to the F structure revealed that the means for the incongruent condition significantly increased for 11 of the 13 communication categories. These results further underscore the observations that teams assigned to the D structure increased their communication by increasing their use of a few categories in the incongruent situation, whereas teams assigned to the F structure increased their use of almost all the communication categories in attempts to adapt to the incongruent situation.

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

Figure 1. The ratio, role-relative incidence rates for incongruence /role-relative incidence rates for congruence, indicates the change in role-relative probability from congruent to incongruent scenarios for Organization D.

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

Figure 2. The ratio, role-relative incidence rates for incongruence /role-relative incidence rates for congruence, indicates the change in role-relative probability from congruent to incongruent scenarios for Organization F.

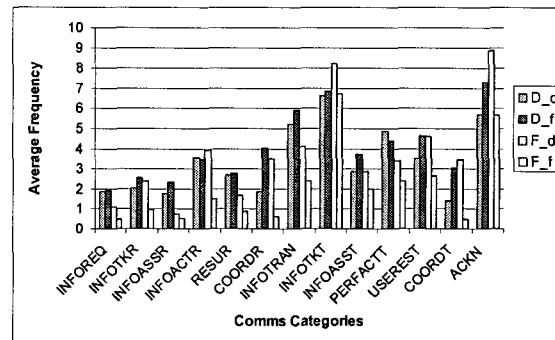


Figure 3. A Plot of the Means for the Four Structure X Scenario Conditions for each Communications Category (Category Abbreviations are Defined in Table 1).

Conclusion

Collectively, these data showed that strategy adaptation in the face of incongruence depended on context. In the divisional case, team members reacted to incongruence by increasing their overall level of communications. In contrast, in the functional case, team members reacted to incongruence by changing what they communicated about. This result likely reflected the fact that in the functional organization, who had access to what resource was critical to success, whereas in the divisional case, each of the participants had a variety of functional resources. This difference likely necessitated changes in the content of communications in the functional organization given the demands of the mission with respect to particular resources. These data suggest, therefore, that what congruence looks like in action depends on the context created by the pairing of organizational structure and mission scenario. Ultimately, our goal is to direct attention to strategy adaptations that characterize incongruence. By doing so, we may be able to signal the need for structural adaptation in the face of incongruence, thereby facilitating structural change and maximizing mission effectiveness. The results reported here are significant in that they suggest that strategy adaptation, and hence our ability to detect the need for change, is complicated in that it will depend on contextual variables.

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