

ASYMMETRIC ADAPTABILITY: DYNAMIC TEAM STRUCTURES AS ONE-WAY STREETS

HENRY MOON
Emory University

JOHN R. HOLLENBECK
STEPHEN E. HUMPHREY
DANIEL R. ILGEN
BRADLEY WEST
Michigan State University

ALEKSANDER P.J. ELLIS
University of Arizona

CHRISTOPHER O. L. H. PORTER
Texas A&M University

This study tested whether teams working on a command and control simulation adapted to structural change in the manner implied by contingency theories. Teams shifting from a functional to a divisional structure showed better performance than teams making a divisional-to-functional shift. Team levels of coordination mediated this difference, and team levels of cognitive ability moderated it. We argue that the static logic behind many contingency theories should be complemented with a dynamic logic challenging the assumption of symmetrical adaptation.

Within the organizational sciences, taking a structural contingency theory approach to optimal organizational performance implies that there are different task environments, different ways in which to structure organizations, and positive implications for performance when the structure of an organization and the dictates of the task environment have a proper fit (Burns & Stalker, 1961; Lawrence & Lorsch, 1967; Miller, 1988; Pennings, 1992). Simply, structural contingency theory advocates an “if this, then that” structure by environment contingency. Support for this proposition can be found in cross-sectional research on both large-scale organizations (Drazin & Van de Ven, 1985) and smaller work teams (Hollenbeck et al., 2002).

Many have used the structural contingency theory proposition that no one structure is always best to argue that in the current, fast-paced, technology-

driven business environment, organizations need to be designed around flexible, team-based structures (Townsend, DeMarie, & Hendrickson, 1998). Townsend and colleagues viewed newly flexible organizations as demonstrating “a pronounced structural difference from traditional workgroup participation because of their ability to transform quickly according to changing task requirements and responsibilities” (1998: 23). Similarly, Levitt, Thomsen, Christiansen, Kunz, Yan, and Nass (1999) extolled the virtues of virtual team design, in which team structure is adaptively engineered to be aligned with project goals. Allred, Snow, and Miles (1996) characterized this emerging model of organizations as “cellular structures,” a term implying both individual units’ ability to function independently and the ability of multiple units to engage in more complex functions through interdependent action, depending upon environmental demands and constraints.

It is hard to argue with the virtues of flexibility, and the concept of infinitely adaptive persons and organizations is certainly alluring. However, the difficulties in maintaining such high levels of adaptation in organizations should not be underestimated. The preponderance of evidence in support of contingency approaches tends to be based on generalizations from static, between-groups re-

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search designs, not within-group designs in which a team or organization *actually changes* its structure between two data collection times. In fact, little of the empirical research in support of contingency theories in general, or structural contingency theory specifically, has spoken directly to the issue of change and adaptability over time or across environments. Thus, despite the conceptual attractiveness of this type of reconfigurability, structural contingency theory has come under attack by those documenting the conditions that make change difficult (DiMaggio & Powell, 1983).

The debate between those who advocate the value of structural adaptation and those who question its feasibility, however, has been framed in all or none terms. To date, there has been no discussion of the *direction of change* that various types of reconfiguration require. That is, both sides of this debate have presumed that structural adaptability (or structural inadaptability) is symmetric for all types of changes; no theory exists according to which one type of change might be systematically more difficult to accomplish than another, no do any empirical data test this proposition.

The purpose of this article is to introduce the concept "asymmetric adaptability" and to present the results of a test of the general proposition that adaptability in social systems can only be understood by directly examining *both the origin and the destination of the adaptation*. In general, we argue that certain types of adaptation are going to be more natural than others, and that the prior experience of working under an earlier system influences how people react to the adapted system. That is, although in a Euclidean sense, the distance from point A to point B is the same as the distance from point B to point A, in a psychological sense, moving a social system from point A to point B may be more difficult than moving it from point B to point A. Moreover, once a social system has been moved from point A to point B, the challenge inherent in reconfiguring the system back in the reverse direction may be greater than the challenge associated with the initial reconfiguration.

In the following sections of this article, we (1) review the general propositions of structural contingency theory, (2) describe, through illustrative examples, two possible points of origin that a team's structure might take on initially (that is, might *adapt from*) and two destinations that a team may need to subsequently move its structures to in order to stay aligned with its environment (that is, *adapt to*), (3) derive hypotheses regarding why it is more difficult to adapt in one direction than in the other, (4) suggest why coordination may be the mediation mechanism that underlies asymmetry,

and (5) propose cognitive ability as a moderator of asymmetry. These ideas are then empirically tested in an experiment in which teams were required to structurally reconfigure in opposing directions.

STRUCTURAL CONTINGENCY THEORY

The applied behavioral and social sciences are replete with contingency theories (Miner, 1984). The core proposition underlying all contingency theories is that there is no one best way to solve all organizational problems. Instead, the proponents of contingency theories argue that an approach that might be suitable under one specific set of circumstances may be unsuitable under a different set of conditions (Dill, 1958). This new set of conditions may demand an approach that is the exact opposite of what was formerly appropriate.

For example, with respect to *allocation of rewards* social interdependence theory suggests that competitive rewards should be employed when task interdependence among job incumbents is low but that cooperative rewards should be used when task interdependence is high (Beersma, Hollenbeck, Humphrey, Moon, Conlon, & Ilgen, 2003; Deustsch, 1949). In Hackman and Oldham's (1976) theory of *job design*, tasks should be designed one way if the job incumbents are high in "growth need strength," but a different way if they are low in growth need strength. In the area of *decision making*, Vroom and Yetton (1973) called for autocratic decision-making styles under one set of conditions, consultative styles under a different set of conditions, and group-based consensus procedures under yet a third set of conditions. In the area of *leadership*, the path goal theory categorizes leader behavior into four different categories (directive, supportive, participative, and achievement-oriented) and lays out a whole host of factors that determine which set of behaviors to avoid or engage in, depending upon the circumstances (House, 1971). Similar contingency-based theories can be found in countless other topic areas, including socialization (Van Maanen & Schein, 1979), conflict management (Conlon, Moon, & Ng, 2002), communication structure and group performance (Shaw, 1976), and executive compensation (Balkin & Gomez-Mejia, 1987).

Structural Contingency Theory: The Types of Departmentation

Structural contingency theory, which has the same form as these other contingency theories, grew from early observations of different organizational structures and different external environ-

ments. Archival analyses of how well various organizations performed under different conditions led to the conclusion that long-term viability was contingent upon a proper match between an organization's structural design and the particular environment it faced. Subsequent research employing cross-sectional, between-subjects designs has provided some support for these proposed relationships (Drazin & Van de Ven, 1985; Hambrick, 1983; Miller & Friesen, 1983).

Although the notion of asymmetric adaptability could be applied to any of the contingency theories listed above, the focus of this experiment was structural changes in work groups. Many organizations are adopting team-based structures, and thus there is a renewed interest in work groups. Ilgen (1999) noted the relevance of group structure as a central determinant of processes and outcomes, if structure is conceptualized in terms of how large numbers of people are differentiated into smaller groups, as well as how the roles of members within these groups are differentiated and coordinated (Penning, 1992).

One of the most critical dimensions of structure is "departmentation" (Wagner, 2000). *Departmentation* deals with the division of labor and refers to the degree to which work units are grouped on the basis of functional similarity or on the basis of geographic/product-market differentiation. In *functional departmentation* schemes, grouping is based on the similarity of the work people perform, whereas in *divisional departmentation* schemes, grouping is based on either the type of product they produce or the geographic region they serve. At the team level, functional departmentation tends to create narrow, specialized roles, in which an incumbent has low personal discretion and a strong need to coordinate with others. By contrast, divisional departmentation creates broader, more general roles, in which an incumbent has wide personal discretion and low needs to coordinate with others (Burns & Stalker, 1961).

For example, imagine a team of four mutual fund research analysts who have to present four comprehensive company case analyses to a large institutional client. One way they could divide up the assignments would be to make one team member responsible for all the research that will go into all four papers (and thus serve as a research specialist), make another team member responsible for all the data analysis associated with all four papers (a data specialist), make a third team member responsible for writing the four reports (a writing specialist), and finally, make the last team member responsible for delivering the physical presentations (a presenter). This approach to task decomposition

would establish a purely *functional structure*. Alternatively, the four could decide to let each individual do one of the four projects independently, carrying out each of the four operations—research, data analysis, writing, and presenting—on his or her own. This approach to task decomposition would establish a purely *divisional structure*. In the end, the exact same mission (preparing and presenting four case studies) will be accomplished, but clearly in two very different ways.

Structural Contingency Theory: Departmentation and Task Environment

The structural contingency theory answer to the question, "What task decomposition scheme is best?" is that a group's structure interacts with its task environment to influence performance. In relatively predictable and stable environments, structures that employ functional departmentation tend to perform better than those that employ divisional structures. Functional structures are effective in this type of environment because they promote *efficiency*. Efficiency is created because redundancy across subunits is minimized and high levels of functional expertise can be developed.

Returning to our example of the four case studies, it seems clear that if the analysts choose a divisional structure, they will be less efficient because each has to physically access many information sources individually. Since no one does this research repeatedly, each is a relative novice, and will therefore probably not be as efficient in carrying it out as the "research specialist" in the functional team who does this one task over and over again. The same novice versus specialist difference might arise in all of the other functional responsibilities, leading the divisional team to be less efficient than the team of specialists. Moreover, divisional structures sometimes lack coordination, in the sense that "the right hand may not know what the left hand is doing," and two analysts may use the same information source to make incongruent points in their presentations.

Although functional structures are efficient in relatively stable and predictive environments, these same structures tend to perform poorly in unstable and unpredictable environments. Unstable and unpredictable environments create changing and complex contingencies that poorly match the specialized skills of individual team members. Returning to our running example, if the individuals choose a functional structure, they will probably be more efficient at the assigned task; however, if there were a sudden change in the task environment, this structure would provide less flexibility

than the divisional structure. For example, suppose one of the members became ill and the remaining team members had to do the fourth report on their own. Because each divisional team member had done each aspect of the task, any one of them could do the fourth report alone. Alternatively, they could share the work in a number of ways, because each had had at least some experience with all aspects of the work. This change in the task environment would create more fundamental problems for the functional team, however, because none of them would have had any experience in the sub-task the absent team member performed.

This example shows the clear efficiency-flexibility trade-off the two structural choices involve and illustrates why there is no one best way to structure teams. According to structural contingency theory, groups should be structured functionally in stable and predictable environments, but divisionally in unpredictable and unstable environments.

Recently, Hollenbeck and coauthors (2002) demonstrated the application of structural contingency theory, which has mostly been studied at the organizational level of analysis, to the team level of analysis. This experiment showed, in line with structural contingency theory predictions, that no one structure was best at all times or under all conditions, but instead, that divisionally structured teams performed better in unpredictable task environments, whereas functionally structured teams performed better in predictable environments. One purpose of this experiment was to replicate (Eden, 2002) findings regarding structural contingency theory at the team level (Hollenbeck et al., 2002) in order to provide a base from which to develop hypotheses about asymmetric adaptability. Specifically:

Hypothesis 1. The nature of a task environment moderates the effect of team structure on performance in such a way that functional structures will perform better in predictable environments, whereas divisional structures will perform better in unpredictable environments.

ASYMMETRIC ADAPTABILITY

Characteristics of Starting Points and Destinations

In view of the theory and research discussed above, many have advocated that in the face of environmental change, groups need to be able to change their structures so that they are always aligned with their environments (Allred et al., 1996; Levitt et al., 1999; Townsend et al., 1998).

Although this inference may logically follow from the existing data, it needs to be noted that this contingency has only been established via cross-sectional studies, and/or studies with between-groups or between-organizations research designs. No one has ever directly documented that teams can actually switch back and forth from one structure to another, moving in either direction equally well, without encountering unforeseen difficulties.

The concept of asymmetric adaptability implies that reconfigurability is directionally dependent and that it is easier to move social systems in some directions than it is to move them in other directions. In structural terms, an organization may start in a functional structure, and then need to adapt to a divisional structure. For example, a team may start out in a stable and predictable environment, but because of some change in the competitive landscape (the introduction of a new technology or a new set of competitors), its members find that they do not have the flexibility required to compete effectively. According to structural contingency theory, this team should then adapt and change from their functional structure to a divisional structure (that is, carry out *functional to divisional adaptation*).

On the other hand, a team may start out in a divisional structure and then need to adapt to a functional structure. For example, say a team's initial task is development of a new product for which user requirements and demands are at first uncertain. Adoption of industry-wide standards then makes the task environment more predictable and stable. This team may find then that it lacks the efficiency needed to compete in the new environment, and structural contingency theory would suggest that this team should adapt and change from the divisional structure to a functional structure (a *D-F adaptation*). Although on paper, it is no more difficult to redraw an organization chart to show functional to divisional (F-D) adaptation than D-F adaptation, in operational reality it may be much more difficult for actual teams to shift in one direction than in the other.

Entrainment theory. In terms of *group norms*, each of the two different structures places different demands on a team's members that could affect the group's habits with respect to group coordination processes—especially the frequency of communication and mutual support. For example, the narrow roles and the relatively high levels of interdependence created by structuring a group functionally will result in high levels of coordination (that is, communication and support) among group members. In contrast, the broad and complex roles experienced by team members in divisionally

structured groups force incumbents to concentrate on their relatively high-scope jobs. This need for concentration, when combined with the relative independence of divisionally structured team members, makes coordination less critical.

According to entrainment theory (Ancona & Chong, 1996), once a set of norms and habitual activities becomes routine in a social system, these norms become self-reinforcing—or *entrained*—so that they often persist over time, even after their original operational value is gone. Indeed, there is direct empirical support for the notion that norms established early in a group's existence often continue even after their value is no longer evident (Bettenhausen & Murnighan, 1985).

Thus, a team that starts out in a functional structure will develop norms for high levels of coordination behaviors (communication and support), and when this team shifts to a divisional structure, these norms may persist. Although the new structure may not require high levels of coordination, the persistence of these norms may not harm the team's effectiveness. In fact, they may even be beneficial in the sense that members can share the expertise they developed as functional specialists with each other as they enact their new, expanded roles.

On the other hand, a team that starts out in a divisional structure will not develop the same norms for high levels of communication and mutual support, but instead will develop norms for independent activity. When this group shifts to a functional structure, persistence of its initial norms and habits will be dysfunctional because the functional structure demands high levels of coordination, communication, and mutual support. Their absence will result in performance deficiencies that probably would not be experienced by a team that had simply started out with a functional structure in the first place. More formally, our second two hypotheses are:

Hypothesis 2. Teams that experience a divisional to functional structural adaptation will perform worse upon realignment than teams that experience a functional to divisional structural adaptation.

Hypothesis 3. Coordination behaviors mediate the difference in performance between teams engaged in divisional to functional and functional to divisional structural adaptation.

In contrast to what might be expected from entrainment theory, other arguments could be raised that might suggest that a divisional to functional shift may be easier to manage than an functional to

divisional shift. For example, a divisional to functional shift allows individuals to first gain a sense of the “big picture,” which may subsequently help them see how their functional tasks, after the structural change, will fit into the overall scheme of the group's task. Moreover, starting out in a divisional structure allows individuals to develop a broad range of knowledge and skills that may make for an easier transition into narrower roles. Thus, although the predictions based upon entrainment theory are plausible, they are certainly not self-evident, and hence require empirical testing.

Team composition. Although entrainment theory may imply that functional to divisional adaptation may be easier than divisional to functional adaptation, the nature of a team could also affect the adaptation process as it moves in different directions. For example, the shift to a divisional structure from a functional one may place increased cognitive demands on a team. In terms of task scope (Hackman & Oldham, 1976), teams that adapt in the functional to divisional direction start out performing relatively narrow tasks, and then switch to a system in which they perform a more holistic role. In terms of worker empowerment (Thomas & Velthouse, 1990), teams that adapt in the functional to divisional direction experience an increase in personal discretion and choice, whereas personal discretion is reduced for those changing in the opposite direction.

Both of these changes in the nature of a job incumbent's task make it more complex, and research on task complexity has shown that high levels of cognitive ability are more critical for complex jobs than for simple jobs (Hunter & Hunter, 1984). Indeed, in an experiment using data on teams with static structures (fixed structures that did not change), Hollenbeck and his coauthors (2002) showed that teams structured divisionally performed better the higher the average general cognitive ability of their members.

Thus, although in general, it might be easier for teams to shift in the functional to divisional direction than in the opposite direction, the average general cognitive ability of team members may affect the ease of the functional to divisional transition. Teams that are relatively high in general cognitive ability may respond much more positively to functional to divisional shifts than teams that are low in this characteristic, because the former have the cognitive capacity to manage the enlarged role. Teams that are low in cognitive ability and experience a functional to divisional shift may perform at the same levels as divisional to functional teams, which should perform poorly regardless of their levels of cognitive ability. This argument leads to a

moderation hypothesis involving the average level of cognitive ability and the nature of structural realignment. Specifically,

Hypothesis 4. A team's composition and the nature of the structural adaptation moderate performance: the positive effects of functional to divisional transitioning will be stronger in teams that are high in general cognitive ability than they will be in teams that are low in this characteristic.

METHODS

Research Participants and Task

Research participants were 252 upper-level students, each of whom was in 1 of 63 four-person teams. All individuals were randomly assigned to teams, and all teams were randomly assigned to experimental "conditions." In return for their participation, each individual earned class credit as well as eligibility for performance-based prizes. The task was the modified version of a simulation developed for the Department of Defense, Distributed Dynamic Decision Making (DDD; Miller, Young, Kleinman, & Serfaty, 1998). A depiction of the computer screen, which was divided into four equal geographic quadrants, appears in Hollenbeck et al. (2002). The major elements of the task were related to asset management and geography.

Asset management. Each individual participant (manager) controlled four vehicles (assets) that could be launched and then moved to any area on the screen, including those areas monitored by other team members. These vehicles were semi-intelligent agents that could automatically perform functions such as tracking, returning to base to refuel, launching, and so forth. There were four types of vehicle (1) AWACS planes, (2) tanks, (3) helicopters, and (4) jets, and each vehicle had different abilities in terms of range of vision, speed of movement, duration of operability, and weapons capacity. The managers were tasked with using their four assets to identify and properly engage various tracks.

There were 12 unique tracks, 3 of which were considered friendly and 9 of which were considered unfriendly. These tracks differed in various capabilities such as speed, requirements to disable, and ease of identification. For example, the track identified as "A5" was an unfriendly track that moved rapidly through the screen and could only be effectively engaged by the tank. A track identified as "G0" was friendly, moved slowly, and could be engaged by any asset with weapons capability. Some tracks (labeled with a starting designation of

"U") needed to be further identified via a trial and error learning process. Hollenbeck et al. (2002) outlined the specific abilities of all of the assets and tracks. Each team used its assets to engage an array of tracks on a single, networked simulation grid.

Geography. The simulation screen was partitioned in several ways using a grid/coordinate system. First, each quadrant (NW, NE, SW, SE) was assigned to one member of each team. These quadrants were further divided into three regions that varied in terms of the extent to which they needed to be protected from penetration by unfriendly forces. The regions were labeled "neutral" (all areas outside the restricted areas around the outmost perimeter of the screen), "restricted" (a 12 by 12 grid in the center of the screen), and "highly restricted" (a 4 by 4 grid in the very center of the screen). Each team's mission was to keep unfriendly tracks from moving into the restricted and highly restricted areas, while allowing friendly tracks to freely move in and out of the same areas.

All tracks originated from the edge of the screen and proceeded inward. Once a track came within the identification range of either the base or a vehicle, the manager had the opportunity to identify the track. Once a track invaded a restricted zone, the team was required to expeditiously engage the track with the appropriate assets. The team would lose one point for every second the track resided in the restricted zone and two points for every second the track was in the highly restricted zone (see Hollenbeck et al. [2002] for a full description of the capabilities of all the tracks and vehicles). The team was also informed that it would be penalized for engaging any friendly track.

To monitor the geographic space, each manager had a base (a small black box labeled "DM1-4" in the center of the four quadrants) with a detection ring and an identification ring. If the track was inside the detection ring (the outside ring), the individual could see that something was there, but he or she could not determine the nature of the track (friendly or hostile) until it entered the more proximal identification ring (inside ring). Any track outside the detection ring was invisible to the managers, and therefore they had to rely on their teammates to monitor regions of the space that were outside of their own quadrants. In sum, four-person teams were tasked with the management of 16 total assets in a networked computer simulation wherein they addressed a wide array of tracks moving on a partitioned geographic space.

Training. All individuals, and all teams, regardless of experimental condition, received the same training. This considered of two separate modules. The first module (which lasted approximately 30

minutes) introduced the participants to the simulation. The participants were then given a short questionnaire to ensure that they understood the rudimentary operation of the simulation. The second module (which lasted approximately 60 minutes) allowed the participants hands-on practice of the simulation, primarily to learn the basic mouse movements and operations.

Manipulations and Measures

Nature of structural adaptation: Functional to divisional versus divisional to functional. Structural adaptation was manipulated between-teams via the task. In the *functional structure*, vehicles were grouped to create narrow competencies in which each manager was in charge of four assets, *all of the same type*, taking on the role of tank command, helicopter command, jet command, or AWACS command. These roles had relatively *low task scope* because a manager was limited to the particular capability of that one type of asset. People working in these structures also were relatively *low in discretion*, in the sense that once a track became an issue, there might be one possible or logical person to execute the task (for instance, if an A5 or G5 track appeared, the only person who could successfully engage this track was the tank commander). Finally, the fact that each manager could only perform a subset of all the tasks that might be required of a team meant that there was a *high degree of interdependence* in the functional structure.

In the *divisional structure*, vehicles were grouped to create broad and versatile competencies. Each manager in the divisional structure also managed four assets, but in this case, they were *all of different types*. Because of the four vehicles' complex array of strengths and weaknesses, operating the four different vehicles created a job with relatively *high task scope*. People working in the divisional structures also were relatively *high in discretion*, in the sense that once a track became an issue, any one of the four team members could execute the task, and there was no set demand for any one person to do any one task. Finally, the fact that each team member in a divisional structure could manage any task him- or herself meant that there was a *lower interdependence* in the divisional structure (see Hollenbeck et al. [2002] for a graphic display of the different team structures).

Each team operated under both structures, with the order of their use manipulated. Half the teams started out in the functional structure in stage 1, and then shifted into the divisional structure in stage 2. These teams were in the *functional to di-*

visional condition. The other half of the teams, which used the divisional structure in stage 1, and then shifted into the functional structure in stage 2, were in the *divisional to functional* condition). To capture the type of shift a team experienced, we dummy-coded a variable labeled "structure" ("divisional to functional," 1; "functional to divisional," 2).

Task environment. Each team experienced two types of task environment. We varied the sequence in which the teams experienced the environments to control any order effects or effects for experience. In the *unpredictable task environment*, a random number generator determined the entry and exit point of each track, and each track changed course once over the course of its life. In the *predictable task environment*, each track proceeded in a diagonally straight line, originating in the NW quadrant and exiting in the SE quadrant. Thus, the origin and exit points of tracks in the predictable environment were easy to anticipate.

Both task environments created their own unique challenges. The unpredictable environment was challenging because of the uncertainty as to where tracks were originating, but the predictable environment was also challenging because of the heavy concentration of tracks flooding into a single area. Each stage contained 100 separate tracks and lasted roughly 30 minutes. Structural adaptation and task environment were completely crossed, in a pure two by two factorial design in which all the independent variables were orthogonal. Like structure, environment was dummy-coded ("random environment," 1; "predictable environment," 2).

Cognitive ability. Individual cognitive ability was measured via Form IV of the Wonderlic Personnel Test (Wonderlic & Associates, 1983). We aggregated individual team members' cognitive ability into an average team level of cognitive ability.

Team coordination. Team coordination was calculated by using two computer-generated outputs of team behavior. *Supportive behavior* was measured as the frequency with which one team member engaged enemy tracks in another team member's zone of responsibility. For example, if the manager in the NW quadrant sent an asset into the SW quadrant to engage a track, this action counted as a coordination behavior, because it helped the manager in the SW quadrant clear his or her zone. *Communication behavior* was the frequency with which one team member transferred information regarding the nature of a track to another team member. That is, if the manager in the NW quadrant learned that a certain track headed south was friendly, he or she could electronically share this information with the SW manager. Doing this re-

quired some effort on the part of the NW manager, but it spared the SW manager from having to identify the track him- or herself.

Team performance. Each team started the simulation with 50,000 points and lost 1 point for each second that any unfriendly track was in the restricted zone and 2 points per second for each unfriendly track in the highly restricted zone. The teams also lost 300 points for disabling any friendly track. These point calculations were the same that Hollenbeck and his coauthors (2002) used. Performance was measured twice, both when a team was in stage 1 (and in its origin structure) and when the team was in stage 2 (in its destination structure). Because all hypotheses were directional, we employed one-tailed tests of statistical significance.

RESULTS

Table 1 presents the means, standard deviations, and correlations of all the variables measured or manipulated in this experiment. Table 2 presents the results of our regression analysis of the difference in stage 1 and stage 2 performance and the results for performance at each stage regressed on structure, task environment, and the interaction between structure and task environment.

For the model shown in the first column of Table 2, structure and environment were entered in the first two hierarchical steps, followed by their interaction in a third step. This regression showed that at stage 1, there were no "main effects" for structure ($\Delta R^2 = .02$ or environment $\Delta R^2 = .01$). Thus, in line with structural contingency theory, no one structure was best across environments.

Consistent with Hypothesis 1, however, the results in the third step of this regression equation show that the interaction between structure and the environment was statistically significant ($\Delta R^2 = .08$) and accounted for an appreciable amount of variance. Teams that were working in predictable

environments performed better when structured functionally, whereas teams confronting unpredictable environments fared better when structured divisionally. This pattern of findings is a direct replication of Hollenbeck et al. (2002), and it is just this type of robust result that has led many to suggest that organizations *should change* their structures in order to stay aligned with their environments.

The second column of Table 2 shows the results for performance in stage 2, when each team changed its structure from functional to divisional or from divisional to functional. We again saw a statistically significant interaction between structure and environment ($\Delta R^2 = .07$), similar to what was discovered in stage 1, in that, all else being equal, it was better for a team when its structure matched its environments in the manner prescribed by structural contingency theory. However, unlike what was found at stage 1 (where no one structure was better), at stage 2, we saw a statistically significant *main effect* for structure that explained 6 percent of the variance in performance ($\Delta R^2 = .06$). Regardless of their environment, the teams that changed from a functional to a divisional structure ($\bar{x} = 33,797$) tended to outperform those that changed from a divisional to a functional structure ($\bar{x} = 31,815$).

We tested the robustness of this finding using a more rigorous test. Because the ultimate dependent variable of interest was a difference score reflecting ease or difficulty in switching from one structure to another, we used the regression decomposition techniques described by Edwards (1995). That is, in addition to the stage 1 and stage 2 performance scores, we also regressed the change scores between stage 1 and stage 2. These results are reported in the third column of Table 2. We found that only structure was significantly related to the difference in performance scores between the two stages ($\Delta R^2 = .11$). Neither the main effect for en-

TABLE 1
Descriptive Statistics and Correlations^a

Variable	Mean	s.d.	1	2	3	4	5	6	7	8
1. Structure	1.51	0.50								
2. Environment	1.55	0.50	.01							
3. Cognitive ability	24.76	2.56	.00	-.06						
4. Average support	26.03	6.89	-.01	-.17	.13					
5. Average communication	60.00	11.90	-.12	-.19	.27*	.25*				
6. Performance, stage 1	27,556	3,984	-.14	.09	-.01	.21	.19			
7. Performance, stage 2	32,822	4,081	.25*	-.07	.02	-.09	-.13	.31*		
8. Change, stage 1 - stage 2	-5,266	4,734	-.32*	.14	-.03	.25*	.27*	.57*	-.60*	

^a $n = 63$.

* $p < .05$

TABLE 2
Results of Hierarchical Regression Analysis^a

Independent Variable	Stage 1		Stage 2		Difference	
	β	ΔR^2	β	ΔR^2	β	ΔR^2
Structure	-1,066	.02	1,982*	.06*	-3,048*	.11*
Environment	.738	.01	-.592	.00	1,330	.02
Structure \times environment	-4,346*	.08*	-4,415*	.07*	.68	.00
Total R^2		.11*		.13*		.13*

^a $n = 63$ teams.

* $p < .05$

vironment ($\Delta R^2 = .02$) nor the structure by environment interaction ($\Delta R^2 = .00$) was significant. Thus, there was asymmetrical adaptation, supporting Hypothesis 2.

Hypothesis 3 predicts that team coordination will mediate the relationship between structure and team performance at stage 2. Testing mediation is a multistep process (Baron & Kenny, 1986). Mediation is supported when the independent variable being tested significantly relates to the mediator. Here, both team communication ($\Delta R^2 = .30$) and team coordination ($\Delta R^2 = .10$) were positively related to stage 2 structure. Further, the independent variable must significantly relate to the dependent variable in the absence of the mediator; this relationship was shown in our test of Hypothesis 2. Finally, the influence of the independent variable on the dependent variable must shrink upon the addition of the mediator to the model. When team coordination and team communication were controlled, the main effect for structure at stage 2 was no longer significant, with the effect size (ΔR^2) dropping from 6 to 0 percent of variance explained.

Table 3 gives the results of our test for mediation, with the statistics in the second column of Table 3 demonstrating the influence that controlling for team coordinating activities had on the relationship between structure and performance at stage 2. Thus, we found support for Hypothesis 3.

Finally, Hypothesis 4 predicts that team cognitive ability will interact with type of structural change, with low cognitive ability attenuating the otherwise beneficial effects of the functional to divisional transition. Table 4 reports the results of a hierarchical regression analysis testing this moderation hypothesis (Stone & Hollenbeck, 1984). Looking at the results for stage 2 performance, we find a significant interaction between a team's level of cognitive ability and the type of change the team engaged in ($\Delta R^2 = .07$). Figure 2 illustrates the interaction between cognitive ability and type of change, with the relationship between cognitive ability scores and performance plotted separately for teams in functional to divisional and divisional to functional structures. As predicted in Hypothesis 4, teams high in cognitive ability responded

TABLE 3
Mediation of Structure by Team Coordination

Independent Variable	Stage 1		Stage 2		Difference	
	β	ΔR^2	β	ΔR^2	β	ΔR^2
Help	1,392	.08*	-209	.15*	253	.22**
Communication	-.497		-1,031		1,485	
Structure	-1,418	.03	401	.00	890	.01
Environment	3,539	.08*	-1,583	.02	-1,277	.01
Structure \times environment	-7,148	.18*	-4,464	.07*	-2,462	.01
Total R^2		.37*		.24*		.21*

$n = 63$ teams.

* $p < .05$

** $p < .01$

TABLE 4
Moderation Effects of Team Cognitive Ability on Structure

Independent Variable	Stage 1		Stage 2		Difference	
	β	ΔR^2	β	ΔR^2	β	ΔR^2
Structure	-1,066	.02	1,982*	.06*	-3,048*	.11*
Environment	738	.01	-592	.00	1,330	.02
Structure \times environment	-4,346*	.08*	-4,415*	.07*	68	.00
Average cognitive ability	34	.00	69	.00	-35	.00
Average cognitive ability \times structure	540	.03	856	.07*	-315	.01
Total R^2		.14*		.20*		.14*

$n = 63$ teams.

* $p < .05$

better to the functional to divisional transition than teams that were low; however, the high-cognitive-ability teams also responded worse in the divisional to functional shift, which was not technically a formal prediction of Hypothesis 4.

DISCUSSION

The field of organizational behavior is dominated by many different contingency theories whose general import is that there is no one best way to solve all organizational problems. Instead, contingency theories imply that people or organizations, in order to sustain excellence over time (Pulakos, Arad, Donovan, & Plamondon, 2000), need to engage in one set of behaviors when confronted with one set of conditions, but engage in a different set of behaviors under an alternative set of conditions (Smith & Nichols, 1981).

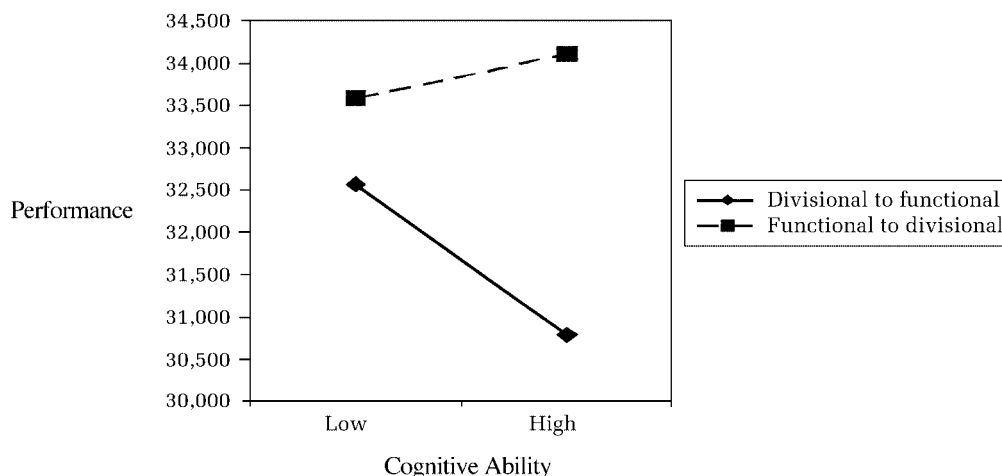
Theoretical Implications

Asymmetric adaptability and team structure.

We introduced the concept of asymmetric adaptability to capture the idea that adaptation can only be fully understood by directly analyzing the point of origin and the destination point associated with specific types of changes. Using structural contingency theory as an exemplar, we replicated the common, cross-sectional contingency finding at stage 1 that indicated that functional structures perform better in predictable environments, whereas divisional structures perform better in unpredictable environments. The dynamic implication of this finding is that if a team's task environment changes, to stay in a fit with its environment, the team should change structures.

Unlike most tests of contingency theories, in this experiment, we tested directly to see if teams could

FIGURE 1
Effects of Cognitive Ability and Structural Shift on Performance at Stage 2



actually adapt in the manner implied by the theory. Although both divisional to functional and functional to divisional shifts can be considered “adaptive” under the right circumstances, in fact, one of these adaptations was much easier to negotiate than the other. Specifically, it was much more natural for teams to shift from a functional to a divisional structure than it was for them to switch in the other direction.

We speculated that the functional to divisional adaptation was easier to make because the norms that are established in the first stage of a functional to divisional transition support performance in the second stage, whereas the norms established in the first stage of a divisional to functional transition are counterproductive for stage 2 performance. The evidence supported this conjecture, in the sense that if coordination behaviors—that is, the frequency of mutual support and communication—were controlled for, the superiority of the functional to divisional teams to the divisional to functional teams at stage 2 disappeared. Although this experiment was certainly not a direct test of entrainment theory, we do support the idea embodied in that theory that norms can often persist over time, even when changes in a group’s structure or task environment make them obsolete (Bettenhausen & Murnighan, 1985).

Third, with respect to group composition issues, we also found evidence that team composition moderated the effect of structural change. The average level of general cognitive ability in a team amplified structural change differences, in that teams that were high on this characteristic responded better to change that enhanced the amount of task scope and autonomy than did teams that were low in ability. Teams with high cognitive ability also showed a much more pronounced negative response when task scope and autonomy were reduced.

We did not formally predict that groups that were high in cognitive ability would ever do worse than low-ability teams, and hence the negative relationship between cognitive ability and performance for divisional to functional teams was unanticipated. This unexpected finding, at first blush, challenges research (Hunter & Hunter, 1984) that has shown positive relationships between cognitive ability and a wide array of tasks. However, the idea that cognitive ability could be a liability for simple tasks is not unprecedented. In fact, on September 2, 1999, the U.S. district court of Connecticut decided that the city of New London had a right *not* to hire an applicant for the job of police officer if his/her cognitive ability was too high. The city contended (Allen, 1999) that the candidates of high ability would become bored during the course of their job and would not react well to the rigid procedures

associated with the position. Our findings and the New London court case are consistent with research (Johnson & Johnson, 2000) that has demonstrated a positive link between perceptions of overqualification and job dissatisfaction. An interesting implication of our findings regarding cognitive ability is that one needs to consider not only the fit of a team’s structure to its environment, but also the fit between a team’s structure and the characteristics of its members.

Practical Implications

The results of this study suggest several important considerations for those who are either designing team structures or thinking about changing teams from one structure to another. First, in terms of designing an initial structure, since it is apparently easier to adjust a structure in the functional to divisional direction than vice versa, managers may want to *establish initial structures that err on the side of being too functional*. If subsequent adjustments in a divisional direction are needed, these will be easier to manage than those that go in the opposite direction. Thus, team designers should initially show a bias in favor of functional structures or structures that lean in that direction. Initial errors that require a divisional-functional readjustment will be more difficult to overcome and have to be avoided at all costs.

Second, for managers who are considering changing a team’s structure to match an environmental change, the criterion for triggering the change may need to be set at different levels depending upon the direction of the change. If a team starts out in a functional structure, even a small amount of evidence that the structure needs to be adjusted (for instance, the team appears to be lacking sufficient flexibility) may be enough to trigger a adaptation toward divisional structure. On the other hand, if a team starts out in a divisional configuration, the burden of evidence needed to initiate change in the functional direction (for instance, the team appears to lack sufficient efficiency) may need to be set much higher. Since executing this latter reconfiguration is more difficult, the value of structural adaptation would need to be higher to offset the higher transition costs associated with this type of restructuring.

Third, if the evidence strongly suggests that a team needs to reconfigure from a divisional structure to a functional structure, managers need to supply external supports in order to ease this transition. Supports might include training programs aimed at increasing the amount of communication between team members, reward systems (team-

based bonuses) that stress that value of collaborative behavior, or goal setting–feedback systems that explicitly monitor and manage communication and helping behaviors among team members. Leaders of teams making this type of transition may need to assume the role of communication and support officer (or directly assign such a role to a team member) to insure that some individual is responsible for assuring that the types of difficulties that teams encounter when making adjustments in the functional direction are addressed.

Finally, in regards to our moderation findings related to cognitive ability, a “war for talent” is currently being waged among organizations as they pursue the most talented workers. Trank, Rynes, and Bretz (2002) recently found that individuals with high ability prefer organizations that are more challenging and selective. This finding is consistent with Ganzach’s (1998) finding that job complexity influenced the link between intelligence and job satisfaction. Our findings regarding cognitive ability establish the converse of the need for challenge among teams of high ability, in that they demonstrated a negative reaction to loss of challenge. Therefore, managers must not only attract top talent by increasing challenge and complexity, but also guard against repulsing top talent with a lack of challenge and complexity.

Asymmetric Adaptability in Alternative Domains

Although it was beyond the scope of this one experiment to establish asymmetric adaptability throughout all contingency theories, we think it interesting to speculate on how various contingency theories might stand up to the same kind of test that was applied here to structural contingency theory. For example, the Vroom-Yetton (1973) model of leadership is a contingency theory according to which the decision-making process that a leader uses should depend upon characteristics of her or his followers and situation. One decision process recommended by this model in one set of circumstances is “GII,” in which the leader shares the problem with subordinates, and together they generate and evaluate alternatives. The goal would be to work slowly and attempt to reach consensus on a solution. The leader serves as chairperson, coordinating the discussion and keeping it focused on the problem. The leader makes sure the critical issues are discussed but does not try to influence the group to adopt his or her solution. In the end, the leader needs to be willing to accept and implement any solution that has support from the group.

Alternatively, within a different set of circumstances, the model might recommend that the same

leader use a process labeled “AI,” in which the leader solves the problem himself or herself, using personal information and not involving the subordinates in any way. Although accepting the *static logic* that might lead this theory to recommend such different styles under different circumstances, the concept of asymmetrical adaptability makes one question the *dynamic logic* involved when, in a real operational setting, the social system tries to move from one state to the other.

Specifically, if the original circumstances dictate a series of initial decisions in which the AI style is appropriate and executed, but then circumstances change, it may be quite natural for the group to adapt from an AI to a GII style because the group members’ roles and influence are expanded in the new, adapted situation. However, if the original circumstances allow for a long series of GII style decisions, but then circumstances change—demanding the leader adopt a new AI style—will this shift be as easy to execute as the other? If group members are asked to sacrifice influence and discretion, will their reactions to the AI style be the same as the reactions of those who experienced only the AI style at stage 1 and have never experienced GII? There may very well be asymmetrical adaptability in this situation, in which it is easier for a team to evolve from a series of AI to GII decision rules than it is for the same team to adapt from a series of GII to AI decision rules.

Another contingency theory that it might be instructive to analyze in this same manner is social interdependence theory (Deutsch, 1949). Social interdependence theory contrasts competitive and cooperative reward allocations and, like all contingency theories, suggests that there is no one best way to allocate awards. According to this theory, if task interdependence among team members is low, then an organization should employ competitive rewards that pit members against each other. However, when team members’ task demands high levels of interdependence among them, the organization should employ cooperative rewards, in which all team members experience the same outcome regardless of their individual contribution. The general, static logic underlying this theory is that cooperative rewards promote collaboration and teamwork under conditions of high interdependence, whereas competitive rewards prevent social loafing among group members when interdependence requirements are low.

Again, one can accept the static logic underlying this theory and at the same time question the dynamic logic if the implication is that a group should change from one reward allocation structure to another if the level of task interdependence changes.

For example, a group might originate in a situation of low task interdependence and work under a competitive reward structure in which every person is looking out for himself or herself. Over the course of time, this will affect the behaviors and interpersonal relationships of these people in a particular direction. If the level of task interdependence changes, however, and this group has to adapt to a new, cooperative reward structure, it is not clear that the level and type of cooperative behavior that its members would show would in any way resemble what would be seen in a group working under a cooperative structure without ever having experienced the competitive structure. Indeed, one might see “cutthroat cooperation” in the former group that would differ dramatically from the heartfelt cooperation seen in the group that had never experienced competition in this work context.

Alternatively, a group that started its work under a cooperative reward allocation structure might experience less disruption if asked to switch to a new, competitive structure. Having established supportive relationships in its early days (stage 1), competition in this group at stage 2 might be “friendly” and might not create the difficulties that might be experienced in the “cutthroat cooperation” group. This pattern would again imply that adaptability is asymmetrical, in the sense that it is more natural for a group to evolve from cooperation to competition than it is for it to go from competition to cooperation. There is potential for research to blend asymmetric compensation strategies with moderators such as trust and individual differences among team members.

Limitations

We realize that what we present is an initial experiment of a new concept tested in a laboratory setting. Although there are clear limits to what can be accomplished in laboratory settings, one needs to keep the nature of the research question in mind when assessing the relevance of external validity (Berkowitz & Donnerstein, 1982). Since no formal aspect of this theory implies it would *not work* in this specific context, this context provided a legitimate venue within which to test the theory. As Ilgen (1986) noted, this is precisely the type of question that is well suited to laboratory contexts.

Future Research

Although this experiment called into question the desirability of divisional to functional shifts in team structure, it did not explore all the possible alternatives short of a total divisional to functional shift that might be available to these teams. Thus,

even though structural adaptation may be a one-way street, as always with navigation, there is more than one way to get from point A to point B. For example, in the experiment we conducted, when the environment became more predictable, it might have been better for the teams we had switch from divisional to functional to go to something less extreme than a strictly functional structure. That is, operationally speaking, instead of shifting from a situation in which they controlled all four types of vehicles to a situation in which they controlled only a single vehicle, the divisional to functional teams may have been better off shifting to a “compromise structure” that allowed them control over two vehicles rather than just one. This change would have been a shift in the functional direction, but not a total shift to a functional structure. Such a compromise structure might make a better destination for such teams, given their point of origin.

Alternatively, this structure could serve as a “transition structure” as a team moved from divisional to functional in two or three steps rather than one. Within organizations, attention toward these hybrid structure shifts might mitigate some of the problems inherent in change. In addition, certain types of “robust” organizational structures may exist that, although not optimal for any one environment, will be serviceable in a number of different environments, thus obviating the need to change structures. Future research needs to examine whether these types of “compromise structures,” “transition structures,” or “robust structures” can ameliorate some of the problems manifested in teams that are trying to navigate a divisional-functional adaptation.

Finally, research might also explore “procedural workarounds,” that is, adaptations in processes that may substitute for structural changes—especially changes in the divisional to functional direction. Thus, instead of changing a structure from divisional to functional, one might be able to change a team’s work processes in ways that enhance efficiency within the existing structure. For example, competitive reward structures have been found to increase the speed of operations in teams similar to those studies here (Beersma et al., 2003). Since increased processing speed enhances efficiency, such a use of competitive reward structure could serve as an alternative to changing team structure. Future research needs to examine this and other types of process adaptations that might serve as alternatives to structural changes in teams that are poorly matched with their environments.

The focus of this paper was on structural contingency theory, and although any one of a number of other contingency theories could be analyzed in a

similar manner, the overall point that should be drawn from this discussion should be clear. The static logic that provides the basis for many contingency theories needs to be complemented by a dynamic logic. This dynamic logic needs to address whether the changes that are dictated by sequential applications of different behavioral routines lead to the type of asymmetrical adaptability that was documented in this experiment. It is a myth to think that individuals, teams, and organizations can be infinitely flexible, and hence future research needs to document other asymmetries, as well as interventions to offset them.

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Henry Moon (*henry_moon@bus.emory.edu*) is an assistant professor of management at the Goizueta Business School at Emory University. He received his Ph.D. in management from Michigan State University. He enjoys researching organizational behavior.

John R. Hollenbeck received his Ph.D. in management from New York University in 1984, and he is currently the Eli Broad Professor of Management at the Eli Broad Graduate School of Business Administration at Michigan State University. Dr. Hollenbeck has published over 60 articles and book chapters on the topics of team decision making and work motivation.

Stephen E. Humphrey is a doctoral candidate in organizational behavior at Michigan State University. His current research interests include virtual teams, brokered ultimatum games, and the relationship between time and behavior.

Daniel R. Ilgen is the John A. Hannah Professor of Psychology and Management at Michigan State University. Professor Ilgen received his M.A. and Ph.D. degrees from the University of Illinois, Urbana-Champaign. His research interests are in work motivation and team behavior.

Bradley West is a doctoral candidate in industrial and organizational psychology at Michigan State University. His current research interests include team development, team learning and decision making, employee attitudes, diversity, and organizational justice.

Aleksander P. J. Ellis (*ellis@eller.arizona.edu*) earned his Ph.D. at Michigan State University in industrial/organizational psychology. He is an assistant professor in the Department of Management and Policy at the Eller College of Business and Public Administration. His current research focuses on team processes such as team learning, back-up behavior, transactive memory, and shared mental models. He is interested in determining whether certain situational and personal characteristics such as training, stress, and personality have the potential to bolster or damage the efficiency and effectiveness of a team's collective information-processing system.

Christopher O. L. H. Porter (*colhp@tamu.edu*) is an assistant professor of management at Mays Business School at Texas A&M University. He earned his Ph.D. in business administration at Michigan State University. His research interests focus on team composition and teamwork, performance appraisals and feedback interventions, and police performance management.



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