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Team Adaptation to Structural Misalignment: Determinants of Alternative Change Mechanisms

Topics: Cognitive domain issues; Social domain issues; C2 experimentation

Michael D. Johnson*, John R. Hollenbeck, Daniel R. Ilgen, Dustin Jundt*, D. Scott Derue*, and Christopher Barnes*

Michigan State University

Contact: Michael D. Johnson

Michigan State University

N475 Business College Complex

East Lansing, MI 48824

Tel. (517) 353-7229

Fax. (517) 432-1111

johnson@bus.msu.edu

* Students

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Abstract

Structural Contingency Theory holds that teams perform best when their structure is aligned with their environment (Hollenbeck et al., 2002). Yet when teams perform poorly due to structural misalignment, they may focus on making changes to their personnel or processes rather than to their structure. This experiment examined whether teams decided to make changes in their structure, personnel, or processes when their structure was misaligned with their environment, and the impact of those decisions on their performance. Two interventions were tested: (a) providing information to teams on the typology of possible changes, and (b) the feedback provided to the teams about their previous structural alignment. Results indicated that teams were most likely to choose to change their structure when (a) they were explicitly informed about the three possible types of changes, and (b) they were provided with feedback regarding their structural alignment. Teams that changed structure subsequently performed better than teams that did not change structure, and the decision to change structure mediated the relationship between the interventions and subsequent team performance. In contrast, a decision to change personnel did not improve performance, and a decision to change process actually worsened team performance.

Research on both organizations and teams has shown that when it comes to designing task structures or resource allocation structures, there is no "one best way" across diverse contexts (Burns & Stalker, 1961). Instead, the optimal structure for any given mission may depend upon the nature of the task environment (e.g., predictable versus uncertain). For example, functional structures tend to work best in predictable task environments, but divisional structures work best in uncertain environments (Hollenbeck et al., 2002; Johnson et al., in press).

This suggests that when confronted with dynamic situations that may entail changes in the nature of the task environment, teams should change their structure in order to maintain high levels of performance. However, in terms of perceptual space, personnel and processes are often the "figure," whereas the team's structure is the "ground." Hence, when confronted with performance deficiency problems, attention tends to be directed at changes in personnel (e.g., where an individual or subgroup is singled out as the scapegoat) or changes in processes (e.g., re-engineering or benchmarking procedures). This may even occur in contexts where the most direct causal determinant of the performance deficiency is an overlooked structural problem.

Clearly, if the primary determinant of a performance deficiency is actually structural, structural realignment should be the preferred solution to such a problem. Thus, interventions aimed at both increasing the salience and desirability of structural adaptation may need to be developed. This study examined two such interventions: (a) the information provided to teams regarding possible changes, and (b) the feedback provided to the teams about their degree of structural alignment.

A Typology of Change Mechanisms

In this section, we propose a typology of possible changes that teams can make in an attempt to improve their performance. In so doing, we draw broadly from the organizational

change and development literature, but this typology has not been proposed elsewhere. Additionally, although our focus is on teams, the typology may apply equally well to higher levels of analysis, such as departments, SBUs, or organizations themselves. Specifically, we suggest that teams can make three types of changes: structure, personnel, or process.

Structural Changes

The first type of change teams may make is structural in nature. Drawing from Burns and Stalker's (1961) theory of mechanistic and organic organizations, both Wagner (2000) and Hollenbeck (2000) suggested that two dimensions along which teams can be structured are centralization and departmentation. Centralization refers to the horizontal dimension of structure, reflecting how much authority (if any) is invested in a team leader. Highly centralized teams require most decisions to be made by the leader, whereas highly decentralized teams empower team members to make decisions, and may even be self-managing (without a leader). Departmentation refers to the horizontal dimension of structure, reflecting differences in specialization of the members. In functional teams, members specialize in one aspect of the team's task, through possessing expertise or resources in a specific area, whereas in divisional teams, members are generalists that handle many aspects of the team's task. In addition to these two dimensions of structure, Johnson et al. (in press) added rewards as a third dimension. In cooperatively rewarded teams, members are rewarded based upon their team's performance as a whole, whereas in competitively rewarded teams, members are rewarded based upon their individual performance.

According to structural contingency theory, there is no one best way to structure teams; instead, the best structure depends upon both the environment within which the team operates and the dimension of performance they are seeking to maximize. Centralized, functional, and

cooperatively rewarded teams fit best in predictable environments and promote accuracy, while decentralized, divisional, and competitively rewarded teams fit best in unpredictable environments and promote speed of performance. When seeking to improve their performance, teams making structural changes may modify any combination of these structural dimensions. Centralized teams may become decentralized, functional teams may become divisional, cooperatively rewarded teams may become competitively rewarded, or vice versa. Moreover, teams may undergo more than one structural change simultaneously. For example, a centralized and divisional team that has operating in an unpredictable environment may change to a decentralized and divisional structure in order to become more aligned with their environment.

Personnel Changes

The second type of change teams may make is related to personnel—the team members themselves. In this type of change, the performance problem is attributed to one or more of the team members, and these attributions may or may not be legitimate. A team member may legitimately lack the requisite knowledge, skills, or abilities (KSAs) to perform their portion of the team's task. A team member may possess the requisite KSAs but not be a good fit with the rest of the team, and thus inhibit overall team performance (Ferris, Youngblood, & Yates, 1985). There may simply be more team members than is necessary to do the task ("too many cooks spoil the broth"), and thus one or more needs to be downsized or reassigned.

More pernicious, however, are the illegitimate attributions. When team performance is poor, people often engage in counterfactual thinking, where they consider what could have happened if something had been done differently. Often that counterfactual thinking process leads people to blame one member for the team's failure, even if there were many factors that led to poor performance (Naquin & Tynan, 2003). Alternatively, a team member may serve as a

scapegoat for the rest of the team, as the other members seek to avoid responsibility for the team's failure (Boeker, 1992; Gamson & Scotch, 1964).

When poor team performance is attributed to personnel issues, teams may make one or more of four types of changes. First, they may remove the member or members who are perceived to be responsible for the team's poor performance. If the task can be performed with fewer members, these members may not be replaced, but in most cases, other individuals will be selected to take over their responsibilities. Second, teams may seek training for the poorly performing members in order to imbue them with the knowledge and/or skills necessary for good team performance. Third, teams may engage in activities intended to increase the motivation of the poorly performing members. This may entail the promise of rewards for better performance or the threat of punishment for continued poor performance. Finally, teams may redistribute roles within the team so that each team member fills the role that is most in line with their KSAs. Thus, a team confronted with a performance deficiency has a wide variety of options open to them if they attribute this to a personnel problem.

Process Changes

The third type of change teams may make is related to their process—the methods and strategies they use to perform their tasks. In this type of change, poor performance is attributed not to the team's structure or personnel, but rather to how they are doing their jobs. In a sense, the team believes that they have been going about their tasks the wrong way, and devise what they believe to be superior strategies that will lead to better performance. At the organizational level, making process changes is often referred to as reengineering, work redesign or business process design, where work is redesigned to improve efficiency in workflow or effectiveness in organizational performance (Burke, 1997).

This is roughly paralleled at the team level, as teams make changes that enable them to be more efficient or effective in performing their tasks. Teams may make changes to their technology, possibly in response to changes in task complexity (Lawrence & Lorsch, 1967). They may develop better methods of coordinating their actions with each other, possibly by improving their communication practices. They may develop strategies for helping each other out when individual members are overwhelmed with task demands. As these brief examples illustrate, the range of process changes teams may make are numerous, and are dependent upon the team's task and the environment in which they operate.

Thus, teams may make three types of changes when they are seeking to improve their performance: structural, personnel, or process changes. We suggest, however, that these three types of changes are not equally salient to teams in most situations. Instead, teams tend to focus on personnel and process changes rather than structural changes. We suggest that this is because personnel and process—the people and the actions they do—are the figure, whereas structure—the stage on which the people perform their actions—is the ground. Within the choice to focus on process or personnel, we will also argue that teams will focus first on process changes rather than personnel changes, because this is easier to accomplish from a logistical, political and interpersonal perspective relative to eliminating or changing personnel. Finally, we will argue groups do not usually consider structural changes because structure is the foundation on which they operate. In essence, structure is largely invisible to teams when they are considering what to change. Thus, we expect that in most situations, the changes teams decide to make are likely to be related first to process, then to personnel and rarely to structure.

H1: In the absence of any intervention, teams that are structurally misaligned with their environment are most likely to make (a) process changes with greater frequency than

personnel or structural changes, and (b) personnel changes with greater frequency than structural changes.

Providing Teams with Structural Information and Feedback

If the above hypothesis is true, then teams may at times be choosing to make changes to personnel and process when structural change is what is really needed. As noted above, structural contingency theory holds that different structures work best in different environments. If a team is operating in a structure that is misaligned with its environment, the best change they could make would be structural. But if structure is invisible to teams, they will be likely to leave their structure intact while tinkering with personnel and processes. Thus, a primary goal of this study was to develop tools that would make it more likely that teams would choose to make structural changes when structural changes are warranted. Specifically, we considered two such tools: (a) informing teams about the theoretical typology of changes outlined above, and (b) providing feedback to teams on their degree of structural alignment with their environment.

Providing Information on the Typology

If the problem of not choosing to make structural changes when they are warranted is simply due to the lack of salience of structure, then perhaps simply making teams aware of the possibility of structural change will be enough to cause them to choose to make structural changes. This may occur for two reasons. First, training teams about the typology of possible changes may make them aware of the possibility of structural change when they previously had no idea that such a change could be made. Training has been previously been shown to reduce decision errors and biases. For example, failure to recognize regression to the mean was among the numerous decision errors described by Kahneman and Tversky (1973). Fong, Krantz, and Nisbett (1986) demonstrated, however, that this decision error could be overcome through

training on basic statistics. In their study, students enrolled in a college statistics course were contacted either early in the course or later in the course, and were asked why baseball Rookies of the Year tended not to perform as well their second year. Students who answered this question later in the course were much more likely to attribute the decrease in performance to regression to the mean than were students who answered the question earlier in the course. This suggests, then, that training teams on the possible types of changes they could make may help them to avoid the error of neglecting structural change when it is warranted.

Second, informing teams of the typology immediately before they make their decision on what to change increases the salience of structural change. Even if teams have been previously trained on the typology of changes, they still may neglect structure because of its relative invisibility compared to personnel and process. According to the availability heuristic (Tversky & Kahneman, 1974), people tend to use information that is more available to them when making their decisions. If teams typically make process and personnel changes, these types of changes will be more cognitively available when they are deciding on what type of change to make. Informing (or reminding) teams of the typology immediately preceding the change should increase the availability of structural change relative to the other two types of changes.

H2: When teams that are structurally misaligned with their environment are informed of the typology of changes, they will be more likely to choose to make a structural change relative to personnel or process changes.

Providing Structural Feedback

The second tool we tested to increase the probability that misaligned teams will choose to make structural changes was providing feedback regarding the teams' structural alignment. This tool is based on the notion that when teams are given explicit evidence that their structure does

not fit their environment, they will choose to change their structure. Providing this type of feedback both increases the salience of structure as a possible avenue for change and increases the legitimacy of such a change. The salience of structure is increased in the same way described above: providing feedback on structural alignment makes structure more cognitively available to teams as they make their decisions regarding change.

Indeed, this can be seen in many ways as organizational generalization and extensive of past research on "biofeedback." The term "biofeedback" was coined in the late 1960s to describe laboratory procedures employed to train people on how to alter various aspects of the supposedly "autonomic nervous system." That is, at the time, scientists believed that people were not able to voluntarily control various aspects of the nervous system such as brain activity, blood pressure, and heart rate. However, by attaching people to electrodes that allowed them to readily perceive these patterns of activity, researchers soon discovered that people could learn to regulate many of these so-called involuntary responses. Many applied treatments grew out of this research, including preventative treatments for high blood pressure, migraine headaches, irregular heartbeats, and epilepsy. The key to all of these treatments was making a formerly "invisible" aspect of self-regulation "visible" through direct feedback, as well as illustrating acceptable and unacceptable ranges for various feedback values (Waldstein, Manuck, Ryan, & Muldoon, 1991).

In addition to increasing the perceptual salience of structure as a target of change, this kind of feedback also increases the perceived legitimacy of choosing a structural change. That is, when teams are given feedback that they are structurally misaligned, making a structural change is clearly a rational choice. According to the social information processing approach (Salancik & Pfeffer, 1978), people are highly influenced by what others think when they make decisions. In teams, this is exacerbated when teams attempt to reach consensus on their decisions. One

member may correctly determine the best option but may not bring it up due to concern about what the others will think of it. Alternatively, he may raise the option but have it rejected by the other members because the majority prefers another option. When feedback on structural misalignment is provided, however, the legitimacy of making a structural change is increased, making it more likely that the option will at least be both discussed and chosen.

H3: When teams that are structurally misaligned with their environment are provided with feedback on their structural alignment, they will be more likely to choose to make a structural change.

Team Composition: Openness to Experience

Aside from interventions that provide information on the typology and feedback on structural misalignment, the composition of the team itself may affect the likelihood that structurally misaligned teams will choose to make structural changes. Of the personality factors that make up the Big Five model of personality (Costa & McCrae, 1992), openness to experience is most relevant to making decisions regarding change. Among the subfacets of openness are three that directly affect decision making regarding change: ideas, fantasy, and action. In the ideas subfacet, people who are high on openness are intellectually curious, and enjoy considering new ideas. In the fantasy subfacet, people high on openness are highly imaginative, and can envision varied scenarios better than people who are low on openness. In the actions subfacet, people high on openness value experimentation and learning, and are more likely to test out alternative courses of action than those low on openness. Together, these three subfacets suggest that teams composed of people high on openness will (a) be more likely to seriously consider structural change, (b) be able to envision how their team will function under a different structure, and (c) be more willing to try out structural change.

H4: When teams that are structurally misaligned with their environment are high on openness to experience, they will be more likely to choose to make a structural change relative to process or personnel change.

Finally, we suggest that for structurally misaligned teams, the decision on whether to make a structural change mediates the effect of the three factors mentioned above (providing information on the typology, providing structural feedback, and openness to experience) on future team performance. If the predictions of structural contingency theory hold true (and they have in both field and laboratory studies; cf. (Drazin & van de Ven, 1985; Hambrick, 1983; Hollenbeck et al., 2002), then making a structural change should improve the team's performance relative to teams who remain in a misaligned structure.

H5: The decision to make a structural change mediates the relationship between the provision of information on the typology, provision of structural feedback, and openness to experience on the one hand, and future performance on the other.

Methods

Research Participants and Task

Three hundred twelve undergraduate students in an upper-level management course at a large Midwestern university were arrayed into 78 four-person teams. Individuals signed up for a research session at their discretion, and were randomly assigned to teams within their session. Teams were randomly assigned to conditions in which they participated in two 30-minute simulations, which we refer to as Time 1 and Time 2. The simulations were identical across both times and across all conditions. Students received course credit for participation.

Participants engaged in a dynamic and networked computer simulation, which was a modified version of the Distributed Dynamic Decision-making (DDD) simulation developed for

the Department of Defense for research and training (Miller, Young, Kleinman, & Serfaty, 1998). The version of the simulation used here was developed for teams of four members with little or no military experience (MSU-DDD). Because this simulation has been described in detail in other sources (see Hollenbeck et al., 2002) we provide only a brief description in Appendix A.

Teams were randomly assigned to one of four conditions in a fully crossed 2 x 2 design, and were provided with different information prior to their discussion and decision. Half of the teams were provided with information on the typology prior to their discussion, and half were not provided with this information. This was crossed by providing half of the teams in each of these conditions with feedback on their structural alignment, and the other half were not provided with structural alignment feedback. Thus, this created four conditions where a quarter of the teams received no information or feedback (control condition), a quarter received only information on the typology, a quarter received only structural alignment feedback, and a quarter received both information on the typology and structural alignment feedback.

Manipulations and Measures

Information on the typology and structural feedback. After the first thirty-minute simulation, teams were asked to make a decision on what—if anything—they wanted to change before the second thirty-minute simulation. See Appendix B for the exact text of the two manipulations.

Openness to experience. Openness to experience was measured using the twelve items from the Revised NEO Personality Inventory (Costa & McCrae, 1992). Responses were provided on a five-point scale, and coefficient alpha in our sample was .65. The individual scores of the team members were averaged to create the team-level variable.

Change decision. After the first thirty-minute simulation, the teams were given up to ten minutes to make decisions on what they would like to change (if anything) in order to try to improve their performance in the second simulation. The trainer remained in the room to answer any questions the teams may have had, but did not participate in the discussion in any other way. The teams were required to come to a consensus decision on any changes they would make; after the decision was reached, the trainer asked each team member personally if they agreed with the decision. The teams could make any combination of the three types of changes.

*Performance***.** Performance was captured by the computer simulation as a composite of four variables. Speed of performance was operationalized as a combination of attack speed and identification speed. Attack speed measured the elapsed time between when an enemy track entered the restricted area and when a team member engaged it. Identification speed measured the elapsed time between when a track entered the screen and when a team member identified it. Accuracy of performance was operationalized as a combination of friendly fire errors and missed opportunities. Friendly fire errors reflected a count of the number of times a friendly track was disabled. Missed opportunities were operationalized as the the of the number of times an enemy track was engaged, but the vehicle used to engage the track did not have enough power to disable it. These four variables were standardized and averaged to create the performance composite, which was obtained at both Time 1 and Time 2.

Results

The correlations and descriptive statistics for all of the variables are displayed in Table 1. Hypothesis 1 suggested that in the absence of any intervention, structurally misaligned teams will choose to make (a) process changes with the most frequency, followed by (b) personnel changes, followed by structural changes. To test this hypothesis, we examined the choices made

by the nineteen teams in the control condition through paired sample t-tests. Results indicated that sixteen of these teams (84%) chose to make process changes and three (16%) chose to make personnel changes, whereas only one team (5%) chose to make a structural change. The difference between the frequencies of process changes and personnel changes was significant ($t = 5.12$, $p < .01$), as was the difference between the frequencies of process changes and structural changes ($t = 8.13$, $p < .01$). The difference between the frequencies of personnel changes and structural changes, however, was not significant ($t = 1.00$, *ns*). Thus, Hypothesis 1 was partially supported.

Hypotheses 2-4 suggested that teams would be more likely to make structural changes when they were informed of the typology (2), given feedback on their structural alignment (3), and were high on openness to experience. We tested these hypotheses in one binary logistic regression equation, which is appropriate for dichotomous dependent variables. We first created three dummy codes to capture the four manipulated conditions, with the control condition as the comparison condition. We then regressed whether the team made a decision to change structure on these dummy codes and on the team's score on openness to experience. Table 2 displays the results of this equation. Each of the other three conditions chose to change structure significantly more often than the control condition (typology only: $B = 3.92$, $SE = 1.22$; structural feedback only: $B = 3.60$, $SE = 1.22$; both typology and structural feedback: $B = 6.40$, $SE = 1.59$; all $p < .01$), fully supporting Hypotheses 2 and 3. Additionally, openness to experience exerted a positive effect on teams' decisions to change structure ($B = 4.94$, $SE = 1.77$, $p < .01$), supporting Hypothesis 4.

As a comparison, we ran the same logistic regression equation twice more, using variables capturing whether teams chose to make personnel changes or process changes as the

dependent variables. Table 2 also displays the results of these equations. Teams did not make personnel changes more often than the control condition if they were only given the typology (*B* = .75, *SE* = .87, *ns*) or the structural feedback (*B* = .08, *SE* = .94, *ns*), but they did if they were given both (*B* = 1.89, *SE* = .85, $p < .05$) and if they were higher on openness to experience (*B* = 4.51, *SE* = 1.72, $p < .01$). Similarly, teams did not make more or fewer process changes if they were given only the typology (*B* = -.18, *SE* = .84, *ns*) or the structural feedback (*B* = -1.32, *SE* = .80, *ns*). They did, however, make significantly fewer process changes if they were given both (*B* = -1.58, *SE* = .78, $p < .05$). Openness to experience had no effect on whether teams made process changes (*B* = -1.68, *SE* = 1.26, *ns*). The percentage of teams that chose to make each type of change is displayed in Figure 2.

Hypothesis 5 suggested that the decision to make a structural change mediates the relationship between the independent variables and future performance. We tested this hypothesis following the Baron and Kenny (1986) procedure which requires three conditions to be met to infer mediation effects: (a) the independent variables must be significantly related to the proposed mediator; (b) the independent variables must be significantly related to the dependent variable; and (c) the relationship between the independent and dependent variables is decreased when controlling for the mediation effects.

The first of these conditions was established in the logistic regression equation described above. To establish the second condition for mediation, we regressed Time 2 performance on the three dummy variables, openness to experience, and Time 1 performance (to control for between-team variance in overall ability). In this equation, Time 2 performance was significantly predicted only by Time 1 performance (*B* = .52, *SE* = .10, $p < .01$) and the dummy variable representing the condition where teams were given both the typology and structural feedback (*B*

= .38, *SE* = .18, $p < .05$). Thus, the decision to make a structural change could not mediate the relationship between the other two dummy variables and openness to experience on the hand, and Time 2 performance on the other. Regarding the third condition for mediation, when the relationship between the decision to make a structural change and Time 2 performance was controlled, the effect of the dummy variable capturing whether the teams were given both the typology and structural feedback on Time 2 performance dropped significantly (*B* = .07, *SE* = .22, *ns*). This indicated that the decision to make a structural change fully mediated the relationship between this dummy variable and Time 2 performance, lending partial support to Hypothesis 5.

Discussion

The purpose of this study was to test what factors would cause structurally misaligned teams to choose to change their structure. We described a typology of types of changes teams can make when they wish to improve their performance, suggesting that teams tend to make changes to personnel and process rather than changes in structure. Our data demonstrated that when left to their own devices, most teams chose to change their process, not their structure. Three factors, however, made it more likely that teams would make structural changes. First, when teams were provided with information on this typology, more than half of them chose to change their structure. This suggests that making structure salient to structurally misaligned teams increases the likelihood that they will choose to change their structure.

Second, when teams were provided with feedback regarding their degree of structural misalignment, more than half of them also chose to change their structure. This suggests that making structure not only salient, but also a legitimate avenue of change, increases the likelihood that teams will choose to change their structure. Notably, the highest incidence of structural

change was evidenced by those teams who received both information on the typology and feedback regarding their structural alignment, however these effects were additive, not interactive. This suggests that the two interventions were not simply redundant mechanisms for increasing the likelihood of structural change, but rather, each had a unique effect.

Third, teams that were composed of people who were high on the personality trait of openness to experience were more likely to choose to change their structure. People high on openness are imaginative, enjoy considering new ideas, and are more willing to test ideas through experimentation than people low on this trait. In this study, openness had a strong effect on decisions to make structural changes, and was also positively correlated with decisions to make personnel changes, but was not correlated with decisions to change process.

An interesting but unanticipated finding was the negative correlation between decisions to change structure and decisions to change process. Figure 2 graphically demonstrates that generally, the more teams chose to change structure, the less they chose to change process (although nothing in the experiment prevented them from changing both or neither). This is particularly interesting because neither of the interventions were designed to decrease decisions to change process. In the condition where teams received both information on the typology and structural feedback, the teams made more decisions to change structure than to change process; this was the only condition with that particular pattern of decision making.

This is particularly important because decisions to change process actually had a negative effect on future performance. The implication is that when teams misdiagnose their structural problem and start tinkering around with their process, they may actually perform worse than they did previously. In contrast, when teams correctly diagnosed their structural problem and actually changed their structure, they performed better. Moreover, the decision to change structure

mediated the relationship between future performance and the two interventions designed to increase the likelihood of structural change. Teams that received both information on the typology and structural feedback were the most likely to change their structure, and the decision to change structure was in turn responsible for their better future performance.

Another unanticipated effect of our study was the reluctance of these teams to make personnel changes. Although we anticipated that teams would be more likely to change process than personnel, we also anticipated that personnel changes would occur more frequently than structural changes, but this did not occur. As Figure 2 makes clear, these teams did not make personnel changes very frequently, and providing the typology information (which promoted structural change) did nothing to promote personnel changes even though this was highlighted as one specific option. Future research should examine this reluctance more fully, particularly in situations when the true explanation for a team-level performance deficiency can be attributed to a personnel problem rather than to a structural problem as was the case in this study.

Limitations

At least three characteristics of this experiment limit our findings. First, the sample and the task may limit the generalizability of the findings to other contexts. Our sample consisted of undergraduate college students, and thus is not representative of the population of people working in teams. The task was a simple computerized simulation that may not capture the complex tasks of many work teams. On the other hand, there are certain features of this task that do achieve what Berkowitz and Donnerstein (1982) refer to as mundane realism. Most weapons directors or those operating consoles in command and control situations are lieutenants, and thus our research participants are about the right age and education level. In addition, the command and control task is one where people sit at computer monitors and collect information exactly as

is done in this simulation (which was developed for the Department of Defense). Also, these people tend to be assembled into crews based upon rotations that preclude their working together for long periods of time (i.e., many of these crew have short but meaningful histories).

Although the consequences of decisions for our research participants were not as dramatic as they would be in a real situation, this was a psychologically engaging task and research participants were visibly upset when they performed poorly or made errors. The research participants were also aware of the financial bonuses that were available to the top performing teams, and the valence and probability of such rewards motivated them to perform well. Thus, there were consequences associated with performance that mattered to these people, so we believe that "psychological realism" (Berkowitz & Donnerstein, 1982) was also quite high.

Second, the nature of the experimental setting may have made participants believe they couldn't change their structure, unless they were explicitly told that they could do so. In this context, the decision to change structure necessitated a change in the computer simulation, whereas changes to personnel and process did not. We did, however, attempt to highlight structure before the first game. Participants were explicitly told that they would be "operating in a divisional structure. This means that each of you will control one of each vehicle type." Additionally, one team in the control condition did indeed change structure, demonstrating that it was not impossible for teams to consider making a structural change.

Third, it may be difficult in other contexts to develop a structural feedback mechanism like the "structure meter" we presented to our participants. In our task, we had solid previous data that allowed us not only to determine the factors that best distinguished between structural alignment and misalignment, but also to set regression weights for these factors. It may not be as clear in other tasks what the factors are that could help a team decide whether their structure was

aligned or misaligned with their environment, although anecdotal data on the symptoms associated with various structural problems is often available in these contexts.

Practical Implications

The practical implications of this study are relatively straightforward. If structure really is invisible to teams—as our results indicate—then organizations should seek ways to make it more visible. We developed two such mechanisms, which varied both in their likelihood of effecting structural change and in their ease of development. Providing teams information on the typology of possible changes would be an easy mechanism to implement in most organizations, and it significantly increased the likelihood that teams would choose to make structural changes. Providing feedback on teams' degree of structural alignment would be more difficult to implement, but our data show that combining these two mechanisms was the most effective method of causing teams to choose structural change, and was associated with the best future performance. Thus, our recommendation is that organizations seek ways of integrating both of these mechanisms as decision aids for teams attempting to improve their performance.

Directions for Future Research

We suggest five directions for future research, most of which are related to the presentation of feedback to teams. First, the structural feedback we provided in our experiment was specifically designed to give teams an indication of how structurally aligned they were in terms of departmentation. This is just one dimension of structure, however; future research could examine ways of presenting structural feedback on centralization and rewards as well. Second, our structural feedback was highly simplified, such that teams were given a single alignment score in a graphical format. Other methods of presentation may be more or less effective than the method we used, and future research could attempt to determine the most effective method.

Third, our feedback mechanism only presented information related to structure. A more complete decision aid would also present information on the team's personnel and processes, so that teams would have better information to determine if their performance could be better enhanced by making changes to structure, personnel, or process.

Fourth, in our experiment, all of the teams started in a misaligned structure, and thus changing structure was the appropriate change to make. Future research could examine whether teams who start in an aligned structure would make structural changes when given information on the typology or when given structural feedback. This may be particularly relevant for teams who are only given information on the typology. If making structure salient increases the likelihood that teams will change structure regardless of whether they are structurally aligned or not, presenting only the typology could actually harm future team performance.

Fifth, it would be interesting to see whether certain types of people respond more or less readily to feedback mechanisms. Our study showed that teams that were high on openness were more likely to change structure, but other traits may also be relevant to change decisions. For example, people high on neuroticism have been shown to be less likely to make risky decisions (Lauriola & Levin, 2001); it may be that teams composed of people high on Neuroticism, then, would be less likely to respond to structural feedback compared to teams composed of people low on this trait.

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Table 1. Correlations and descriptives

	M	*SD*	*1*	*2*	*3*	*4*	*5*	*6*	*7*
1. Typology	.54	.50							
2. Structural feedback	.47	.50	.00						
3. Openness to experience	3.22	.20	-.16	-.02					
4. Structural change	.53	.50	.43**	.41**	.19				
5. Personnel change	.26	.44	.19	.15	.28*	.26*			
6. Process change	.70	.46	-.04	-.30**	.00	-.27*	.06		
7. T1 performance	.00	.63	-.14	-.08	.16	-.06	-.16	-.04	
8. T2 performance	.00	.62	.05	.18	.01	.23*	-.15	-.27*	.50**

N = 78 teams.

* $p < .05$

** $p < .01$

Table 2. Logistic regression of change decisions on experimental manipulations and openness to experience

	Structural change		*Personnel change*		*Process change*	
	B	*SE*	*B*	*SE*	*B*	*SE*
Constant	-19.32**	6.12	-16.53**	5.78	2.22	4.13
Typology only	3.92**	1.22	.75	.87	-.18	.84
Structural feedback only	3.60**	1.22	.08	.94	-1.32	.80
Typology & structural feedback	6.40**	1.59	1.89*	.85	-1.58*	.78
Openness to experience	4.94**	1.77	4.51**	1.72	-.17	1.26
$\chi^2(4)$	42.30**		14.18**		7.16	

N = 78 teams.

* $p < .05$

** $p < .01$

Figure 1. Example of structural feedback.

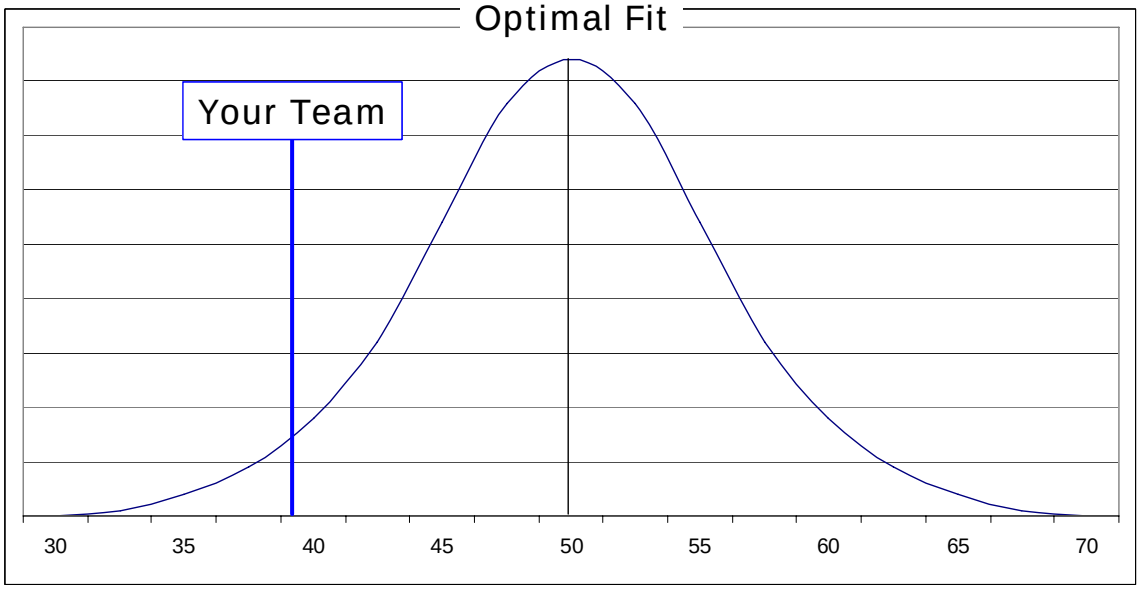
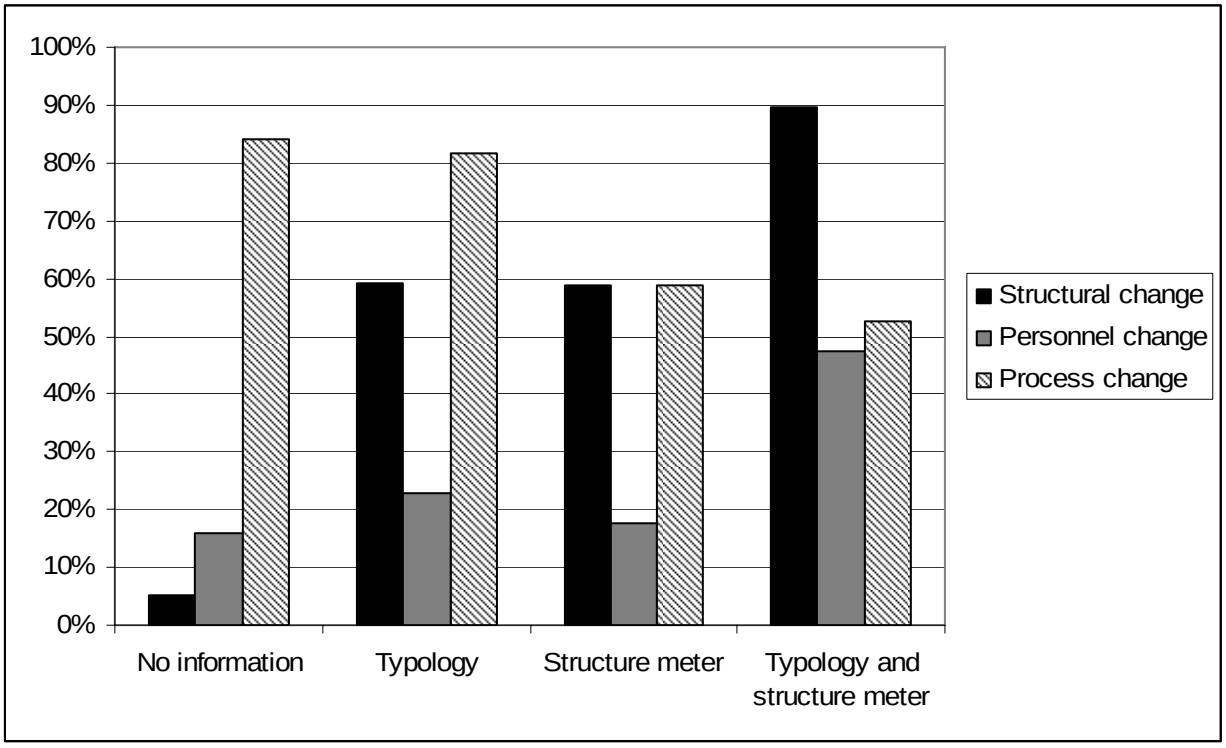


Figure 2. Probabilities of making changes in each condition.



Appendix A. Description of the task

Teams played a command and control simulation in which each team member sat at a networked computer. The individual team members were located in the same room but were unable to see the screens of their teammates. The teams' mission was to monitor a hypothetical geographic region, keeping unfriendly forces from moving into the restricted areas and allowing friendly forces to move about freely. Radar representations of these forces moving through the geographic space monitored by the team were known as "tracks." In monitoring the geographic space, each team member's base had radar capacities that covered only a portion of the area that needed to be monitored. Any track outside the radar range was invisible to the team members from their base. If the team members wanted to determine the nature of a track outside this ring, they could ask their teammates to provide that information to them or they could launch a vehicle and move it near the track and manually identify it.

Each team member had control of four vehicles that could be launched and moved to different areas of the screen. The vehicles had the ability to engage the various tracks as they moved through the geographic region. In total, the team had four AWACS planes, four tanks, four helicopters, and four jets. Each of these vehicles varied in its capacities on four different dimensions: (a) range of vision, (b) speed of movement, (c) duration of operability, and (d) weapons capacity. At Time 1, each team member had control over one of each of the four vehicles, creating a divisional resource allocation structure–meaning that each team member was able to engage and disable any enemy track that encroached on his/her geographical region.

There were eight types of "standard tracks" that were known a priori to have specific characteristics, and these were taught in the training session prior to the start of the simulation. There were also four types of novel tracks, or "unknown tracks" that were not encountered

during training. Thus, team members did not know whether the novel tracks were air or ground, friendly or unfriendly, or what power it took to disable them if they were unfriendly. The team members could only learn the nature of these tracks via deductive trial and error experience. The teams' overall objective, then, was to disable enemy tracks as quickly as possible if they entered the restricted airspace, while avoiding the errors of disabling friendly tracks or wasting resources by attempting to engage tracks with less power than was required.

The tracks that the teams faced were arranged in a predictable format, such that all of the tracks entered the screen in the northwest corner and proceeded across the forbidden zone to the southwest corner. Thus, the track set was predictable in that the participants knew where the threats would originate. As established by Hollenbeck et al. (2002), the divisional structure described above is misaligned with this predictable environment.

Appendix B. Text of the manipulations

Information on the Typology

Teams given information on the typology were told:

> I'm going to ask you to make a decision about whether you want to make any changes in this next game. You will have a similar task environment in Game 2 to what you had in Game 1; this means that the targets will come from generally the same direction and with the same power levels as in Game 1. In the past, we have found that many teams don't want to change anything. They play it in Game 2 the same way they did in Game 1. That is perfectly fine if you choose this option.
>
> Other teams have chosen to change their seating arrangement. Because the DM2 quadrant is overloaded with targets compared to the other quadrants, teams have chosen to have some or all of their team members play Game 2 from a different base because of their unique skills. This is called a role change. If you decide to make a role change, let me know how you would like to change your seating arrangement.
>
> Still other teams have chosen to change their strategy for playing the game. These teams feel like they have learned something about the simulation in Game 1, and want to approach Game 2 with a different strategy. For example, a team might decide something like, "Everyone will keep their vehicles in their own quadrant." This is called a process change. If you decide to make a process change, let me know what it is so I can write it down.
>
> Finally, other teams have chosen to redistribute the vehicles among the

bases. Instead of having one of each type of vehicle at each base, they decide to put more or less of each vehicle at the different bases. This is called a structural change. If you decide to make a structural change, you should decide how you want to allocate the vehicles at each base. Just to let you know, the software is somewhat limited, so if you decide you want to make a structural change, let me know how you want the vehicles distributed, and I'll let you know the game option that is closest to your choice.

If you choose to change anything in game 2, you can combine these three types of changes in any way you want. You may choose to change only your structure, only your roles, only your process, or any combination of the three. Or you may choose to change nothing at all.

Teams not given information on the typology were told:

I'm going to ask you to make a decision about whether you want to make any changes in this next game. You will have a similar task environment in Game 2 to what you had in Game 1; this means that the targets will come from generally the same direction and with the same power levels as in Game 1. If you have any ideas on how your team might improve its performance in Game 2, now is the time to discuss them.

Structural Alignment Feedback

Based on data from Hollenbeck et al. (2002), we created a "structure meter" that indicated each team's degree of structural alignment based on their performance and behaviors in the first thirty-minute simulation. These data indicated that three factors best indicated the structural fit in the simulation: (1) the degree to which team members attacked tracks in team

members' quadrants (help attacks), (2) the speed with which they attacked tracks in team members' quadrants (help attack speed), and (3) their overall point score from the simulation. Based on the Hollenbeck et al. (2002) data, we calculated regression weights for each of these factors by regressing a dichotomous variable that captured the team's structure (functional or divisional) on these three factors.

In the current study, we multiplied each team's raw scores on these three factors by the regression weights calculated from the Hollenbeck et al. (2002) data and summed them, creating a unique structural alignment score for each team. In essence, this score showed each team the likelihood that their structure was aligned with the task environment they were facing. To ease interpretation, we converted these scores to T-scores by multiplying the score by 10 and adding 50. This score was presented to the team using a PowerPoint slide; an example is provided in Figure 1. The teams provided with this information were told:

> To assist you in making this decision, I have prepared a decision aid for you based on your behaviors in game 1. We have found that teams do more or less of certain types of behaviors depending upon whether their structure fits their task environment. This slide shows you how much it appears that your structure (how your vehicles were allocated across the bases) in game 1 fit the task environment. Most teams that fit their task environment score close to 50 on the structure meter. The farther away from 50 (higher or lower), the less likely it is that the team's structure fit the task environment. In a previous study, 60% of the teams that fit their task environment had structure meter scores between 45 and 55, and 95% had scores between 40 and 60. Your team's score on the structure meter for game 1 was _____.

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Team Adaptation to Structural Misalignment: Determinants of Alternative Change Mechanisms

Michael D. Johnson, John R. Hollenbeck,
Daniel R. Ilgen, D. Scott Derue, Dustin Jundt,
and Christopher Barnes

Michigan State University

Structural Fit in Teams

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- No “one best way” to bring about good team performance (Taylor, 1911)
- Team structure should be aligned with the task environment (Burns & Stalker, 1961; Hollenbeck, 2000)
- Structure is overlooked as a possible change when teams are misaligned

A Typology of Change Mechanisms

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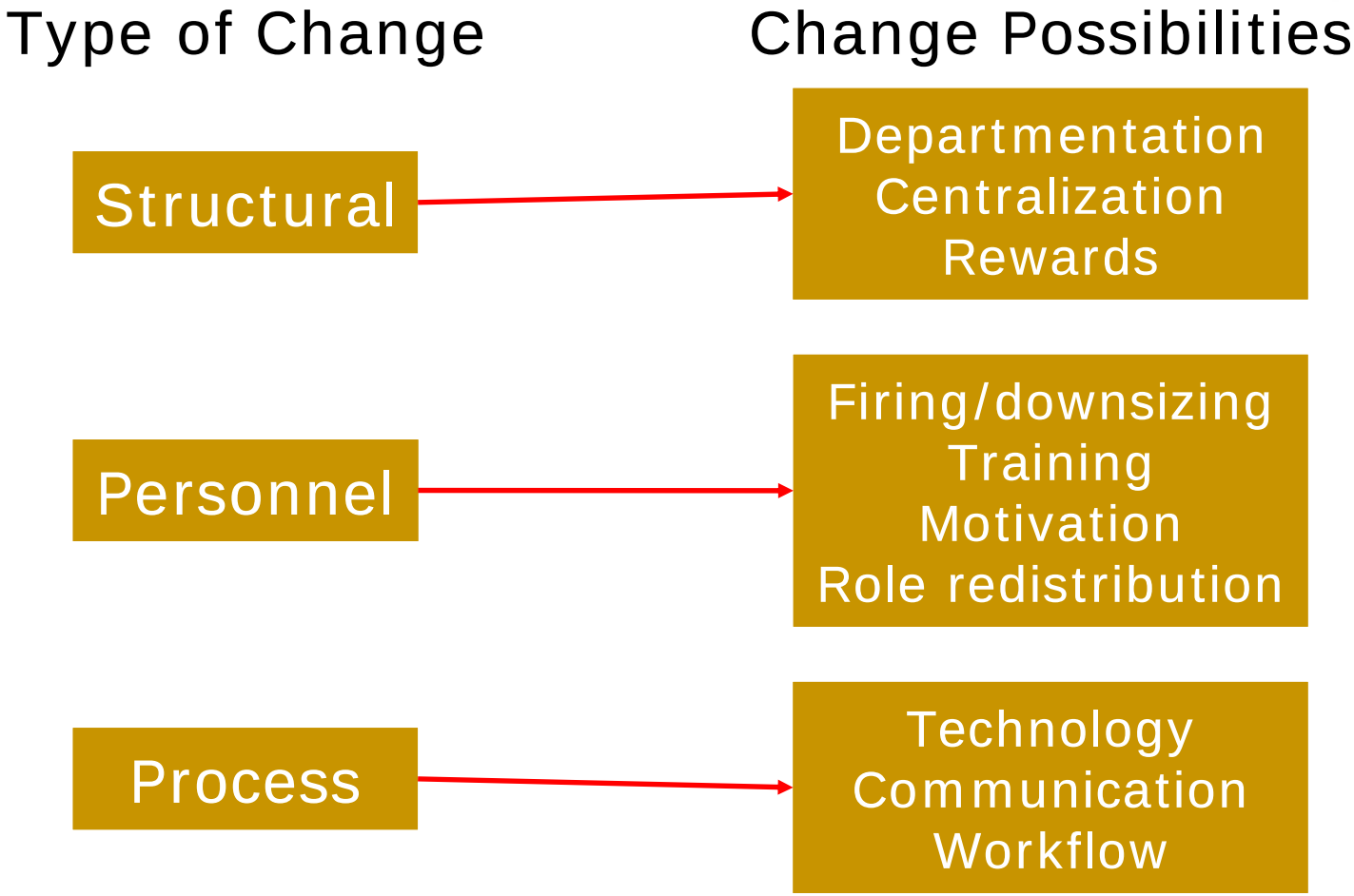

A Typology of Change Mechanisms

- Not all changes are equally visible
  - Process and personnel are the figure
  - Structure is the ground

H1: In the absence of any intervention, teams that are structurally misaligned with their environment are most likely to make (a) process changes with greater frequency than personnel or structural changes, and (b) personnel changes with greater frequency than structural changes.

Overcoming the Bias

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- Providing information on the typology
  - Training can reduce decision biases (Kahneman & Tversky, 1973; Fong, Krantz, & Nisbett 1986)
  - Availability heuristic (Kahneman & Tversky, 1974)

H2: When teams that are structurally misaligned with their environment are informed of the typology of changes, they will be more likely to choose to make a structural change relative to personnel or process changes.

Overcoming the Bias

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- Providing structural feedback
  - Increases both salience and legitimacy of structural change
  - Extension of biofeedback (Waldstein, Manuck, Ryan, & Muldoon, 1991)

H3: When teams that are structurally misaligned with their environment are provided with feedback on their structural alignment, they will be more likely to choose to make a structural change.

Effects of Change Decisions

- Task performance
  - Performance is contingent upon structure matching environment (Burns & Stalker, 1961)
  - Correct diagnosis of problem should improve performance

H4a: When teams that are structurally misaligned with their environment choose to change structure, they improve their task performance.

Effects of Change Decisions

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- Contextual performance
  - Activities that support the social and psychological environment (Borman & Motowidlo, 1993)
  - "Healthy" teams should engage in more of these activities

H4b: When teams that are structurally misaligned with their environment choose to change structure, they improve their contextual performance.

Methods

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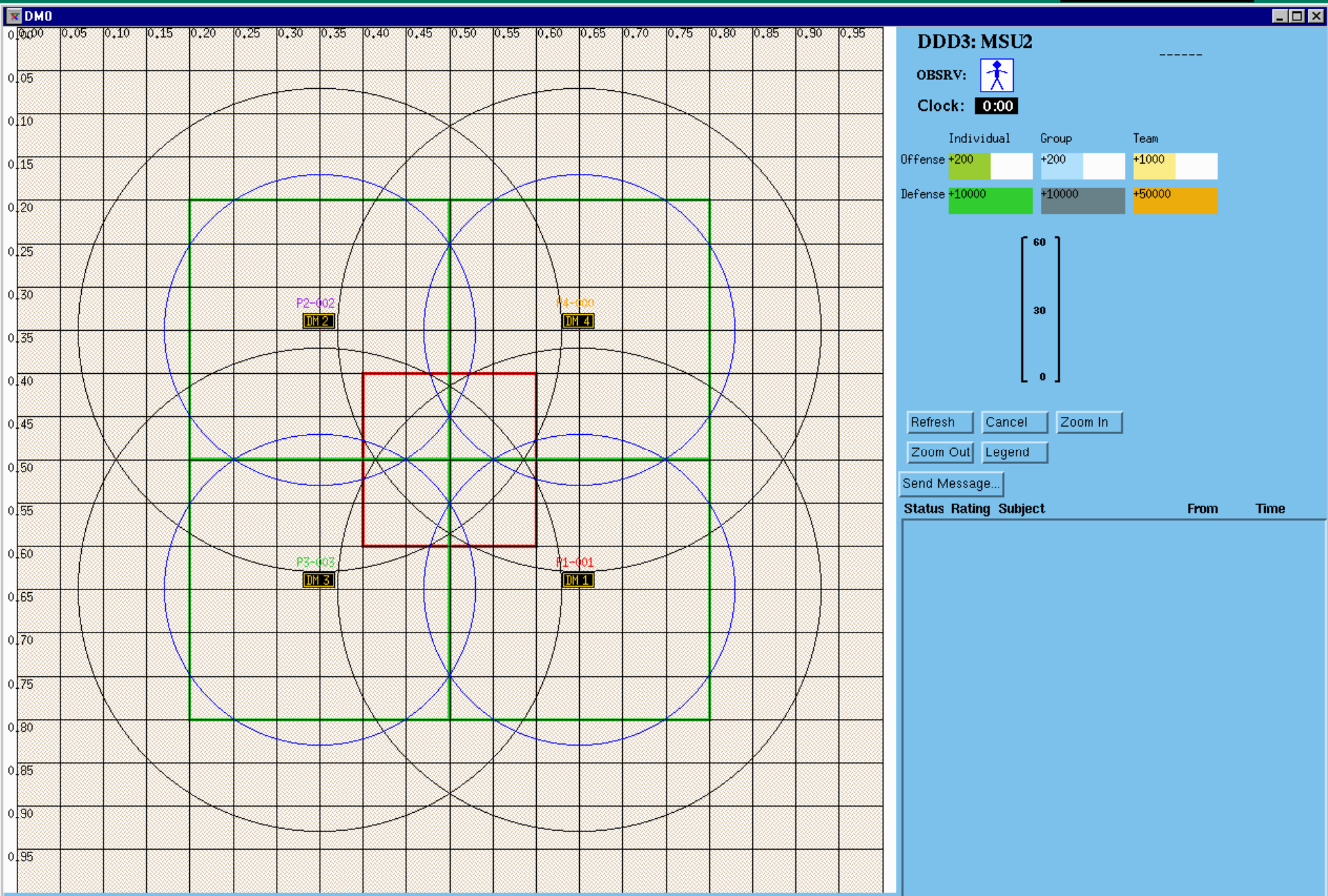
- Research Participants and Task
  - 312 undergraduate students in 78 four-person teams
  - Distributed Dynamic Decision-making (DDD) simulation (Miller, Young, Kleinman, & Serfaty, 1998)
  - Two 30-minute simulations with a predictable environment
  - Divisional structure in first simulation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Methods

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- Manipulations and Measures
  - 2 x 2 design
    - Information on the typology
    - Structural feedback
  - Change decision: Consensus on what to change
  - Task performance
    - Identification speed
    - Attack speed
    - Friendly fire kills
    - Missed opportunities
  - Contextual performance
    - Helping
    - Communication

Results

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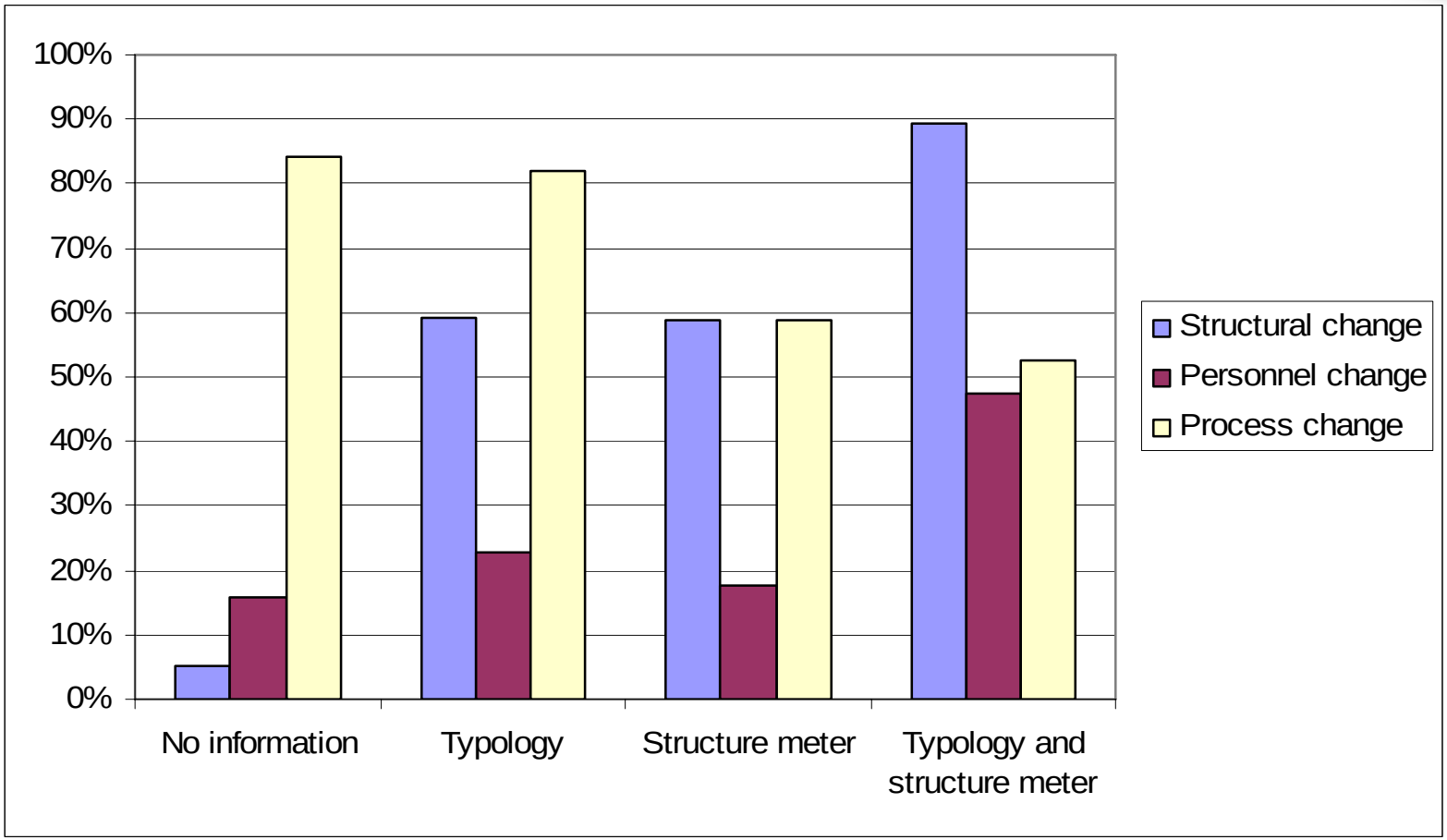

Results

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	Task Performance	*Contextual Performance*
Time 1 Performance	.49**	.64**
Structural Change	.25**	.20*
Personnel Change	-.12	-.28**
Process Change	-.17*	.07
F	10.28**	12.50**
R^2	.32	.38

Results

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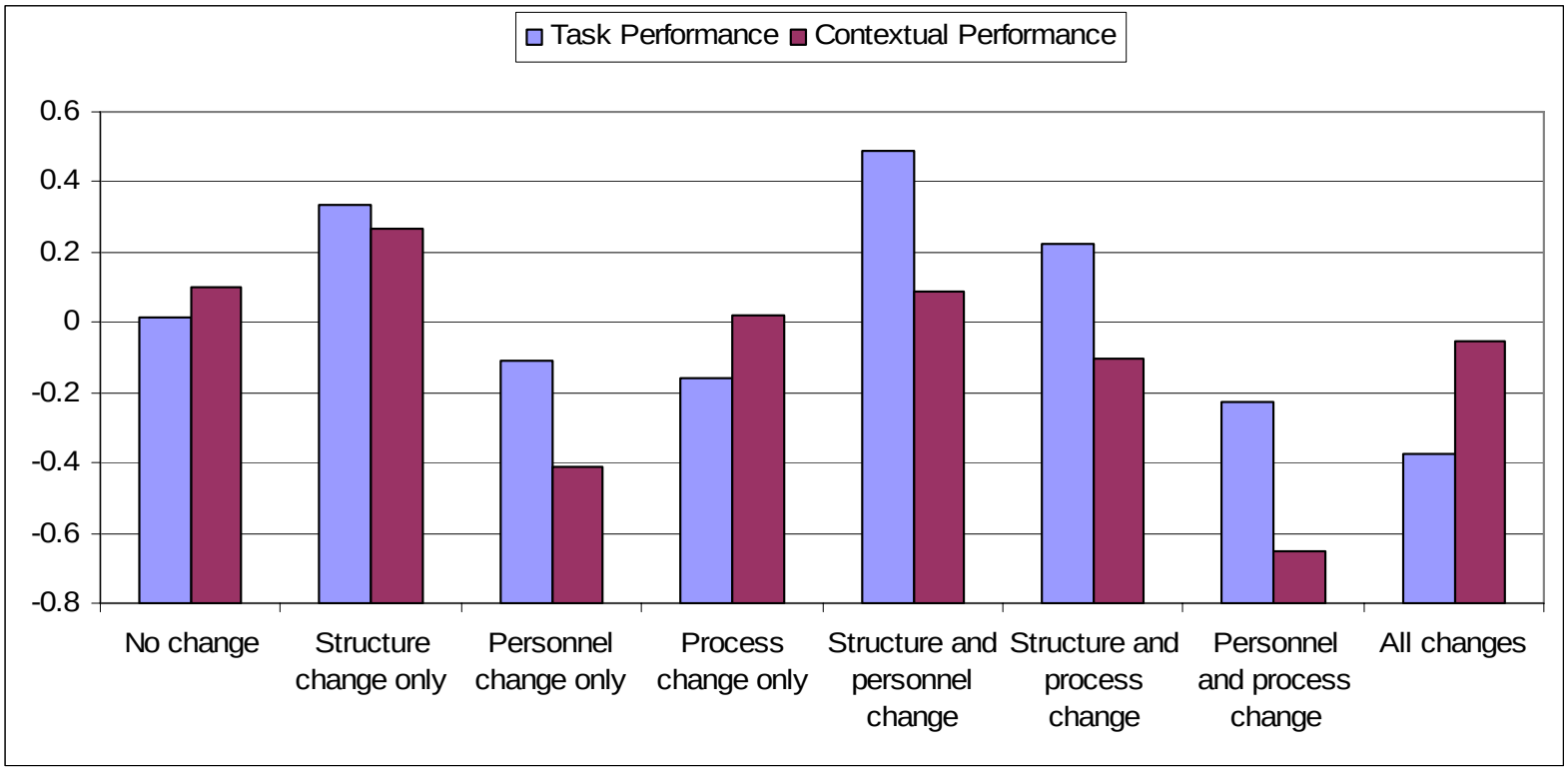

Discussion

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- Future research
  - Feedback on other structural dimensions
  - Feedback on personnel and process
  - Various feedback formats
  - Person x feedback interactions
  - Aligned with environment

Structural Feedback

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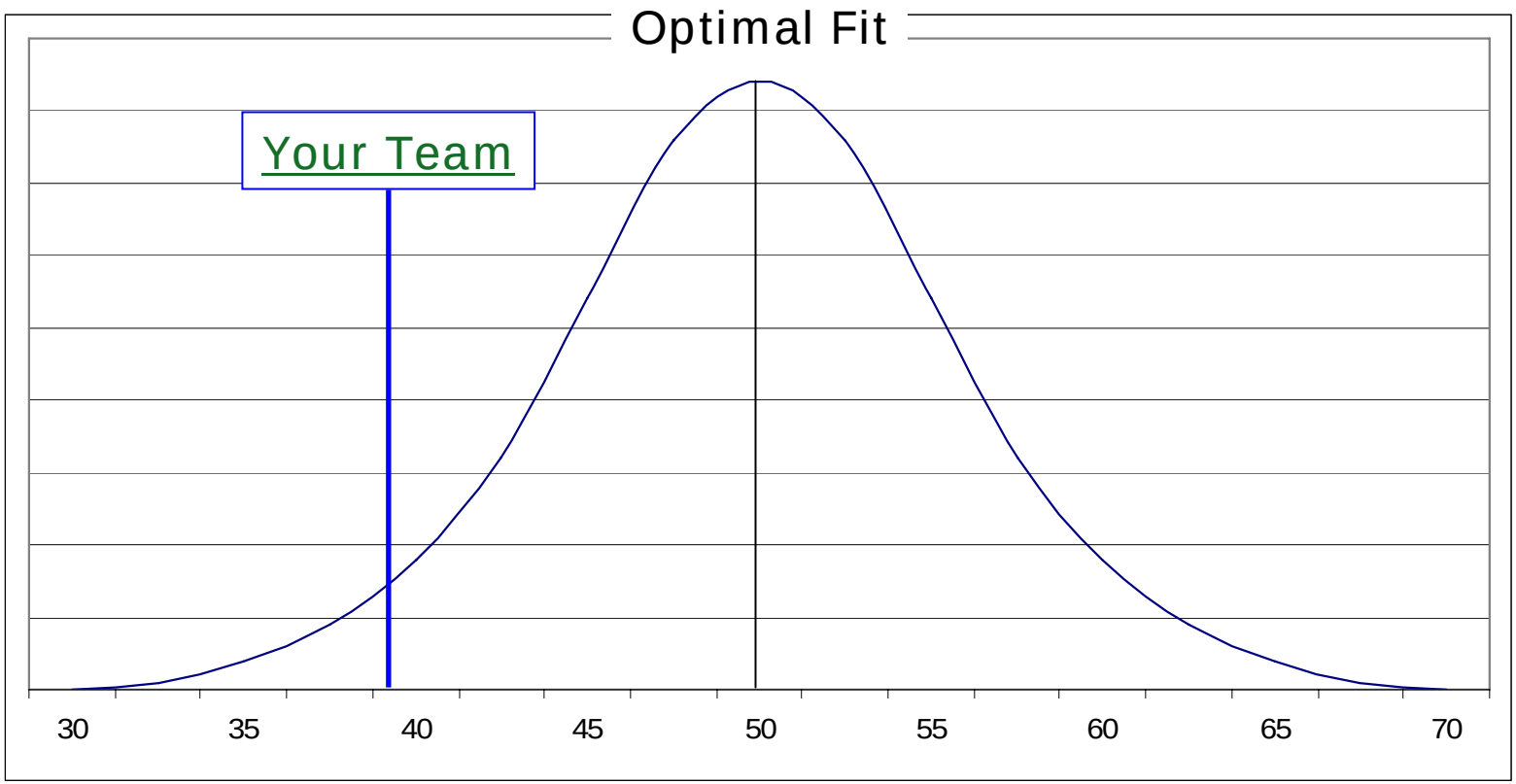

Change Frequencies

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