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Contextualizing Patterns of Work Group Interaction: Toward a Nested Theory of Structuration

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The focus of this article is the patterns of interaction that arise within work groups, and how organizational and institutional factors play a role in shaping these patterns. Based on an ethnographic study of groups across three national contexts, we describe the variation in patterns of interaction that we observed. We further suggest how different patterns of interaction form mutually reinforcing systems with aspects of the organizational context. In addition, we suggest how these mutually reinforcing systems are perpetuated by aspects of the broader institutional context. Our findings point toward a nested theory of structuration, expanding structuration theory to multiple levels simultaneously. In turn our findings have theoretical and practical implications for better understanding and managing interaction patterns among group members.

Key words: interaction; work group; structuration; institutional context; cultural context

Introduction

How does work get done in groups? Why does similar work get done differently in different places?

To address these questions, we must explore what people actually do at work. As Stephen Barley and Gideon Kunda (2001) aptly describe: "The dearth of data on what people *actually* do—the skills, knowledge, and practices that comprise their routine work—leave us with increasingly anachronistic theories and outdated images of work and how it is organized" (p. 90). Moreover, if we want to understand how work gets done, we cannot strip away the context. Rather, we must contextualize our findings to better understand the phenomenon we observe (e.g., Johns 2001, Rousseau and Fried 2001). Also, we must consider how factors at multiple levels of analysis shape and constrain the phenomenon we study (Kozlowski and Klein 2000, Hackman 2003).

Back in the 1950s, researchers at the MIT Group Networks Laboratory established that variation in patterns of communication among group members affects group functioning and performance (Bavelas 1950, Leavitt 1951, Shaw and Rothschild, 1956). However, by the 1970s, this stream of research had been largely abandoned (Monge and Contractor 2001). Along with several other researchers (i.e., Argote et al. 1989, Brown and Miller 2000, Sparrowe et al. 2001, Cummings and Cross 2003), our purpose is to revive research that explores patterns of work group interaction. Moreover, we are interested in expanding the scope of this research to include both the national *and* organizational context in which these patterns emerge.

Prior research that explores the effects of contextual factors has tended to focus on either macrocontextual variables and how they affect organization structure (e.g., Hamilton and Biggart 1988, Maurice et al. 1980), or on organization-level factors and how they affect aggregate measures of group functioning and performance (e.g., Stokols 1981, Seers et al. 1995, DeMatteo et al. 1998). Some researchers have further explored how differences in cultural profiles, based on individuals' value orientations (Hofstede 1980, House et al. 1999), affect how people behave in groups (Mann 1980, Earley 1993, Bond and Smith 1996). Missing in these studies is an exploration of the patterns of work group interaction. Moreover, missing in these studies is an exploration of how the multiple different levels of context affect each other, as well as the patterns of work group interaction.

Our research is unique in its multilevel focus on interaction patterns and both the organizational and national context in which these patterns exist. We further chose to focus on the patterns of helping as a type of interaction pattern because of the central role of helping behavior in completing the work of the software engineering teams we studied. Using what Hackman (2003) calls "informed induction," we further identified the structures located at each level that appeared to most powerfully explain our local phenomenon, patterns of helping. We found that the reward structures can both explain and be explained by the patterns of helping. In turn, this mutually reinforcing relationship between the reward structures and helping patterns can itself be explained by elements of the larger institutional context.

Our analysis suggests a nested theory of structuration, extending structuration theory across multiple levels of analysis simultaneously. This nested theory of structuration further sheds light on alternative theories of fit—contingency, configuration, and congruence—suggesting how the underlying mechanism of mutual influence associated with structuration theory may explain how fit is achieved in these alternative theories. Our analysis also illustrates the value of unpacking aggregate measures, be they cultural or group aggregates, to better understand how work really gets done. In the end, our findings have theoretical and practical implications for better understanding and managing interaction patterns among group members.

Methods

Given how little is known about patterns of interaction within work groups and their relationship with the organizational and national contexts in which they exist, we engaged in close observation and built grounded theory. We studied software engineering as a type of work because, characteristic of knowledge work, software engineering includes both an individual and an interdependent component (Perlow 1999). Furthermore, the work is open-ended, creative, individually styled, and very demanding (Barley and Orr 1997). It cannot be standardized or fully planned out in advance (Bell 1973). Moreover, as it turned out, individuals—even on the components of their work for which they were individually responsible—often got stuck and needed help. We could therefore isolate a particular type of interaction—getting help on individual work—and explore how patterns of helping varied across groups.

We sought to hold constant the nature of the work as much as possible, while varying the context. Toward this end, we explored three teams of software engineers doing similar work at similar stages in the work process, but in very different cultural contexts.[1] We studied software engineers working for three partnerships, each a venture with the same American-headquartered multinational corporation. These partnerships were located in three distinct national contexts—Bangalore, India; Shenzen, China; and Budapest, Hungary. We refer to the three sites studied as follows: (1) *Cco* (all company names are pseudonyms), the joint venture located in Shenzhen, China; (2) *Ico*, the joint venture located in Bangalore, India; and (3) *Hco*, the *strategic partnership*, with longer-term plans to form a joint venture, located in Budapest, Hungary.

To further choose the three sites, we looked for teams who were comparable in terms of performance. These regions were home to some of the fastest-growing, most technically advanced software development industries in the world (IDC 1995, NASSCOM 1997). Moreover, each of the local organizations we studied had been chosen by the headquarters for an alliance because of its reputation for being technically advanced in its region. The teams we studied were further chosen by senior managers at each location as being among their highest-performing teams of software engineers. Additionally, members of the U.S. headquarters helped to select the three teams studied to ensure highly comparable work assignments.

Research Sites

Physically, the offices looked quite similar. The Cco office was immaculate, air conditioned, and well lit. Cco engineers sat in cubicles in wide-open spaces with managers around the edges in closed offices. Like Cco, Ico was clean, well lit, and air conditioned. Ico engineers also sat in cubicles; however, their workspace was configured in honeycombs, rather than rows. At Hco, the entire company was not all co-located. Rather, Hco was spread out around the city of Budapest, with groups of 5 to 25 engineers working at each location. The team studied worked by itself a few blocks from the head office, sharing two big open rooms plus a small kitchen. Their office was also clean, well lit, and air conditioned.

In addition, the three teams had similar compositions. The Cco team consisted of a project leader and four engineers: The project leader was male, as were two of the engineers. The Ico team consisted of a project leader and five engineers: The project leader was female, as was one of the five engineers. The Hco team consisted of a project leader and four engineers: The project leader was male, as were three of the four engineers. Across the three teams, the engineers ranged in age from 22 to 30 years old; the average age was 25 at both Cco and Ico, and 26 at Hco. The project leaders at Cco and Ico were 28; the Hco project leader was 29. All engineers and project leaders were natives of their respective countries. Additionally, all members of these three teams had four-year degrees from top technical universities in their countries. The project leaders had all been engineers; they simply had a few more years of experience in the software industry than the engineers that they managed.

Nature of Work

In each case, the team worked to provide a collective deliverable to a single customer. The work was moderately interdependent in the sense that individual components could be completed relatively independently of each other prior to being integrated into a finished product. In all three cases, the project leader divided up the work among the engineers such that each engineer was assigned his or her own independent tasks to perform based on his or her area of specialty. We observed each project after the work had been assigned and as engineers worked on completing their individual deliverables. At a later date, each of the engineers' individual components would be integrated and delivered to the customer.

Cco. The team we studied at Cco was working on part of the internal development of a banking system for a high-technology manufacturer located in Shenzhen. The project was scheduled to last a total of eight months. During the first two months, the project had focused on documenting the user requirements. The following four months were spent coding. The project leader had divided the coding task into 10 modules to be completed in sequence. Each of the four engineers on the team was assigned a part of each module. The project leader was responsible for integrating different components completed by each of his engineers. The plan was to complete these 10 modules by the end of the sixth month, leaving two months to test the code before delivering it to the customer. We collected data during the three weeks spanning the end of the fifth and the beginning of the sixth month. The period observed involved engineers working independently, but each on different aspects of the same module.

Ico. The team we studied at Ico was working for a company in Germany that had developed a home banking system for the Internet. The project was to develop Internet security plug-ins that checked for viruses. It had started six months prior to our arrival, with three engineers identifying the programming needs of the customer in Germany. After three months, these engineers had returned to India with a set of work requirements. At this point, five engineers plus a project leader worked on-site in India. The engineers each had separate tasks, the output of which they provided to their project leader upon completion. When we arrived, the engineers had already been back in India for two months, and had about three months more work to do.

Hco. The team we studied at Hco was working to computerize the information technology system for a hospital in Debrecen, Hungary. The project, including installation and training, was scheduled to last two years and had begun six months prior to our arrival. When we arrived, the team was in the midst of developing new features for the information technology system. The project leader had spent long hours dividing up the work as he thought would best suit the skills and abilities of his four engineers. He would later be responsible for integrating their work and interfacing with the customer.

The nature of the tasks carried out by the three teams studied can be characterized as "complex" and "uncertain" (March and Simon 1958, Thompson 1967). The software-engineering tasks allocated to individual engineers were complex in the sense that novel solutions were required as new problems emerged. Complexity reduces the preprogrammability of tasks and increases information requirements, thus increasing task uncertainty. The tasks were uncertain in the sense that the information required to perform the tasks was greater than the information possessed by any one individual engineer at any given point in time, requiring both new learning and the sharing of knowledge among engineers and the project leader.

Data Sources

Data for this study were drawn from observations, interviews, and tracking logs conducted by the first author.

Observations. In each location, the selected team of software engineers was observed on a daily basis. The first author was usually present from the time the engineers arrived until they left, observing them at work in their cubicles, at meetings, and in hallway conversations. She typed field notes throughout the day, as time permitted, and for several hours each night. She was on-site for eight weeks at Ico, six weeks at Hco, and three weeks at Cco. Consistent with the process of inductive theory building (Glaser and Strauss 1967), by the time she got to Cco she already knew what she had found at Ico and Hco, which enabled her to collect comparative data more efficiently. In contrast, when she started at Ico, she had little idea what she would find at Hco or Cco, so her data collection effort had to be broader, and therefore her stay more lengthy.

At each site, the first author had an office near to where the software engineers worked. This location enabled her to close the door and have confidential conversations with the engineers. Often engineers would come into her office, shut the door, sit down, and update her on events that had occurred. At both Hco and Cco, because English was not spoken among engineers at work, it was more difficult to capture the full meaning of meetings and interactions observed. The first author often had to reconstruct content by asking multiple individuals their interpretations of events. She did this in interviews, hallway conversations, and informal discussions with engineers in her office. At both Hco and Cco, about 75% of the engineers spoke English and almost all of them understood it; English is the international language of software development. Still, a translator was always available to assist with any difficulties encountered while communicating.

Interviews. In addition to observing work, the first author interviewed a range of people at each company. She first interviewed each member of the software team, including all engineers, their project leader, and their manager. Initial formal interviews lasting one to two hours provided background information about team members as well as an understanding of team members' perceptions of their work. During these interviews, questions were asked about the individual's work history, work at the present company, life outside of work, and career goals.

To obtain a richer understanding of the work environment, additional interviews were conducted with other individuals at each site, including both other managers and other engineers. These interviews provided supplemental information on individuals' perceptions of their work, company, and industry. At Ico, an additional 7 senior managers, 14 managers, and 18 engineers were interviewed. At Hco, an additional three senior managers, seven managers, and nine engineers were interviewed. At Cco, an additional four senior managers, six managers, and six engineers were interviewed.

Tracking Logs and Debriefing Interviews. To better understand how individuals spend their time at work, each member of the selected teams was asked to keep a log of what he (or she) did on one randomly chosen day. On these days, individuals were asked to track their activities from when they woke up until they went to bed. The team members were asked to wear a digital watch that beeped on the hour, and at each beep to write down everything they had done during the previous hour. Team members were encouraged to write down interactions as they occurred and to use the beeps as an extra reminder to keep track of their activities. The day after a team member tracked his or her activities, a debriefing interview was held. In these interviews, the individual was asked to talk through his (or her) log sheet, reviewing all interactions in which he (or she) had engaged, including who had initiated each interaction, for what purpose, and with what outcome. Data from 10-tracked days at Ico, 6-tracked days at Hco, and 6-tracked days at Cco were collected.

Analyses

To analyze the data collected at each site, we followed the guidelines suggested by Glaser and Strauss (1967) and Miles and Huberman (1984), developing empirically grounded sets of categories capturing how people related to one another in the process of getting the work done (e.g., types of interactions, people involved, sequencing) and the context in which it occurred (e.g., reward, family, educational, mobility, and political systems). We followed an iterative process, first developing hunches, then comparing those ideas to new data from the site, and further using the new data to decide whether to retain, revise, or discard the inferences. We came to recognize that the key interaction, which occurred among engineers and their project leader once the work was divided up and individuals were each focused on their own deliverables, was that of helping. At all three sites, individuals often encountered problems on their deliverables and would turn to others for help. However, we noted that who they tended to turn to and who willingly reciprocated varied across the three sites. Below, we first document the observed variation in patterns of helping that emerged among teammates in the process of doing their work. We next document the reward structures and the elements of the larger institutional context that appear to play a role in shaping these helping patterns.

Patterns of Helping Within Work Groups

We first describe the helping patterns observed within each of the three work groups studied. We then present data from the daily tracking logs, which corroborate the patterns identified.

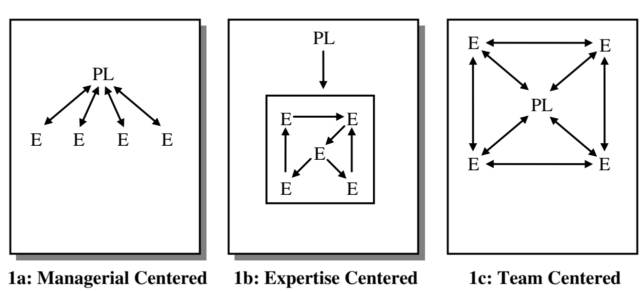
Cco

At Cco, engineers narrowly focused on their own work responsibilities, interacting with their project leader as necessary. Cco engineers frequently approached the project leader to clarify assignments and to ask for help. For example, one Cco engineer noted, "If something is not clear, I will always confirm it first." Furthermore, engineers approached their project leader for help in doing the work itself. For instance, at one point a Cco engineer started working on a piece of code but found a bug in it. The engineer informed the project leader of the problem and they spent half an hour discussing the problem, trying to understand it so they could correct it. In contrast, Cco engineers rarely communicated with their peers about work-related questions. We refer to this pattern of helping as "managerial centered." In this system, the core helping interaction was between engineers and their project leader. (Refer to Figure 1a.)

Ico

In contrast to the managerial-centered pattern of helping at Cco, the Ico project leader was more removed from the day-to-day technical questions arising in the work process. When problems arose, engineers depended on each other for help. They requested help based on a peer's area of expertise. As one engineer explained, "When I get stuck, I turn to other engineers on the team, friends at the company, or as a last resort, surf the net." For example, when one Ico engineer needed help on a problem related to the UNIX system, he turned to another engineer. The other engineer had a reputation

Figure 1 Patterns of Helping Within Work Groups



1a: Managerial Centered **1b: Expertise Centered** **1c: Team Centered**

Notes. E = Engineer. PL = Project Leader.

for being the office expert on UNIX. The Ico engineers knew each others' strengths and felt at ease both asking for and providing help. Moreover, if engineers found members of their team could not help, they asked a batch mate—someone who entered Ico at the same time that they had entered—or they would call a classmate at another company—often a competitor—for assistance. Indeed, peer input was so valued at Ico, engineers would wait long periods of time for such expertise. For example, one Ico engineer spent the better part of two days waiting for a peer to assist with her code. She relied on his expertise so much that she did not try to proceed without him. Whether she could have created an alternative solution on her own was not clear. What was clear was that she never considered the possibility of exploring other ways to address the problem.

There was far greater interaction among engineers at Ico than at Cco. Ico engineers turned to each other whenever they were not sure how to proceed, or when they wanted the benefit of someone else's expertise in a given situation. We refer to this pattern of helping as "expertise centered." In this system, the core helping interaction was between engineers based on areas of specialized knowledge in which they could provide help. (Refer to Figure 1b.)

Hco

At Hco, the project leader was more involved in addressing technical questions than at Ico, and the engineers were more involved than at Cco. Work assignments at Hco were not defined more broadly than at Cco or at Ico; however, Hco engineers frequently discussed problems with whomever happened to be available, whether their project leader or a peer engineer. For example, when one engineer had a bug in his code, he discussed the problem with a peer who knew little about this type of problem. Together, they explored possible origins. They looked at the source code and spent over an hour exploring how to fix the bug. When engineers would discuss a problem, often others in the office would overhear the conversation and find that they too had something to contribute. Consequently, they would join the conversation. Frequently, all four engineers and the project leader would become involved. As a result of such frequent, more general interactions, engineers at Hco had a broader sense than Cco or Ico engineers of what each was doing and what problems each faced.

Because Hco engineers appeared more willing—and, as part of the process, became more able—to assist each other on tasks not specifically assigned to them or within their particular areas of expertise, the Hco work process was often independent of specific individuals. Even the project leader and the engineers were closely interchangeable. When the project leader left for vacation when his team was busy finalizing the product for installation, one engineer explained: "I have extra work this week because [the project leader] is away. We each develop certain functions, and it is easier if there is a problem for me to work on those functions I have developed and for him to work on the ones he developed... but if a problem arises and the one of us responsible is away, the other one can always figure out a solution." When asked if he would ever contact the project leader on vacation, he responded, seemingly quite surprised by the question, "No. I can figure it out." Similarly, the project leader could easily step in for an engineer who was having a problem, and peer engineers often stepped in for each other as well. We refer to this pattern of helping as "team centered." In this system, helping occurred, more generally, between all members of the team. (Refer to Figure 1c.)

Table 1 Patterns of Helping Within Work Groups

	Cco	Ico	Hco
Role of project leader	Provider	Overseer	Team player
Role of engineer	Specialist	Specialist	Generalist
Dependent on whom for help	Project leader	Peer engineer	Project leader or peer engineer

In sum, the patterns of helping varied across the groups studied in three core ways. First, the role of the project leader varied from that of provider to overseer to team player. Second, engineers were either specialists or generalists. Third, the person on whom an engineer depended for help on work-related questions/problems was the project leader, a peer engineer, or whoever was available. Table 1 summarizes these differences.

Corroborating Evidence

The daily tracking data corroborate the existence of the three different patterns of helping. According to these data, Cco engineers spent the smallest fraction of their workday interacting (13%), with the vast majority of this interactive time spent with their project leader (81%). Indeed, no time was spent in team meetings and hardly any with individuals beyond the team (2%). (Refer to Table 2.) These time allocations support our observation that at Cco helping existed primarily between the project leader and each engineer, and not among peer engineers.

Table 2 Composition of Interactive Time

	Cco	*Ico*	*Hco*
Fraction of total work time spent interacting	0.13	0.26	0.26
Fraction of interactive time spent on			
• Managerial interactions	0.81	0.13	0.54
• Engineer interactions	0.17	0.55	0.31
• Group meetings	0.00	0.10	0.09
• Other interactions	0.02	0.22	0.06

In contrast, the daily tracking data indicate Ico engineers spent more of their workday interacting (26%). Furthermore, most of this time was spent with other engineers (55%), rather than with their project leader (13%). When engineers did meet as a team with their project leader, the purpose was to update their project leader on their progress to date (10%). In addition, Ico engineers allocated almost a quarter of their time to interactions with individuals outside the team (22%).[2] These time allocations highlight the limited technical assistance Ico engineers received from the project leader and emphasize Ico engineers' reliance on each others' expertise, even when such expertise lay outside the team or even company.

Finally, the daily tracking data indicate that Hco engineers spent an equivalent percentage of work time to Ico engineers interacting (26%). However, these interactions were divided among the project leader and peer engineers more equally than they were at Ico. Indeed, the allocation of Hco engineers' interactive time consistently fell between that of Ico and Cco for each type of interaction. Hco engineers spent more time interacting with their project leader than Ico engineers, but less time than Cco engineers did. Furthermore, Hco engineers spent more time interacting with peers than did Cco engineers, but less time than Ico engineers. Hco engineers also spent more time interacting in team meetings than Cco engineers did, and just slightly less than Ico engineers; however, the purpose of these meetings was quite different at Hco, compared to Ico. At Hco, team meetings were discussions about how to address a particular problem that one or more members of the team faced, as opposed to an update on each individual's status. Overall, the Hco engineers' time allocations support our observation that helping was more evenly distributed between the project leader and engineers and among the engineers themselves.

It is interesting to note that had we only observed aggregate measures of time spent interacting, the Ico and Hco teams would appear to be identical. However, when we unpacked the aggregate measures and observed the patterns of helping, we found important differences between Ico and Hco. Further, these differences turned out to be part of a reinforcing relationship with the reward structures in each context, which we describe below.

Reward Structures

In each case, the nature of the work was similar in terms of complexity, uncertainty, and interdependence. Differences in the nature of the work, therefore, cannot explain the observed variation in patterns of helping. Variation in the criteria that governed the distribution of rewards as well as variation in the nature of the rewards that were given, however, can explain the observed variation in helping patterns. Below, we describe where each team falls in terms of the criteria for rewards (refer to Figure 2), and then we describe the nature of the rewards themselves. In the following section, we describe *how* reward structures, in turn, can explain and be explained by the observed variation in helping patterns.

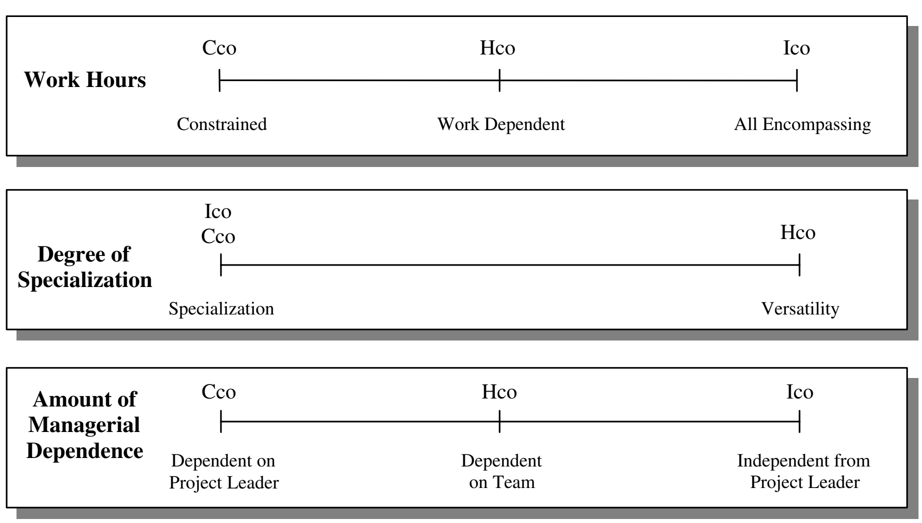
Criteria for Rewards

At all three sites, the criteria for rewarding engineers involved hours worked, the level of specialization, and the degree of managerial dependence. The criteria varied from short to long work hours, from specialization to versatility, and from managerial dependence to managerial independence.

Work Hours

Cco. At Cco, engineers were evaluated based on their work within fixed temporal boundaries; how hard they worked was more important than how long they worked.

Figure 2 Criteria for Rewards



Cco engineers were expected to work eight hours starting between 8:00 and 9:00 A.M. and ending between 5:00 and 6:00 P.M., with an hour for lunch. At Cco, engineers rarely were expected to work much beyond 6:00 P.M., or on the weekends.

As one Cco engineer stated, "Hours do not matter. If I worked more hours, I wouldn't be any more successful." Another engineer explained that it is "your way of working ... your efficiency ... not the sheer number of hours one puts in. We don't get rewarded for hours. Longer hours [beyond an eight-hour day] will not result in a higher evaluation." As one project leader confirmed: "Hours worked are not important for evaluation." Rather, as one manager put it, "We judge engineers based on how hard they work [while at work] and their native talent."

Ico. At Ico, the core workday—9:00 A.M. to 6:30 P.M.—was referred to as "mandatory time." Ico engineers were expected to begin their workdays around 9:00 A.M., but end closer to 7:00 P.M., and often as late as 10:00 or 11:00 P.M. In addition to long workdays, weekend work was regularly expected. Saturday was typically considered a full workday, with individuals expected to arrive around 10:00 A.M. and leave about 6:00 P.M. One engineer explained: "There is great pressure to spend the entire day in the office on Saturday whether or not you have work to do."

At Ico, it was important to managers that their engineers demonstrated a commitment to work, "a mindset" as one manager referred to it, "a willingness to do whatever in response to the job." Managers modeled the desired behavior. For example, the team's manager (i.e., the project leader's manager) was described by one of his engineers as "ambitious and extremely hard working." This manager often stayed late into the evening and routinely worked long hours on Saturdays. Moreover, he seldom took time off from work between Monday and Saturday. One of his engineers noted: "I don't think he has taken a single day off this year."

Ico managers expected their engineers to be like themselves, willing to work at all times. Rather than regulating fixed hours, the managers ensured that work got done by rewarding long hours. One project leader described his team's efforts in glowing terms: "[They] want to excel and know when to set their priorities ... [they] never go on leave ... and I never ask any of my staff to do this. It comes from within them."

Hco. At Hco, engineers typically worked from 9:00 A.M. until 6:00 P.M., sometimes 7:00 P.M. The senior manager estimated total [expected] work hours to be "5, 8-hour days a week ... but everyone works at least 10% more than a 40-hour week." Moreover, work hours were expected to vary with work demands. Engineers were expected to put in long hours when the work required it.

The project leader explained, "People are evaluated on their output, not on the amount of time they put into their work .... The team has a whole range of skill levels. Those with higher skills will take a shorter amount of time to complete the same task." The manager confirmed, "I don't evaluate people based on long hours. It is hard for me to even know if people are working or not because they can, and many of them do, work from home." He added, "I can get a lot more done at home. I work at home whenever I can." It is important to note that, unlike Cco or Ico engineers, Hco engineers had the technical capabilities (i.e., computers, faxes, and cell phones) and the physical space to work at home. Moreover, because engineers were evaluated on output, not hours, Hco engineers had the flexibility to decide whether to work at home. They could also choose when and how long they worked at the office. One engineer explained: "I decide for myself when I must devote more time to keep up with deadlines. I decide not just when I should work, but which projects are urgent or critical and where I prefer to do my work ... I decide where and when by myself."

Rewards for Specialization

Cco. Cco managers rewarded engineers with strong technical backgrounds who could rapidly adapt to a continually changing technological world. Cco wanted engineers who would make an effort both at work and outside of work to learn and advance their areas of expertise. Managers evaluated engineers based on their ability to "catch on to new technology .... We want people who take advantage of ongoing training and learning opportunities so they stay current." Engineers were rewarded for bringing the needed set of skills to a project—often from a specific area of rapidly advancing technology.

Ico. Engineers at Ico were also expected to provide a set of skills to their team, and they too were expected to stay up to date on their skills. According to one manager, "Engineers must constantly be developing the skills needed by the client .... It is essential to stay current."

Hco. At Hco, managers valued people who showed a desire to work hard to achieve a goal. However, rather than focusing on people's existing knowledge, managers focused on what people could learn in short periods of time. The project leader explained that, when hiring, "What matters is not that one is familiar with how the work is done, or the language in which we program, but that one can pick it up quickly .... I look for people who want to do the work and want to learn." The focus at Hco was on understanding the whole project and being able to help whoever needed help, rather than developing an in-depth understanding of a particular part of the project and staying abreast of current trends only in that specialized area. Hco engineers were rewarded for being generalists, rather than specialists.

Rewards for Managerial Dependence

Cco. Cco engineers were encouraged to consult with their project leader whenever necessary to complete their deliverables. Cco managers rewarded engineers who were cautious and avoided taking risks that might lead them down the wrong path. According to the project leader, "If people do not fully understand, they should clarify their questions." He explained that he did not value people working independently, trying to develop a program by themselves. He preferred that an engineer approach him frequently with questions and updates.

Ico. At Ico, engineers were expected to work independently from their project leader and to seek help from their peers as needed. "Ultimately," the project leader explained, "the more support I provide an engineer, the lower rating I will give him in his yearly appraisal.... At some point, you need to become independent." Unlike Cco, where the project leader encouraged his engineers to turn first to him when there was a question or problem, the Ico project leader encouraged engineers to do as they were told and work among themselves to solve technical problems.

Hco. At Hco, individuals were rewarded not only for being committed to gaining a broad understanding of the project, but also for being willing to do whatever was needed to contribute to the *team's* success. When engineers needed help, they were expected to turn to whoever was available, whether that person was their project leader or another engineer. Hco project leaders willingly provided assistance and expected this same willingness of their engineers. As the project leader stated, "If someone has the time, I expect it of them to help." The manager explained, "Anything impeding the group's progress is worthy of a group member's time." The project leader noted: "We are all in the same boat. We must work together. We must depend on each other to succeed."

Nature of Rewards

In the above subsection, we described the three core criteria on which engineers were evaluated. However, not only do the criteria for rewards vary across the three sites studied, but the rewards themselves vary as well.

Cco. At Cco, engineers received salaries that were comparable to other "top-flight" software houses in China. In addition, engineers were paid extra for the rare request for overtime work. The project leader and the manager evaluated engineers every three months. Bonuses were paid based on these assessments. Promotions were evaluated every six months. High-performing engineers were further rewarded with more challenging work assignments that enabled them to further develop their technical skills on the job, as well as more opportunities to engage in training sessions outside of work.

Ico. At Ico, engineers received compensation comparable with the rest of the software industry. Engineers also received a certain amount of money, based on performance, placed in an account, which they could then allocate among benefits including medical insurance, company car, housing loan, or refrigerator. Engineers were evaluated once a year by their manager in conjunction with their project leader, on a 1 to 5 scale, where 5 is "unsatisfactory performance" and 1 is "far exceeds expectations, needs no supervision, and doing work of next level." Salary, benefits, and promotions depended on one's ratings. High-performing engineers also received more challenging work assignments that enabled them to further develop their skills, and projects that would likely take them abroad, to Europe and, most desirably, to the United States.

Hco. At Hco, salaries were top-end for the software engineers in Hungary. However, there was no "extra" money at Hco to further motivate engineers. There were no bonuses. The manager explained, "I need to find other ways to motivate (besides money). There is no extra money for bonuses or raises." There was only an implicit promise that, if the company did well, "they will create a stable environment for their futures and a place where they know they will have a good job." This was seen as a valuable promise, given that most engineers currently had multiple unemployed friends and family members.

Reward-Helping Systems

As noted above, the observed helping patterns differed in three core ways: (1) role of the project leader, (2) role of the engineer, and (3) dependencies between project leader and engineers and among engineers. Our findings, elaborated in the previous section, further suggest that reward structures vary as they pertain to: (1) work hours, (2) degree of specialization, and (3) amount of managerial dependence. In this section, we describe *how* differences in reward structures appear to reinforce the patterns of helping, while the patterns of helping appear to reinforce the differences in reward structures.

While interconnections appear to exist between each of the three characteristics of the helping patterns and each of the three ways in which the reward structures vary, we have chosen for the sake of clarity and brevity to describe only three of these nine relationships in the paper. We describe the following relationships between aspects of the reward structures and helping patterns: (1) work hours and role of project leader, (2) degree of specialization and role of engineers, and (3) amount of managerial dependence and core helping interaction (i.e., between project leader and engineers, or among engineers). It is important to keep in mind that we are only exploring a subset of the multiple interconnections that appear to exist. Further, it is important to note that even the three relationships we do describe are not independent from each other, but are themselves highly interrelated. We describe them as three distinct mutually reinforcing relationships only to simplify the explanation, while still providing sufficient evidence to document that reward structures and patterns of helping appear to be highly interconnected, each reinforcing the other. In each case, through their mutual reinforcement, reward structures and helping patterns form a distinct type of reward-helping system.

Cco

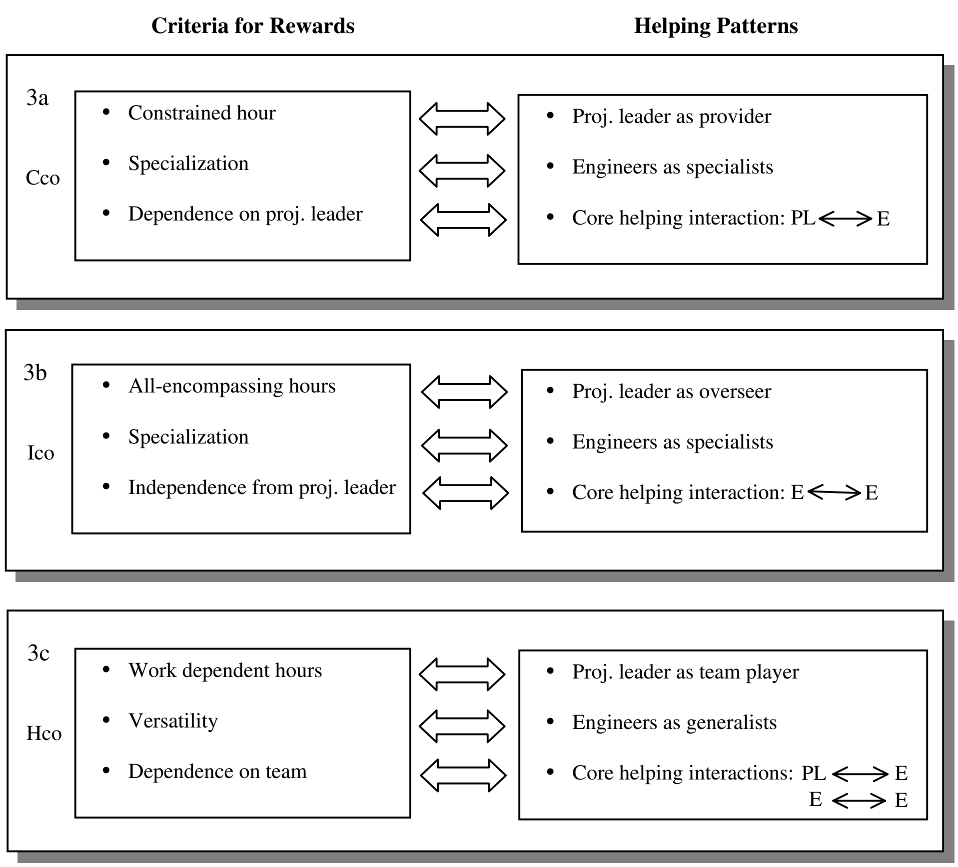
At Cco, the project leader acted as the central provider of help. Cco engineers were specialists who were expected to seek out their project leader as necessary to get their jobs done. At the same time, the reward system valued engineers for completing their assigned work during short but intensive work hours, for maintaining areas of specialization, and for getting help from the project leader to ensure optimal time use. (Refer to Figure 3a.)

The first mutually reinforcing relationship on which we focus revolves around the role of the project leader and the hours worked. Having the project leader act as the central provider of help required that the work got done in the hours that the project leader was at work. It also required that engineers were present during those hours. The project leader was therefore encouraged to reward engineers for all working the same short, but tightly regulated, schedule. In turn, when engineers worked only those short and tightly regulated hours, there was pressure to maintain a system of helping that took advantage of the fact that engineers were all present during the same overlapping hours, but also that ensured the work got done in this constrained time period. This set of requirements reinforced the project leader's role as the central source of help, with the project leader focused on ensuring that the work got done as efficiently as possible.

The second mutually reinforcing relationship we focus on revolves around the engineers' role as specialists and the degree of specialization rewarded. At Cco, patterns of helping based on specialization reinforced a system that rewarded engineers for being specialists. Because the work required specialists, the project leader wanted to encourage engineers to be specialists. Rewarding specialists reinforced a system that revolved around the use of specialists to get the job done. Moreover, the engineers, rewarded for being specialists, put pressure on their project leader to provide them with work opportunities where they could act as specialists and further hone their areas of specialization.

Finally, the third mutually reinforcing relationship we focus on revolves around the dependencies between the

Figure 3 Mutually Reinforcing Relationship Between Rewards and Helping Patterns



project leader and engineers and the amount of managerial dependence rewarded. At Cco, the central dependency was between the project leader and the engineers, and the reward system valued engineers for being dependent on their project leader. A system that revolved around engineers seeking help from their project leader reinforced the valuing of engineers so they would remain dependent on their project leader. At the same time, encouraging engineers to be dependent on their project leader reinforced that the core helping interaction was between engineers and their project leader, and not between peer engineers.

Ico

At Ico, the project leader was more removed from the process than at Cco, and engineers completed their work with limited help from the project leader. Engineers depended on each other, based on their areas of specialization. At the same time, the reward system valued engineers for working all-encompassing hours independently from their project leader. (Refer to Figure 3b.)

In terms of the first mutually reinforcing relationship, at Ico the helping patterns did not include the project leader. Not having the project leader involved in the day-to-day execution of tasks allowed the project leader to spend time involved in other aspects of the work; however, it also meant that the project leader was not focused on ensuring the completion of work during a tightly constrained workday. The helping patterns at Ico reinforced a reward system that valued work hours being long and all encompassing, rather than short and rigid as at Cco, to ensure that the work got done. At the same time, because long hours were rewarded, there was less pressure to develop patterns of helping that ensured that work got done in a constrained number of hours. Instead, the rewarding of long hours reinforced the existence of helping patterns where the project leader did not need to spend a great deal of time acting as the primary source of help.

In terms of the second mutually reinforcing relationship, at Ico patterns of helping were based on specialization. As at Cco, this reinforced a rewarding of specialists to ensure that engineers would maintain the necessary specialization to do the work. And, rewarding specialists reinforced helping patterns based on areas of expertise.

Finally, in terms of the third mutually reinforcing relationship, the patterns of helping were between engineers rather than with their project leader, and managerial independence, not dependence, was rewarded. A system that depended on engineers seeking help from each other and not from the project leader reinforced valuing engineers for helping each other and not turning to the project leader. At the same time, rewarding independence from one's project leader reinforced the existence of patterns of helping between peer engineers, and not the project leader.

Hco

At Hco, the project leader and engineers worked together as a team with overlapping skills, helping each other as necessary. Hco engineers were rewarded based on their versatility and willingness to help whomever needed help to make sure that the team would succeed; they were evaluated based on output, not hours. (Refer to Figure 3c.)

At Hco, the first two mutually reinforcing relationships were particularly highly interrelated. The project leader's role was neither that of the central provider of help nor that of an overseer, but rather that of a team player. At the same time, the engineers were generalists, not specialists. The project leader and the engineers were therefore more easily substitutable, and did not all need to be at work during the same overlapping hours to ensure that each could complete his or her own deliverables. This emphasis on the team rather than particular individuals doing particular work reinforced the rewarding of engineers for getting the work done rather than working a fixed set of overlapping hours. Because team members, in turn, were not always there during the same overlapping hours, it forced them to develop ways of working that enabled them to make progress even if they were not all present. Rewarding hours based on getting the work done, rather than long hours, therefore reinforced a pattern of helping that revolved around everyone being able to help each other. Moreover, versatility was also rewarded, reinforcing team members' willingness to develop as generalists rather than specialists.

Furthermore, in terms of the third relationship, the patterns of helping at Hco existed between engineers and the project leader as well as among engineers, and dependence on the team was rewarded. Developing a pattern of helping with both the project leader and other engineers reinforced a dynamic where the project leader and the engineers were rewarded for being dependent more generally on the team than on anyone in particular. At the same time, rewarding people for being dependent more generally on the team rather than on any one particular individual reinforced patterns of helping among all of the members of the team.

Elements of Institutional Context

Given the cross-cultural nature of our data, we are able to further consider how these reward-helping systems were shaped by the larger context. What we observed was a tight link between the institutional context and the reward structures, which is highly consistent with existing literature (e.g., Maurice et al. 1980, Lincoln and Kalleberg 1990). In each of our three cases, government policies and family values appeared to shape the types of hours rewarded. The education and mobility systems appeared to influence whether engineers were rewarded for being specialists or generalists, and the mobility systems further appeared to shape the nature of the rewards that were offered.

Hours Worked

At each site, rewards for hours worked were not only part of the mutually reinforcing relationship between the rewards and helping patterns; these rewards were further reinforced by government policies, and work and family values.

Cco. At Cco, work hours were short and rigid. Indeed, the Chinese government discouraged overtime—beyond five, eight-hour days a week—and required that engineers be paid extra for overtime work. Expressing a perception shared across engineers and managers at Cco, one manager explained: "The Government is concerned that it is not healthy for the workforce to overwork." Moreover, Cco engineers expressed a strong preference not to work overtime unless it was absolutely necessary to meet a deadline. As one engineer explained, "I work only eight hours a day, but I work very hard during those eight hours. I am very busy at work in order to avoid overtime." Cco engineers did not want work to dominate their lives. One engineer said, "I define success more broadly as a 'happy life' and one in which I don't need to always worry about tomorrow." Married engineers with children talked about their desire to maximize the amount of time that they could spend with their families. One engineer with a nine-month old described, "My husband and I recently moved so I would be closer to our daughter when I am at work. We have a live-in babysitter, but I want to be close.... I want to maximize the time I can spend with my daughter."

Ico. At Ico, work hours were long and all encompassing. Ico engineers accepted the importance of these long work hours. One engineer commented, "There is a sense of commitment among the engineers that they will work as hard as necessary to get the job done. People don't complain, realizing that they must work—sometimes even through the night—until things are finished." Ico engineers believed work should come before all else, including family. They relied on their social networks to manage household chores and childcare responsibilities. One engineer, six months pregnant, explained: "I am not sure about the time I will be able to spend with my child. I would still be willing to accept on-site assignments if they are short, not more than six months. My in-laws and my parents will take care of the child." (Note: On-site assignments are overseas postings.) Indeed, with this type of support from relatives, Ico engineers apparently could devote themselves to work without feelings of conflict. One engineer described her parents as caregivers: "They raised me. I have no concerns.... I only feel responsible that my children are well brought up. I do not have to do it."

Hco. At Hco, work hours were the most responsive to work demands. More like Cco than Ico, neither engineers nor managers at Hco wanted to bow completely to the pressures of work. As one engineer explained, "Success in life means success at work, while also having a family and raising children." Individuals respected and protected each other's family time, developing ways to cover for each other so that neither the team's progress nor the individual's flexibility was hindered. Moreover, at Hco they stressed the importance of finding ways to balance success at work not only with time to appreciate their family, but also their culture and history. According to the senior manager: "One's job is critically important, but as a human being, there are other more important things... culture and family. There are other things in life that matter besides money." On two different occasions, members of the Hco team insisted on taking the first author to concerts, explaining this was a critical part of who they were and how they worked.

Development of Specialization

At each site, rewards for specialization were also a core part of the mutually reinforcing relationship between rewards and helping patterns. The rewards for specialization appeared to be further reinforced by elements of the larger institutional context. Specifically, both the education and mobility systems appeared to reinforce the rewards for specialization.

Cco. Cco managers suggested that the importance of specialists was supported by an educational system that trained individuals to be specialists. As one manager explained, comparing education in the United States and China: "In the U.S., the education system is focused on developing one's imagination. In China, the goal is to pour knowledge into a child's mind. We are not taught to think broadly, but to memorize the relevant facts."

Furthermore, the external labor market rewarded Cco engineers for being specialists. Cco engineers lived under a Communist system, where everyone was ensured a job. The issue for Cco engineers was whether they had a "good job," which to them was defined as working for a private firm, not the government. Engineers obtained "good jobs" based on having expertise in an area in which a firm needed to hire. To ensure that they always had a good job, engineers wanted jobs that would provide them with advanced technology tools, so they could continue to learn while working. They also wanted jobs that provided them with the time and opportunity to learn outside the job, both on their own and by attending training seminars.

If engineers did not receive developmental opportunities, they would move to a new organization. About a quarter of new engineers left within their first year at the company. Of the 40 people in the division studied, 5 had left the previous year and 3 had already left during the first 6 months of the current year. To retain their engineers, Cco managers felt immense pressure to provide engineers with opportunities to develop as specialists.

Ico. The reward-helping system at Ico, like the one at Cco, revolved around specialists, and was reinforced by both the education and mobility systems in India. Ico engineers, like Cco engineers, were trained as specialists and perceived that they could achieve their greatest career potential by developing marketable areas of expertise and switching jobs to increase opportunities. When engineers had skills in areas that they considered to be critical and in demand (whether at the company or elsewhere), they felt strongly about continuing to work in those areas to further develop their expertise.

Like Cco engineers, Ico engineers continually searched for jobs with better development opportunities and higher pay. One Ico engineer explained, "There is no loyalty. It is very different from my parents' generation where you worked at one company until retirement. I have already worked at four companies [she was 26 years old]. What is most important is my growth as an individual." Ico engineers had even more job offers within their country and abroad than Cco engineers, because of the strength of the software market in India and the engineers' greater freedom to enter and leave their country. According to the human resource manager, "Turnover at Ico is 22% a year." Like at Cco, Ico managers therefore experienced much pressure to find ways to accommodate engineers' desire for opportunities to further develop their areas of specialization, especially if they wanted to retain the most technically qualified engineers.

Hco. Unlike the reward-helping system at Cco and Ico that revolved around specialists, the system at Hco revolved around generalists. The centrality of generalists was reinforced by an education system that trains generalists. As one manager explained:

> There is something very unique about the Hungarian way of thinking. It is very colorful.... Our language itself is more complex. Individuals must think very hard and deep about the words they choose to convey accurate meaning...contrast that with the narrow yes/no form of the English language...the English dictionary is much thinner than the Hungarian dictionary.... From an early age, we come to have a greater sensitivity to problems...to understand them more broadly.

Moreover, the mobility system in Hungary produced generalists. Unlike Cco and Ico engineers, for whom job opportunities abounded, at Hco there was a looming fear of unemployment. As one manager explained:

> For 40 years of Communist rule, you were sent to jail if you didn't have a job and no one lost their job unless there was a real problem. To not have a job took on a very serious meaning. Today, with all the changes in the environment, many people find themselves without a job, but they haven't changed their idea of what it means to be unemployed, and so they don't know how to handle it. It gets them totally down. People know so many others who are unemployed that it is terrifying for them. It could happen to them or their families at any time.

Hco engineers perceived that their greatest job potential would be realized if Hco succeeded and they were part of that success. As a result, Hco employees were loyal to the company and eager to be part of its growth. When one engineer was asked where he wanted to be in 10 years, he responded, definitively. "at Hco." Engineers envisioned their future as highly connected to Hco's success, and as a result actively pursued opportunities to be part of the team, work together, and help and cover for each other to ensure the company's success. At the same time, because of the breadth of understanding of the project that the engineers developed, Hco managers invested heavily in keeping their engineers. Part of the way in which the project leader made such an investment was by working collaboratively with his engineers, reinforcing that they all were important members of the team working collectively to ensure the completion of the final product.

Nature of Rewards

Beyond finding that elements of the institutional context appeared to affect the criteria for rewards, we further found the mobility system influenced the nature of the rewards. At Ico, where there was the most job mobility and engineers were single-mindedly focused on finding work that expanded their skill base so they could maintain mobility, Ico managers rewarded top-performing engineers with the most challenging work assignments—which in turn enabled them to learn the most in the process of doing their work. In contrast, at Hco, where job mobility was low and the foremost issue for engineers was job security, the reward for high-level work was a greater sense of job security. Moreover, at Hco, because job security ultimately involved not only one's own performance but the performance of one's teammates—so the company stayed in business—there was a much greater emphasis on team work and being a team player. Finally, at Cco, where job mobility was much greater than at Hco, but more limited than at Ico—mostly because of the fewer opportunities to go beyond their own country—high performance was rewarded by opportunities to develop skills that would in turn be useful for the company. Letting engineers spend long periods of time outside the workplace, while highly valued by the engineers, was perceived to be less risky at Cco than at Ico because Ico engineers would most likely leave upon returning from their training experience, while Cco engineers were more likely to continue to work for the organization. Cco could therefore afford this investment because the engineers were more likely to add value to the company when they returned.

Discussion and Implications

We have conducted a multilevel exploration of software-engineering teams performing similar tasks at Cco, Ico, and Hco. We have found differences in helping patterns among engineers, as well as with their managers. We have further found that these patterns of helping appear to be part of mutually reinforcing relationships with the organization reward systems and, moreover, that these reward-helping systems are further reinforced by elements of the larger institutional context.

In the language of contingency, configuration, and congruence theorists, we have identified "fit" between multiple components: helping patterns, reward structures, and elements of the larger institutional context. As Schoonhoven (1981) pointed out, the underlying idea behind such theories of fit is that somehow the presence of one organizational structure enhances the impact of the others. When there is a lack of fit, the presence of one organizational structure undermines the impact of the others.

Contingency theory posits that organizational structures are most effective to the extent that they fit with the nature of the task and the requirements of the external environment (e.g., Lawrence and Lorsch 1967, Galbraith 1977). Configuration theory posits that organizational structures are most effective to the extent that they fit with each other, in the sense that they are working in the same direction and not at cross-purposes (e.g., Ichniowski et al. 1997). Congruence theory posits that organizations are most effective to the extent that the structures fit with each other, as well as with the nature of the task and the external environment (e.g., Nadler and Tushman 1997). Congruence theory further posits that organizations, to be effective, should achieve fit between their internal structures and the types of people who are hired, as well as with the informal culture of the organization (e.g., Tushman and O'Reilly 1997).

In this paper, we document "fit" with a key additional component. The components between which we find fit include institutional structures, organizational structures, *and* patterns of work group interaction. While the other theories include several of these components (particularly congruence theory, which is the most inclusive), none of them consider patterns of work group interaction as one of the components with which fit is achieved.

Furthermore, the primary mechanism for achieving fit among the various components differs in our data from that of contingency, configuration, and congruence theories. In each of those theories, fit is achieved through the design choices made by managers regarding the adoption of various components. Organizations whose managers choose components that fit together well are expected to thrive, while organizations whose managers make the wrong choices are expected to be less effective, and even to fail. In our data, by contrast, fit does not appear to occur simply due to managerial choice regarding various organizational practices. Rather, fit appears to occur through a process of mutual influence, where the components themselves shape the forms each other take. In other words, work group interactions and organization practices shape each other (i.e., reward-helping system). That is not to suggest that managerial action does not play a role in shaping organization practices, but only that these practices are themselves part of a mutually reinforcing relationship that is beyond the manager's *direct* control.

Given these differences between our data and theories of contingency, configuration, and congruence, both in terms of the core components in need of fit and in how such fit is achieved, we turned to structuration theory to further understand our findings. What is unique about structuration theory as a theory of fit is the treatment of workplace interactions as a distinct organizational component in need of fit, and the process of mutual influence between workplace interactions and organizational structures as a distinct mechanism for achieving fit (Giddens 1984).

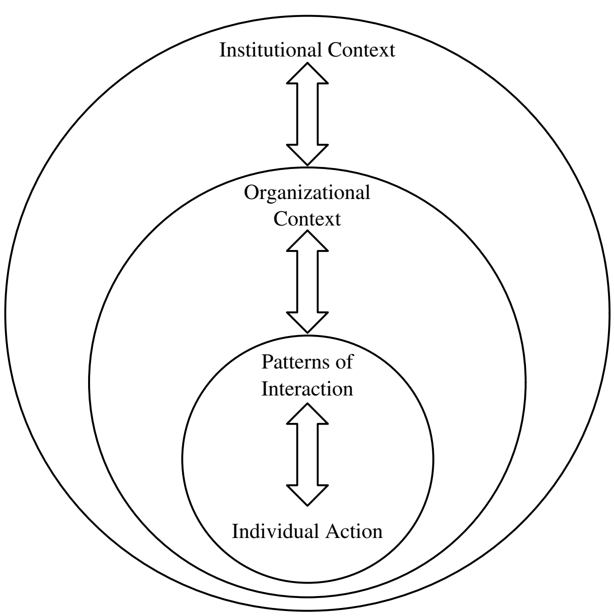
According to structuration theory, agents act within the constraints of structures in such a way that either reinforces or undermines those structures. In particular, structuration theorists have suggested that the form and meaning of prescribed structures are produced and reproduced through emergent interactions, and that the likelihood and content of emergent interactions are influenced by prescribed structures (e.g., Ranson et al. 1980). In addition, structuration theory has been specifically applied to patterns of interaction in work groups (e.g., Poole et al. 1996). Moreover, Pentland (1992), in a study of software support hot lines, has gone so far as to document how types of helping behaviors, in particular, both reflect and enact major structural features of the organization.

It is important to note that according to structuration theory, managerial choice does play a role in the adoption of organizational structures (Orlikowski and Yates 1994). However, while the structures can result from managerial choice, the patterns of interaction themselves do not result directly from managerial choice. Rather, the patterns of interaction are shaped by the structures that managers and others have chosen to implement in a particular workplace. These patterns of interaction, shaped by the organizational structures, in turn reinforce or alter the organization structures.

Applying structuration theory to our data sheds light on structuration theory as well as on alternative theories of fit (i.e., contingency, configuration, and congruence). Our data illustrate how the process of structuration may occur on multiple levels simultaneously, with each level of the mutually reinforcing relationship between action and structure itself in a mutually reinforcing relationship with structures at the next level. In other words, we found that patterns of interaction and elements of the organizational context appeared to create a mutually reinforcing relationship, which itself, as an entity, appeared to be reinforced by elements of the larger institutional context. And, in conjunction with theorizing by Barley and Tolbert (1997), we would expect that this relationship with the broader institutional context not only shapes but also is shaped by what goes on within the organization. Moreover, Feldman (2003) has documented how individuals' patterns of interaction or routines themselves shape and are shaped by individual action, which she notes are embedded in a process of shaping and being shaped by the organizational context. Taken together with existing literature, our findings therefore suggest a nested theory of structuration. Individual action and patterns of interaction mutually reinforce each other, and further are part of a mutually reinforcing relationship with elements of the organizational context (reward structure in our case). In turn, this relationship (the reward-helping system in our case) is itself further part of a mutually reinforcing relationship with elements of the larger institutional context. (See Figure 4 for a graphical depiction of this nested theory of structuration.)

There are, however, some important limitations of our theorizing stemming from the cross-sectional nature of our data. We are unable to provide compelling evidence that the reward-helping system shapes the institutional context; our data effectively suggest only how the institutional context shapes the reward-helping system. Moreover, we can only suggest the existence of a mutually reinforcing relationship between reward structures and helping patterns; we do not have the data to document its existence. Future research, ideally using longitudinal data, would benefit from further exploration into the existence of each of the multiple mutually reinforcing relationships illustrated in Figure 4.

Figure 4 Nested Theory of Structuration



Still, the nested theory of structuration suggested by our data raises important possibilities for better understanding alternative theories of fit, namely contingency, configuration, and congruence. Although structuration theory does not directly address the question of fit between organizational structures, the mechanism posited by structuration theory for achieving fit between organizational structures and workplace interaction—that of mutual influence—may help to explain whether organizational structures fit with each other. As Schoonhoven (1981) has pointed out, there has not previously been a theoretical rationale for why some organizational structures fit together, or enhance each other's impact, while other organizational structures lack fit. However, from a structuration standpoint, organizational structures would be said to fit with each other to the extent that they reinforce and are reinforced by the same patterns of interaction. In other words, for two organizational structures to fit with each other, they both must simultaneously be in their own unique mutually reinforcing relationship with the same pattern of interaction.

The nested theory of structuration suggested by our data also has implications for research that draws aggregate-level conclusions at either the group or cultural level of analysis. When aggregate measures are considered, important differences are overlooked. For instance, given the fraction of time spent interacting across the three sites, one would expect great similarity between Ico and Hco, and much larger differences with Cco, where half as much time was spent interacting. However, moving down a level to explore patterns of interaction, we have documented three distinct patterns of helping: expertise centered, team centered, and managerial centered, respectively.

This same critique of aggregate measures is also relevant to research that depends on aggregate measures of the cultural context. If one were to look at differences in cultural value orientations of the engineers we studied, as is typically done in cross-cultural comparative research (e.g., Hofstede 1980, Earley 1993), one would again predict different patterns of behavior from those that we observed. In terms of cultural value orientations, Hungary has been found to be the most individualistic and hierarchical of the three countries studied (Fiske et al. 1998, House et al. 1999). However, we found Hco to be the least hierarchical and the most collectivist in work orientation. We further found that Hco engineers were willing to help their colleagues because their job mobility was highly constrained, and they viewed their career success as dependent on the success of their firm. The institutional context therefore appears to have shaped the reward-helping system in a way that differs from that which the individualistic, hierarchical cultural-value orientations of Hungarians would predict.

This finding is consistent with a purely structural explanation of behavior, which finds social structures, not cultural values, are the antecedent of workplace dynamics (Bendix 1956, Dore 1973, Cole 1985). However, while cultural value orientations in Hungary alone cannot explain patterns of helping at Hco, they may still play a role in shaping the institutional context, which in turn appears to play a central role in shaping the reward-helping systems. The Hungarians' individualistic cultural value orientation, in conjunction with their education and mobility system that values generalists, means that to be successful as an individual, one must be a generalist. Helping others therefore becomes an essential component of one's own individual success. Cultural value orientations should therefore, perhaps, be conceptualized as an additional outer ring in our nested theory of structuration, depicted in Figure 4. This proposition is consistent with a study of free riding in the United States and Japan, where Yamagishi (1988) found that, when comparing the behaviors of members of different cultures, one must focus on both value orientations and the institutional context. We are similarly suggesting that both value orientations and institutional context may influence behavior.

The nested theory of structuration emerging from our research also has important implications for better understanding and managing interaction patterns among group members, such as team learning (e.g., Edmondson 2002), coordination (e.g., Faraj and Sproull 2000, Gittell 2002), and knowledge sharing (e.g., Cummings and Cross 2003, Borgatti and Cross 2003), as well as helping (e.g., Burke et al. 1976, Lees 1997). What our nested theory of structuration suggests is that to sustain or change any of these patterns of interaction requires not just understanding the patterns of interaction themselves, but also the organizational, institutional, and cultural contexts that enable and constrain them.

Moreover, when team members are separated by space, time, organizational, and even cultural boundaries as they are in global virtual teams (Maznevski and Chudoba 2000), our nested theory of structuration suggests that managing interaction patterns presents additional challenges. Drawing on our data to construct a hypothetical example, suppose a global virtual team was formed comprising engineers from Cco, Ico, and Hco. Cco engineers would tend to look to their team leader for help, rather than to their peer engineers. If the team leader was from Ico, he or she would perceive the Cco engineers as lacking sufficient initiative to either solve problems on their own or to seek help from their peers with the appropriate expertise. The reverse problem would occur for Ico engineers with a Cco team leader. Hco engineers, on the other hand, would tend to look to anyone on the team for help, regardless of his or her area of expertise, meeting with resistance from Ico engineers who were accustomed to helping only in their particular area of expertise and from Cco engineers who expect engineers to seek help from their team leader rather than their peers. Similar conflicts would arise around rewards for work hours and rewards for specialization.

Even if the team leader was able to develop a common set of rewards for all members of the virtual team, those rewards would come into conflict with at least some of the institutional contexts in which team members lived and worked, as well as with some of the team members' preestablished patterns of interacting. What would happen next would depend on which force won out. If the change in the rewards dominated, and it affected enough people, it might begin to affect both people's patterns of interaction as well as their institutional context, shaping both to be more consistent with the new reward system. However, there would be great resistance to changing the reward system in those contexts in which the change was at odds with old patterns of interacting. Both the institutional context and individual repetition of old ways of interacting would likely undermine such a change or cause people to leave the organization.

In taking a multilevel approach to the study of how work gets done, we have highlighted a set of mutual, interconnected relationships that appear to shape and constrain patterns of work group interaction. Whether one strives to better understand patterns of interaction among group members such as team learning, coordination, knowledge sharing, or helping in a given context or across multiple contexts, our findings suggest that it is insufficient to explore these patterns in isolation, or even to just include the organizational, institutional, and cultural contexts in which these patterns occur. Rather, understanding the interconnections that exist across these multiple levels is essential to effectively sustain or change the patterns of interaction in play in organizations.

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Endnotes

[1]All data collection was done by the first author. However, for ease of exposition, we do not make this distinction in the text except in the data sources section.

[2]When Ico engineers needed help, they would often turn to their batch mates, others who had joined the company at the same time as them, or their classmates from university, who frequently worked at a competitor company.

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