

Understanding Team Adaptation via Team Communication

ABSTRACT

It is to an organization's advantage to monitor the fit between its structure and its responsibilities, and to alter its structure when a misfit – or incongruence – is identified. In a simulated naval mission, teams of six military officers were afforded the opportunity to adapt the structure of a Naval organization to fit changing mission requirements. A majority of the teams made adaptive structural changes, albeit modest in most cases, in anticipation or in response to enemy tactics that implied incongruence. Analysis of team communications during mission engagements showed that the amount of congruence experienced was reflected in communication patterns. Teams that took steps to alter their organizational structure to better match an impeding incongruent mission exhibited lower total communication volume and lower coordination requirements compared to teams that made little attempt to adapt. Aspects of communication appeared sensitive to structural adaptation undertaken by teams and may serve as an early indicator of adaptation effectiveness.

INTRODUCTION

There is empirical evidence that high performing organizations can discern when changes in environmental forces necessitate adaptive changes in the *strategies* (e.g., communication patterns, back-up behaviors) that they employ (Entin & Serfaty, 1999). Rarely, however, do organizations make changes to their organizational *structures* (i.e., asset allocation, team member roles and responsibilities) in order to adapt to environmental changes (Hollenbeck et al., 1999). There may be several reasons for this reluctance. First, organizations may not feel that they have been empowered to make alterations to their organizational structures. Second, even if an organization has the authority

to change their structure, they may lack the necessary training to do so competently. Third, organizations may sense that structure and mission are becoming incongruent (mismatched), but they may have difficulty gauging the nature or severity of the mismatch. Lastly, organizations may feel uncomfortable switching from known structures to those that are less well known and unproven. As a consequence of these obstacles to change, organizations may remain in inefficient structures, neglecting opportunities for improved performance. Given the potential benefits of dynamic structural adaptation, it is essential to understand how an organization can be aided to consider and make structural adaptations. If structural adaptation is legitimized and obstacles minimized, to what degree and for what reasons will organizations change their structures? To answer these questions, we need to know more about the environmental cues that lead members of an organization to consider structural changes, what is entailed in the process of structural adaptation, and specifically how members of an organization might be aided in deciding to make a structural adaptation.

Highly effective teams recognize that decays in performance are often indicators of the need for remediation (Entin and Serfaty, 1999). A first step in investigating adaptation was to produce a situation in which significant performance decrements could be expected, and to identify observable indicators in the situation that could inform organization members that structural adaptation would be prudent. The next step would be to have organization members experience such a situation, provide them with feedback on those indicators, and give them the opportunity to adapt. What follows next is a discussion of a study that manipulated congruence between organizational structure and mission demands as a means to produce

performance decrements and cues that some structural adaptation would be beneficial.

Manipulating Congruency to Produce the Impedance of Change

The study described below empirically demonstrates that congruence between organizational structure and mission can be manipulated and that incongruence can lead to performance decrements. In their study, Diedrich et al. (2003) used model-based organizational design techniques to create scenarios that were either congruent or incongruent with two organizational structures: functional and divisional. 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 a large area of operations. In contrast, in the divisional structure, each participant had control over a single multifunctional platform that, to a large extent, was able to process all functional tasks within a bounded geographical region. Congruence between the mission scenarios and the organizations was achieved by varying coordination requirements and task phasing. Relative to the congruent case, the incongruent case required greater coordination among team members; that is, mission tasks required more than one team member for successful mission task prosecution. In addition, within the incongruent cases, mission tasks were phased so as to overwhelm particular team members (e.g., a wave of hostile aircraft across the area of operations to overwhelm the functional Air Warfare team member). It was these increases in coordination requirements that lead Diedrich et al., (2003) to hypothesize that performance would be worse in the incongruent cases. They also predicted that relative to the congruent cases, performance in the incongruent cases would be characterized by increased communications volume and higher perceived levels of workload.

Results reported by Diedrich et al. (2003) supported their predictions. The overall percentage of tasks completed indicated that in both organizations, performance was superior in

the congruent cases compared to the incongruent conditions. Consistent with the argument that performance in the incongruent conditions required much greater between-participant coordination to complete tasks accurately, communication volume was clearly higher in the incongruent condition compared to the congruent. Moreover, the requests for coordination and statements that coordination will, is or has occurred (i.e., coordination transfers) were also higher in the incongruent cases. The robustness of the communication differences is supported by the fact that the differences appeared early and persisted throughout the scenario. This also suggests that communication is a leading indicator of incongruence. Apparently, a great deal of coordination is achieved through verbal exchange within the context of these types of mission scenarios (Entin and Serfaty, 1999). Another consequence of the incongruent condition was higher perceived workloads reported throughout the scenario. The early and persistent onset of the communication difference and workload indicated they were appropriate candidates for leading indicators that adaptation would be beneficial.

Investigating the Adaptation Process

Building on the results of Diedrich et al. (2003), we conducted a study which examined the adaptation processes. We briefly review the methodology and results; a more complete report of this study can be found in Entin et al. (2004). Then we present our analysis of the communication traffic. We focus on communications because we hold that organizations and teams typically use voice communications to coordinate actions in a variety of tasks (Orasanu, 1990; Entin & Serfaty, 1999; Entin, 1999). MacMillan, Diedrich, Entin, and Serfaty (2005) highlight the importance of explicit communication to achieve the necessary sharing of information among team members so that organizations and teams can act in concert to achieve common goals. Moreover, the major conduit for the sharing of information and a primary process reflecting the need for change are typically accomplished via voice communication (Diedrich et al., 2003). We also

believe that the communications results provide an augmented picture of the current results and of the adaptation process.

METHOD

Five, six-person teams were formed from 30 Naval Postgraduate School attendees. Each team received training on the Distributed Dynamic Decision-making simulator (Kleinman and Serfaty, 1989; Serfaty and Kleinman, 1985) and performed three joint forces missions.

Team Communication Coding

The approach discussed by Entin and Entin (2001) was used to code the communication traffic. This approach allows verbal communications among the members of a team to be captured by observers at an *intermediate* level of detail that incorporates both semantic and quantitative aspects of the communication stream. Employing this technique, during a scenario, two observers listened to the communications in real time, and using handheld computers (tablets) running specifically designed software coded the source, the recipient, the time, and the type of the verbal communications among the team members. Types of communications were divided into three basic categories: transfers, requests, and acknowledgements. Both transfers and requests, in turn, were classified as requests for information, action, or coordination.

The recording form on the tablet computer was configured in a matrix format. The top of the matrix columns were labeled with the participant's call signs, to indicate who was talking to whom (e.g., Green to: Blue, Purple, Red, Orange, Brown; Blue to: Green, Purple, etc.). Down the left edge of the matrix, the rows were labeled to indicate the communication categories used. Below is a list of nine categories used to code team communications (Entin, 1999).

- Information requests
- Action requests
- Action requests using a specific resource
- Coordination requests
- Information transfers

- Action transfers
- Action transfers using a specific resources
- Coordination transfers
- Acknowledgements

Procedure

Similar to Diedrich et al. (2003) described above, teams were assigned to either a divisional or a functional organizational structure and then experienced missions scenarios that were congruent and then incongruent with their structure. Once again, congruence was achieved by defining task requirements within a scenario that matched the asset capabilities controlled by individuals within an organizational structure, thus reducing need for coordination between players and minimizing communication and coordination overhead.

In the first two simulated mission, the organizational structure of each team was congruent with the mission requirements, and therefore required no structural adaptation. The difference between the first and second mission was the introduction of SCUD ballistic missiles into theater in session two. Teams absorbed the two additional weapon systems to counter the SCUD threat with little appreciable changes to their initial organizational structures. However, after the second mission, the teams were told that the enemy would be making significant tactical changes and that the team's organizational structure would no longer be congruent to the mission requirements. Teams were provided with feedback on their performance in the congruent condition, in addition to a description of the performance of other teams in the incongruent condition they were about to perform. This feedback served as an appraisal of their likely low performance if they did not alter their structure. A moderated planning session followed to afford teams the opportunity to counteract these changes by modifying their organizational structure. Each team then participated in a third mission which was incongruent with their initial organizational structure. In reaction to performance in this third mission, each team had a second opportunity to

make organizational changes, but the teams were not given the opportunity to perform yet another mission with their altered organizational structure.

RESULTS

The primary focus of the study was on structural adaptation and communication, thus analyses of workload and performance were not conducted. To assess structural adaptation Entin et al. (2004) developed a novel approach. The approach noted that the initial organization to which a team was assigned was optimized for missions of that type. Thus, the allocation of assets in the divisional organization was optimized for divisional missions and was ill-suited for functional missions. In contrast, the allocation of assets in the functional organization was optimized for functional missions. By calculating the similarity of asset allocation for each team after each planning session with the optimal functional and divisional organizations, the degree of overlap could be assessed. This was accomplished by determining the percentage of assets in common. In sessions two and three each team had 53 assets to use. As teams reallocated assets during each planning session, the percentage of the 53 assets that overlapped with the optimal organizations was calculated.

Adaptation Analyses

Result indicated that a majority of the teams made adaptive structural changes, albeit modest in most cases, to their asset allocation, either in anticipation or in response to incongruent enemy tactics. Specifically, upon hearing in a briefing that the enemy had made substantial changes creating a mission incongruent to their initial structure, two of the divisional teams made substantial changes away from an incongruent divisional structure toward a congruent functional structure. Neither team became decidedly functional in structure with at most 38% of assets aligned with the optimal functional structure. The third divisional team remained decidedly divisional with 81% of its asset aligned with the initial divisional structure. Following experience with the incongruent mission scenario all three initially divisional

teams made only small changes (on average less than 10%) to their existing structures. Teams initially assigned to the functional structure made little or no change to their structure after learning the enemy had made changes to make mission scenario incongruent with their structure. After experiencing the incongruent scenario mission one team adapted by moved their structure about halfway between a functional and divisional structure, whereas, the other team hardly changed its structure.

Communication Analyses

The total communication volume results shown in Fig. 1 are from Diedrich et al. (2003) and in Fig. 2, from the present study. The interaction between congruence condition and organizational structure is significant ($p < .008$). The pattern for the divisional and functional structures in the congruent condition found in Diedrich et al. (2003) are quite similar to that of the present study, save a higher communications volume. This is not the case for the incongruent condition. In Diedrich et al. (2003) total communication is essentially equally high for the divisional and functional teams in the incongruent condition and total communication is higher in the incongruent than congruent condition. Teams in Diedrich et al. (2003) are constrained in their initial structures and there was no opportunity to structurally adapt. In the incongruent condition all teams are struggling equally to deal with the incongruence. For the present study, total communication for the functional teams is significantly higher ($p < .05$) than that of the divisional teams and the divisional teams' total communication is about the same in the congruent and incongruent conditions. The total communication results in the present study nicely match the adaptation patterns made by the teams heading into the incongruent condition. The functional teams hardly adapted to the impending incongruent condition and hence, paid the price indicated by substantially higher communication volume as they struggled to cope with the incongruence. By contrast, the divisional teams adapted more, two teams moving midway between divisional and functional (the optimal) structure, and thus were better able to deal with the incongruent

condition as indicated by little increase in total communication.

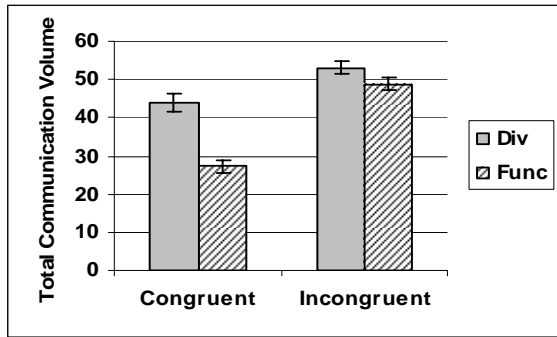


Figure 1. Total communication for organizational structure and congruence condition (adapted from Diedrich et al., 2003)

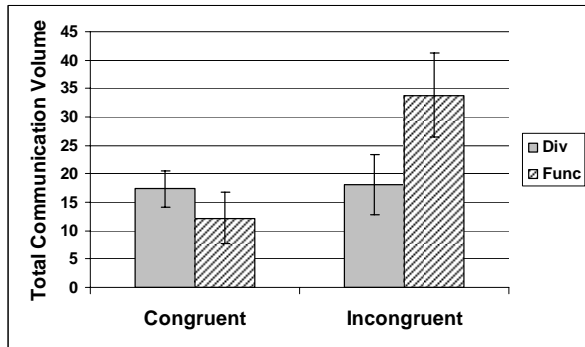


Figure 2. Total communication for organizational structure and congruence condition

Recall that an important component of congruence is coordination overhead. The results in Figs. 3 and 4 depicted coordination requests and coordination transfers. The patterns depicted in both figures are similar to that of total communication volume. Given the importance of coordination to coping with incongruence it is likely that the pattern of results seen for total communication volume are being driven by the need to coordinate as expressed in the two coordination component. Divisional team show marginally significant lower coordination request ($p < .075$) and significantly lower coordination transfers ($p < .05$) than functional teams because they adapted their structures more to the mission scenario.

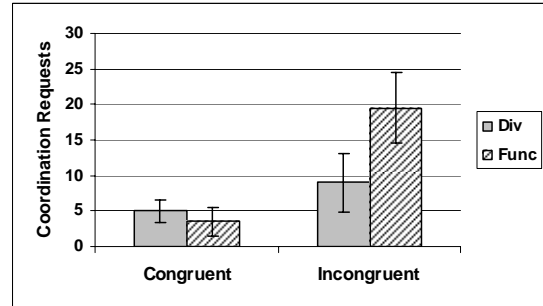


Figure 3. Coordination requests for organization structure and congruence condition

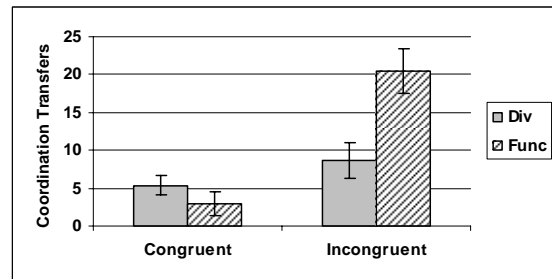


Figure 4. Coordination transfers for organization structure and congruence condition

CONCLUSIONS

Analysis of team communications during mission engagements shows that aspects of communication reflect the amount of congruence teams are experiencing between their organizational structure and mission. Without the ability to make appropriate structural adaptations teams facing missions incongruent with their organizational structure experience performance decrements and increased coordination overhead manifested as increases in communication as team members strive to cope with incongruence. Our analyses also show that aspects of communication are sensitive to level of structural adaptation undertaken by teams to adapt to an incongruent mission. Teams that took steps to alter their organizational structure to better match an impending incongruent mission exhibited lower total communication and perhaps more importantly lower coordination requirements compared to teams that made little attempt to adapt to the impending incongruent mission. The results of Diedrich et al. (2003) indicated that the differences in communication pattern in

response to congruence occurred early and persisted throughout the mission scenario. Thus, it is reasonable to expect that difference in communication pattern due to structural adaptation changes will occur early and persist throughout the mission. Not only is communication a leading indicator of incongruence, but may also be an early indicator that attempts at structural adaptation to incongruence is effective or not.

If teams are made aware that changes in communication pattern can indicate changes in the congruence between their mission and their organizational structure they may be inclined to monitor communication patterns more closely. If teams can be informed of communication pattern via real time feedback mechanisms, taught that structural changes are not only allowed but at times required, and aided in their adaptive changes, teams may begin to alter their structures to be more congruent with the mission. Moreover, further monitoring of the communication pattern can inform them the adaptive changes are working. The bottom line, such adaptive changes lead to higher mission performance.

We are aware of the limitations in our study, specifically small numbers of teams, insufficient counter-balancing, and lack of a performance metric. We believe, however, that our conceptual frame work is sound. Hopefully, further research will lend support to our arguments.

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