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# TEAMXCHANGE: A TEAM PROJECT EXPERIENCE INVOLVING VIRTUAL TEAMS AND FLUID TEAM MEMBERSHIP

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*TeamXchange, an online team-based exercise, is described. TeamXchange is consistent with the collaborative model of learning and provides a means of fostering enhanced student learning and engagement through collaboration in virtual teams experiencing periodic membership changes. It was administered in an undergraduate Organizational Behavior course over two 4-week sessions using WebCT classroom support technology. Quantitative and qualitative results demonstrate some support for the exercise objectives. Specifically, learning of course material, learning about teamwork, and confidence for working in virtual teams were enhanced among those without prior experience working in virtual teams. Team cohesiveness and social loafing behavior were lower in fluid teams than in stable teams. Finally, introverted individuals perceived themselves as having more influence and their teams as more cohesive and communicative than did more extraverted individuals. These results suggest the potential value of TeamXchange, especially for those who have not previously been exposed to virtual teams or who are normally more reticent in face-to-face team or large-class settings. Exercise implications and lessons learned are discussed.*

**Keywords:** *team fluidity; virtual teams; team process; collaborative learning model*

The growth of teams in organizations is well established. As teams and organizations evolve, changes in the makeup of teams and the tasks they face continue. For example, the fluidity of teams has increased, with members

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rotating in and out on a “project” or “as-needed” basis (Townsend, DeMarie, & Hendrickson, 1998). *Team fluidity* refers to team membership rate of change over time. According to Townsend and colleagues, the use of virtual teams also is increasing. Virtual teams are especially likely to be fluid in the sense of rotating membership and participation. In fact, some researchers have suggested that a lack of fluidity in teams can be detrimental to team outcomes (e.g., Guzzo & Dickson, 1996). The purpose of this article is to describe a team exercise that incorporates virtual teams and the concept of team fluidity. I named the exercise “TeamXchange” to reflect the changes in team membership experienced.

TeamXchange was designed with two primary objectives. First, by working on cases from the course textbook in teams, students were exposed to business scenarios related to course material, which necessitated thinking more deeply about concepts and applying them to realistic situations. The exercise also allowed students to prepare for roles as team members in industry (Werner & Lester, 2001). Human, Kilbourne, Clark, Shriberg, and Cunningham (1999) found that employers and students alike desire increased technology usage to better prepare students for the business world. In particular, by working virtually, and by experiencing membership changes throughout the duration of the exercise, students were exposed to team situations that more closely mirror real-world teamwork. Also, exposing students to both changing membership and stability enhanced the experience of changing team membership in this exercise. That is, students were placed in stable teams for one 4-week session and fluid teams for another 4-week session. Based on this first objective, it was hoped that learning of course material, learning specifically about teamwork, and confidence for working in virtual/fluid teams would be enhanced.

As a second objective, the exercise was designed to assess and examine certain team-process variables that have received attention in the management education literature, including team cohesiveness, internal communications, individual influence, and social loafing behavior (e.g., Arbaugh, 2000b; Berger, 1999; Chidambaram, 1996; Leidner & Jarvenpaa, 1995). Indeed, management educators have expressed both optimism (e.g., Leidner & Jarvenpaa, 1995) and reservation (e.g., Berger, 1999) about the use of stu-

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dent teams because of issues such as these. In addition, these process variables related to Organizational Behavior (OB) material covered in class or the text during the term, and thus the exercise was useful to students because it was easily tied to in-class discussions of these concepts.

### **Pedagogical Background Related to the Development of TeamXchange**

Management educators are increasingly incorporating team projects into the overall class experience. In particular, some are using technology-based teams with the goal of providing experiences that might better prepare students for a world in which online coordination over distance is reality. Meisel and Marx (1999) recognize this challenge, noting, "It is increasingly obvious that managing a culture of shared information is a key component of building organizational capabilities as well as an important aspect of education for the workplace. . . . Our response as educators must be to design our learning inputs and outcomes with technology in mind" (p. 720). In fact, online learning experiences can train students in the use of the very technology that they will use in the workplace (Berger, 1999). For instance, students in Berger's (1999) study reported enjoying the chance to learn from different expertise and found an online team-based format to be realistic for problem solving in the business world. Recent work has demonstrated greater learning outcomes among those exposed to classes containing a mix of traditional and online instruction, compared to those exposed only to traditional instruction (Hysong & Mannix, 2003).

In addition, TeamXchange addressed the issue of student engagement that has recently gained the attention of researchers. For example, Burke and Moore (2003) recently found that, compared to more traditional business courses such as accounting, student engagement was lower at the outset of OB courses. They were further able to associate this lower engagement with lower interest in and perceived relevance of the material, and suggested better "selling" of course relevance and a wider variety of course delivery techniques as possible ways to combat this problem. By stressing the increase in the use of virtual and fluid teams in the workplace, while introducing a novel means of experiencing these types of teams, instructors might raise initial levels of interest and engagement, at least in terms of this exercise.

### **LEARNING MODELS**

As Leidner and Jarvenpaa (1995) state in regard to the use of technology for carrying out exercises in the classroom, it is critical to match the use of

technology to the desired pedagogical goals. From a pedagogical perspective, there are several learning models that underlie classroom instruction. For example, the traditional classroom environment is passive and usually consists of an instructor dispersing information to students. This model has received criticism suggesting that students spend too much time gathering information (e.g., taking notes about how teams work) rather than processing or assimilating the information (e.g., experiencing teamwork). There is a great need for substantive classroom experiences that engage the learner and move beyond passive intake and regurgitation of information (Kolb, Rubin, & McIntyre, 1984). In particular, experiential exercises are thought to be more salient and memorable than traditional instructional methods. Furthermore, such experiences are likely to facilitate the development of communication skills, build self-confidence, and enhance knowledge sharing among participants (e.g., Gove, Clark, & Boyd, 1999).

Fortunately, alternative learning models exist that emphasize student construction of knowledge (constructivism), or collaboration with other students to expose them to a wider variety of ideas and to provide a more realistic learning context (collaborativism) (Leidner & Fuller, 1997; Leidner & Jarvenpaa, 1995). More specifically, the primary goal of the collaborative model is the construction of shared understanding through interaction, but implicit goals also include improving communication and listening skills and eliciting participation from all parties. One of its key assumptions is that learners have previous knowledge they can share with others (Leidner & Jarvenpaa, 1995). The nature of fluid teams is consistent with this assumption in that members are more likely to bring knowledge from previous teams with them as they change teams.

Evidence supports the use of an online context to promote learning under the collaborative model. Leidner and Jarvenpaa (1995) state that in regard to online learning, "learners tend to generate higher-level reasoning strategies, a greater diversity of ideas and procedures, more critical thinking, and more creative responses when they are actively learning in cooperative groups than when they are learning individually or competitively" (p. 268). Leidner and Fuller (1997) found that students working collaboratively were more interested in the material and perceived themselves to learn more than students working individually. This pattern of evidence has also been extended to include teams that work asynchronously. For example, Hiltz and Turoff (2002) claim "the evidence is overwhelming that ALNs [asynchronous learning networks] tend to be as effective or more effective than traditional modes of course delivery at the university level" (p. 57). Leidner and Jarvenpaa (1995) discuss the benefits of virtual asynchronous learning

spaces, suggest that a collaborative learning model is best for asynchronous team communication and Web-based classes in general, and present evidence of positive learning outcomes from the use of virtual teams in an MBA course. They further note that asynchronous communications allow learning to be an ongoing process, with built-in flexibility of time and geography for team members.

#### **THE COLLABORATIVE MODEL AS A FACILITATOR OF TEAM PROCESSES**

In addition to learning outcomes, several scholars have suggested that collaborative learning through teamwork is likely to enhance team processes. In particular, some have extended this suggestion to include online teams. For instance, Bigelow (1999) states, "I have found that students generally adapt to an online team format and that online teams can effectively carry out team projects" (p. 642). Arbaugh (2000a) suggests that rather than slowing communication, computer-mediated communication may actually enhance overall communication because "students are provided the opportunity to be more reflective and thoughtful in their discussions rather than having to compete to be recognized" (p. 35). This is even more likely in an asynchronous context. For example, in the context of TeamXchange, students rotate among teams and are thus likely to be exposed to more ideas than if they worked alone on the task. Alavi's (1994) results suggest superior outcomes of technology-enabled collaborative learning compared to non-technology-enabled learning. Also, interest was higher among collaborative online teams in the Leidner and Fuller (1997) study than among students who worked individually. They suggest that this may have been due in part to the symbolic nature of the technology. That is, students likely felt more engaged simply because they were using technology. Bigelow (1999) outlined the likely impact of moving common classroom activities online, suggesting that overall team dynamics and access to information are largely facilitated, whereas communication is mixed. He claims that online teams tend to have better member participation and fewer process problems.

#### **LINKS TO THE BROADER TEAMS LITERATURE**

In the broader teams literature, past conceptualizations of team turnover have largely focused on turnover as a dependent variable. However, with the growing trend toward more fluid, project-based teams, the effects of turnover as an independent variable are in need of greater attention. A few scholars, led by Arrow and McGrath (1995), and Marks, Mathieu, and Zaccaro (2001),

have made strides toward addressing changes in team membership (i.e., membership dynamics). They suggest that extensions to past research are needed because this work has mostly relied on teams composed of the same members throughout the period of interest, with no changes in team membership. Although such prior work has contributed to the literature, it may not fully capture the reality of membership change in teams across a period of time.

Building upon Arrow and McGrath's (1995) and Marks et al.'s (2001) work, Dineen and Noe (2003) have developed a conceptual framework to better understand the potential effects of fluidity in teams. Two of the relationships proposed by Dineen and Noe relate to team process issues identified by management-education scholars and are examined here. Specifically, their framework suggests that stable teams will experience a higher degree of internal communication and cohesiveness than more fluid teams.

Whereas the Dineen and Noe (2003) framework addresses specific process issues in stable versus fluid teams, other relational perspectives link both the fluid and virtual nature of teams. One of these perspectives, cues filtered out, is a deterministic perspective that suggests that team relational effectiveness is constrained by the virtual nature of the team itself (e.g., Daft & Lengel, 1986). For example, contextual factors such as the degree of media richness place automatic ceiling effects on relational effectiveness in virtual teams. That is, virtual teamwork is necessarily constrained due to the nature of the media and interaction itself and cannot be improved beyond these constraints, even over time.

On the other hand, a social information processing (SIP) perspective suggests that a virtual context does initially produce lower relational effectiveness in teams, but that, over time, virtual teams will eventually adapt and develop similar levels of relational effectiveness as face-to-face teams (e.g., Walther, 1992). Chidambaram (1996) conducted a study that compared these two prevailing perspectives in the area of distributed team effectiveness. She found support for the SIP perspective and suggests that computer-mediated teams be given more time to develop close relations compared to face-to-face teams and that social entrainment is a key determinant of team behavior and outcomes.

It is interesting to note, as other virtual teams researchers have (e.g., Townsend et al., 1998), that virtual teams tend to be more fluid. Thus, although SIP has received support, it has mainly been tested with teams that remained intact. Connerley and Mael (2001) suggest that most group formation and process theories assume that teams exist within established interpersonal contexts. However, team processes may be negatively affected if teams are fluid and do not have the chance to develop relational effectiveness. Thus,

these two perspectives provide an interesting bridge between the two phenomena that are of interest in TeamXchange—namely, virtual teamwork and team fluidity. Whereas the perspectives are at odds regarding teams that remain together for a long duration, they seem to both suggest that initially, teams will experience decreased relations in terms of process variables such as cohesiveness.

#### **THE POTENTIAL BENEFITS OF ONLINE TEAM EXPERIENCES AS PART OF A LARGE-COURSE PEDAGOGY**

In large classes, such as the class involved in the present exercise ( $N = 99$ ), offering experiential-learning opportunities can be a particular challenge. Namely, coordination, time, and space issues make in-class exercises more difficult to conduct in larger classes than smaller classes. Leidner and Fuller (1997) recognize this issue stating, “Given the constraints facing most universities related to class size . . . technology may be the most feasible and economical way to enable new and creative applications of learning methods” (p. 150). Also, in-class exercises or discussions tend to discourage participation from students who might be more introverted or experience evaluation apprehension. The issue of relative participation is a consistent concern of management-education scholars (e.g., Berger, 1999; Leidner & Fuller, 1997). For example, Leidner and Fuller (1997) suggest that class size is negatively related to one’s propensity to participate, such that evaluation apprehension may be higher in larger classes. Similarly, more introverted students might be more reticent to speak out or otherwise actively participate in larger classes as compared to smaller classes. For these reasons, out-of-class exercises are a potentially important addition to large-class pedagogies. Also, in an online environment, evaluation apprehension effects may be even lower because participants feel as if their input is more veiled. Thus, the virtual, team-based nature of TeamXchange has the potential benefit of reducing perceived class size and “leveling the playing field” in a certain sense for more reticent class members; whereas it limits extraverts who otherwise tend to dominate in-class or face-to-face discussions, extraverts can still communicate as often as they wish, instead of experiencing production blocking or having to wait their turn. Arbaugh (2000b) suggests that benefits accrue to a greater degree in an asynchronous format such that flexibility is introduced and production blocking and evaluation apprehension are lowered. This alleviates what Holmer (2001) claims to be the most consistent inhibitor of learning in student teams: repressing opinions and ideas. He states that “although potentially more time-consuming, asynchronous Internet-based courses may provide the easiest means to increase student involvement in these courses” (p. 214).



### SUMMARY

A collaborative learning perspective (Leidner & Jarvenpaa, 1995) as well as recent empirical work (e.g., Burke & Moore, 2003) stresses the need to enhance knowledge sharing and perceived relevance of classroom exercises to promote greater engagement and learning. The current exercise mirrors the fluid and virtual nature of many real-world teams in allowing for team collaborative learning in a more flexible context. The exercise holds further potential value in terms of addressing common process problems often associated with larger classes such as social loafing and evaluation apprehension. In the sections that follow, I introduce specific relationships to be studied, address exercise setup and administration, and present and discuss exercise results.

### Relationships Examined in the Present Article

In light of the above discussion, I conducted the following analyses. First, I assessed outcomes such as (a) learning of course material, (b) learning about potential benefits/drawbacks of working in teams, and (c) confidence for working in virtual and changing teams. I then examined potential differences in these outcomes among those who had and did not have prior experience working in virtual and/or fluid teams. Next, several analyses addressed issues of relative participation among team members in fluid and stable teams, as well as team process issues related to communication, cohesiveness, and felt influence in fluid versus stable teams. Furthermore, I examined whether differences existed between introverts and extraverts in terms of perceptions of these process variables during the exercise. Finally, qualitative data were collected that addressed learned skills and preferences for fluid versus stable teams.

### TeamXchange Exercise Administration

#### EXERCISE SETUP

TeamXchange was conducted over a period of 8 weeks in the context of an 11-week upper-level OB survey course consisting of 99 3rd- and 4th-year undergraduate students. Of these students, 56% were male, and ethnicities were as follows: 67% Caucasian, 21% Asian, 8% African American, and 4% other. Work experience averaged 2.4 years. I broke the exercise into two "sessions" of 4 weeks each, in order to allow students to experience both fluidity and continuity in their teams. To conduct the exercise, I assembled teams of

between three and five students. Most teams contained four members, but some students dropped and added the course over the first few weeks, necessitating a few larger and smaller teams. Hiltz and Turoff (2002) recommend between three and six team members and Theilman (1997) recommends a maximum of five for optimal asynchronous collaborative learning. Teams were tasked with analyzing short cases relevant to course material and answering two questions related to the cases each week (i.e., a total of 16 responses over the 8 weeks). These cases were from the end of chapters in the course textbook, *Organizational Behavior* (Daft & Noe, 2001). An example question following a case involving the use of small groups at Sun Software is, "Why is it important for Sun group members to have clear role identities? What might happen if one of the members sought to change his or her role?" The cognitive information processing theory of learning suggests that active assimilation and processing of information must occur for meaningful learning to occur (Shuell, 1986). Leidner and Fuller (1997) suggest that case analysis is one means of bringing this about, and state "the collaborative model of learning further suggests that the exchange of diverse ideas, as well as feedback on those ideas, is crucial to the effective processing of information. Operationalizing this collaboration can be achieved by placing students in groups which work together to analyze case materials" (p. 151). Thus, in addition to its implications for learning about teams in the context of the OB course, TeamXchange also allowed for a discussion of several other concepts normally covered in an OB course (e.g., communication, conflict, individual differences).

A private bulletin board within WebCT was made available to each team in order to work on the project. WebCT is a Web-based classroom support tool that allows each registered student password access to a class Web site. Teams were also allowed to meet face-to-face, by telephone, or by other media if they chose to do so. A survey at the end of the quarter revealed that more than 70% of the class went through the entire exercise without ever meeting a team member face-to-face. It is quite possible, therefore, that two students could have been sitting next to each other during a class meeting and not even have realized that they were on the same team in a given week. Just over 20% of the class did have face-to-face contact with at least one teammate in either the first or second session, and the remainder of the class reported having met at least one teammate face-to-face in both sessions.

As mentioned, all students had the chance to experience both a stable and fluid team situation. Half of the teams remained stable throughout the course of each 4-week session of the project (i.e., they did not experience any membership change). The other half of the teams experienced membership changes varying between one or two member shifts per week. These mem-

bership changes were predetermined and did not relate to students' performance in previous weeks. Students who were members of stable teams during Session 1 were placed in fluid teams for Session 2 and vice versa for students who were members of fluid teams during Session 1.

### GRADING

TeamXchange was worth one fourth of the course grade for the quarter and included a case grade for each of the two sessions and a peer evaluation component. For students on stable teams, case grades were simply the grade assigned to the final team project. For students who changed teams during a session, case grades were weighed by the percentage of time spent on each team. For example, if Amy spent 3 out of the 4 weeks on Team 1 during Session 1, and the remaining week on Team 2, her overall grade for the Session 1 case answers was 75% of Team 1's grade plus 25% of Team 2's grade.

To assess overall participation, each team member was asked to complete a confidential Web-based peer evaluation for members of his/her team each week. Specifically, individuals were asked to distribute 100 points among team members in line with their relative contributions. Thus, if everyone on a team of four was given 25 points toward participation, participation was judged to be equal among team members.

### WEEKLY PROCEDURE

A majority of students had previous experience using WebCT classroom support technology, and comfort with the World Wide Web averaged 4.21 on a 5-point Likert scale ( $SD = .86$ ;  $\alpha = .90$ ; two-item measure). However, to ensure that students were somewhat comfortable prior to the start of the exercise, I required everyone to log onto WebCT and post either career goals or what they hoped to gain from the class on an electronic bulletin board.

In Week 1, I randomly assigned people to teams in either the "stable teams" condition or "fluid teams" condition. A total of 26 teams were formed, and I created 26 private bulletin boards within WebCT—one for each team (there were 24 teams in the second session due to natural course attrition). WebCT allows the administrator to designate access to private bulletin boards for each individual in the class. Thus, I assigned teams by simply freeing access to the appropriate team bulletin board for each individual. That is, when a student logged onto WebCT, he or she only had access to the bulletin board of the team to which he or she had been assigned. Two questions were assigned each week, with each team assigned the same questions. Also, I assigned one member of the team to compile and turn in answers by the due date.

In each of the three subsequent weeks of both TeamXchange sessions, I reassigned students to teams by manipulating their access to the team bulletin boards. Thus, for a stable team, I simply kept the access the same for students on that team. However, I sent each team a new message containing directions for the following week, as well as their final answers from previous weeks. For changing teams, either one or two members were randomly switched into and out of a team in a given week (via access to the bulletin boards). Table 1 illustrates a potential pattern of fluidity during a session of TeamXchange. Students were not made aware of impending changes in advance, making it difficult for them to anticipate their tenure in a given team.

Importantly, in addition to submitting answers for the current week, all teams were encouraged to improve upon answers from previous weeks. That is, even though answers were due weekly, the overall team grade was only based on what was turned in after the fourth week. Thus, teams had the chance to improve answers from previous weeks, an important option for teams with fluid members because a new member might have ideas that could improve answers from previous weeks. Thus, for example, in a stable team, only four people had a chance to contribute to the answers over the course of a 4-week session, whereas in a fluid team, up to eight people could contribute. Because all previous message postings were archived for a given team throughout a 4-week session, new members could view what had been submitted up until the point of them joining the team.

## Results

In discussing results of the TeamXchange exercise, I will present both quantitative analyses and qualitative data summaries. Data were gathered from three sources: the first two were a preclass survey and weekly surveys filled out by class members and linked by identifier numbers. These were optional surveys, and filling them out served as one of two options available to earn extra credit for the quarter. The third data source was an anonymous end-of-course evaluation and included several representative comments made by student participants about their experience with TeamXchange. Because of its anonymity, data from this third source could not be linked with data from the other two sources.

### LEARNING OUTCOMES

The first objective of this exercise was to provide students with the opportunity to experience working in a virtual team or experience membership changes, in the hopes of enhancing learning and integration of the classroom

**TABLE 1**  
**Example of Team Membership Changes**  
**During a TeamXchange Session**

<i>Team</i>	<i>Week 1</i>	<i>Week 2</i>	<i>Week 3</i>	<i>Week 4</i>
1	Student 1	Student 17	Student 17	Student 17
	Student 2	Student 2	Student 2	Student 15
	Student 3	Student 3	Student 8	Student 8
	Student 4	Student 4	Student 16	Student 16
2	Student 5	Student 1	Student 1	Student 1
	Student 6	<i>dropped</i>	<i>dropped</i>	<i>dropped</i>
	Student 7	Student 7	Student 19	Student 19
	Student 8	Student 8	Student 20	Student 20
3	Student 9	Student 5	Student 5	Student 5
	Student 10	Student 10	Student 10	Student 2
	Student 11	Student 11	Student 3	Student 3
	Student 12	Student 12	Student 4	Student 4
4	Student 13	Student 9	Student 9	Student 9
	Student 14	Student 14	<i>dropped</i>	<i>dropped</i>
	Student 15	Student 15	Student 15	Student 18
	Student 16	Student 16	Student 12	Student 12
5	Student 17	Student 13	Student 13	Student 13
	Student 18	Student 18	Student 18	Student 10
	Student 19	Student 19	Student 11	Student 11
	Student 20	Student 20	Student 7	Student 7

material, learning about teamwork, and confidence through working on cases from the text in teams. Means, standard deviations, and intercorrelations among learning and confidence outcome variables are presented in Table 2. Self-reported learning was assessed on the end-of-course evaluation by asking students to "Please indicate how much the TeamXchange project helped you to learn and understand the course material" (1 = *very little*; 5 = *very much*). Students responding to this evaluation ( $n = 58$ ) indicated a moderate level of learning in terms of course material ( $M = 3.07$ ,  $SD = 1.15$ ). They also responded to an item assessing their level of learning about teamwork ("This experience has helped me learn about the benefits and/or problems of working in teams," 1 = *strongly disagree*; 5 = *strongly agree*) with a mean of 3.29 ( $SD = 1.16$ ).

Importantly, these learning levels differed significantly between those who had and had not previously worked in a virtual team. Specifically, the end-of-quarter evaluation revealed that more than 80% of respondents had never before worked in a virtual team (47 out of 56). I further examined learn-

ing outcomes by conducting ANOVAs between those who had and had not worked in a virtual team. Because of the unequal group sizes in these analyses, the harmonic mean was used to represent group size. Findings revealed that those who had not previously worked in a virtual team reported a significantly higher degree of learning in terms of course material ( $M = 3.21$ ) than those who had previously worked in a virtual team ( $M = 2.33$ ),  $F(1, 54) = 4.65, p < .05, \omega^2 = .06$ . Similar results were found when assessing learning about teamwork as the dependent variable,  $F(1, 54) = 4.56, p < .05, \omega^2 = .06$ ,  $M$  (never worked in a virtual team previously) = 3.43,  $M$  (had worked in a virtual team previously) = 2.56.

In addition, I assessed confidence for working in virtual teams. For example, on a 1 to 5 scale (1 = *strongly disagree*; 5 = *strongly agree*), the mean level of confidence gained for working in a virtual team was 3.80 in response to "I will feel more confident working in a virtual team after having participated in this project" ( $SD = 1.09$ ). Again, those who had no previous experience working in a virtual team gained the most confidence for working in such a team,  $F(1, 54) = 4.65, p < .05, \omega^2 = .06$ ;  $M = 3.94$  among those without prior experience and  $M = 3.11$  among those with prior experience. I also conducted ANOVAs examining mean differences in the learning and confidence outcomes between those who had and had not previously worked in teams that changed members. In contrast to the results among those having and not having prior virtual-team experience, mean levels of learning and confidence did not differ when participants did or did not have prior experience working in fluid teams.

#### TEAM PROCESS OUTCOMES

*Measures used.* To investigate team-process issues, several team-process variables were assessed on a weekly basis. The means, standard deviations, and intercorrelations among these variables are presented in Table 3. To assess perceived cohesiveness, Seashore's (1954) measure was used. An example item, rated on a 5-point Likert scale, is, "Members of my team really felt like part of the team." Coefficient alpha was .57 when all five items were included, but increased to .91 when one of the items was dropped. Specifically, the wording of this dropped item had been changed to fit the fluid nature of the teams in this exercise, likely leading to its  $-.51$  corrected item-total correlation. Internal communication was assessed with two items, including, "How would you rate the quality of communications in your team this week?" (1 = *very low*; 5 = *very high*), and coefficient alpha was .87. Individual influence was assessed with three items including, "My recommendations influenced the decisions my team made this week" (1 = *strongly disagree*, 5 = *strongly*

*agree*), and coefficient alpha was .86. To assess social loafing behavior, I computed the standard deviation among peer ratings made by each team member for each of the 8 weeks. For example, if team members A through D were all given 25/100 points in terms of overall participation in a given week, the standard deviation (and, by definition, social loafing) was 0. However, if team members A and B each received 35 points, whereas team members C and D received 15, the social loafing index was 10 (the standard deviation value). Finally, extraversion was assessed on the preclass survey by using Goldberg's (1992) Big 5 marker scale. This scale includes 20 adjectives that assess extraversion and asks respondents to indicate how accurately the adjective describes them using (1 = *extremely inaccurate*; 9 = *extremely accurate*). Coefficient alpha for this scale was .89.

*Process results comparing fluid and stable teams.* I conducted ANOVA using a general linear model (GLM) to assess the effects of fluidity/stability on perceived internal communications, team cohesiveness, and individual influence. Because each participant made multiple assessments of these process variables (i.e., each week), I entered a subject number as a fixed effect in these analyses to control for the effects of nonindependent observations. After accounting for subject effects, results revealed no significant differences between team type in terms of internal communications,  $F(1, 502) = 2.19, p < .10, M(\text{stable teams}) = 3.72; M(\text{fluid teams}) = 3.55$ . However, after accounting for subject effects, there were significant differences in terms of cohesiveness, such that stable teams were perceived to be more cohesive than fluid teams,  $F(1, 503) = 10.04, p < .01, \omega^2 = .01, M(\text{stable teams}) = 3.97; M(\text{fluid teams}) = 3.74$ . Felt influence did not differ between those on stable teams ( $M = 3.55$ ) and fluid teams ( $M = 3.59$ ),  $F(1, 503) = .30, p < .10$ . Finally, I conducted a trend analysis to examine any linear changes in these process variables across weeks of the exercise. No linear trends were found, indicating that results were stable over time,  $F(1, 646) = 1.12$  for communications,  $F(1, 647) = .62$  for cohesiveness, and  $F(1, 647) = .43$  for influence, all  $p > .10$ .

Next, I assessed levels of relative participation in fluid versus stable teams using the measure of social loafing described above. Although social loafing has been identified as problematic in electronic contexts (e.g., Jessup, Connolly, & Tansik, 1990), the average participation standard deviation in the present sample was only 5.12. However, results of GLM analysis revealed that there was a significantly smaller standard deviation in terms of participation levels among members of fluid teams ( $M = 4.38$ ) as compared to stable teams ( $M = 5.78$ ). That is, contributions were more balanced in fluid teams as compared to stable teams,  $F(1, 507) = 11.18, p < .01, \omega^2 = .01$ .

TABLE 2  
Means, Standard Deviations, and Correlations Among Learning and Confidence Variables<sup>a</sup>

Variable	M	SD	1	2	3	4	5
1. Experience with virtual teams (first time = 1)	b	b					
2. Experience with fluid teams (first time = 1)	b	b	.47*** <sup>d</sup>				
3. Learning of course material	3.07	1.15	.28*** <sup>c</sup>	.07 <sup>c</sup>			
4. Learning about teamwork	3.29	1.16	.28*** <sup>c</sup>	.02 <sup>c</sup>	.64***		
5. Confidence for working in virtual teams	3.80	1.09	.28*** <sup>c</sup>	.01 <sup>c</sup>	.49***	.74***	
6. Confidence for working in fluid teams	3.45	1.09	.18*** <sup>c</sup>	.00 <sup>c</sup>	.48***	.54***	.72***

NOTE:  $n$  = between 56 and 58.

a. These variables were collected anonymously and thus could not be correlated with the variables presented in Table 3.

b. Dummy-coded variable.

c. Point biserial  $r$  representing correlation between a dichotomous and continuous variable.

d. Phi coefficient representing correlation between two dichotomous variables.

\*\* $p < .05$ . \*\*\* $p < .01$ .



TABLE 3  
Means, Standard Deviations, and Correlations Among Individual Difference and Team Process Variables<sup>a</sup>

Variable	M	SD	1	2	3	4	5	6
1. Fluid/stable team (fluid = 1)	b	b						
2. Comfort with WW <sup>d</sup>	4.21	0.86	.02 <sup>c</sup>					
3. Extraversion <sup>d</sup>	5.82	1.03	.02 <sup>c</sup>	.06 <sup>d</sup>				
4. Team cohesiveness	3.86	0.86	-.13*** <sup>c</sup>	-.01	-.10**			
5. Internal communication	3.63	0.98	-.09*** <sup>c</sup>	-.05	-.13***	.71***		
6. Individual influence	3.56	0.85	.03 <sup>c</sup>	-.06	-.08*	.28***	.24***	
7. SD of participation	5.12	7.24	-.10*** <sup>c</sup>	-.06	.07*	-.22***	-.19***	.06

NOTE:  $n$  = between 582 and 651.

a. The variables in Table 2 were collected on a separate anonymous survey and could not be correlated with the variables in this table.

b. Dummy-coded variable.

c. Point biserial  $r$  representing correlation between a dichotomous and continuous variable.

d.  $n$  = 89 (extraversion) and 91 (comfort with WW).

\* $p$  < .10. \*\* $p$  < .05. \*\*\* $p$  < .01.

### INDIVIDUAL DIFFERENCE ANALYSES

Finally, one of the goals of this article was to address concerns raised by scholars regarding individuals' propensity to participate in class as well as team discussions. Specifically, scholars have suggested that the use of teams might lower evaluation apprehension by shrinking perceived class size (Leidner & Fuller, 1997). However, extraverts can still be a dominating influence in teams, causing more introverted members to feel as if they lack voice or influence. Results of regression analysis, though, revealed that introverts, rather than extraverts, tended to feel as if they had more influence in these virtual teams although this effect only approached a conventional significance level,  $B = -.08$ ,  $t(610) = -1.91$ ,  $\Delta R^2 = .01$ ,  $p < .06$ . Of note, there was no difference in levels of perceived influence for extraverts versus introverts in fluid versus stable teams. That is, the interaction of extraversion and team type (fluid or stable) did not significantly relate to perceived influence,  $B = .11$ ,  $t(577) = .42$ ,  $\Delta R^2 = .00$ ,  $p < .10$ . Thus, introverts felt more influence than extraverts in both stable and fluid teams.

I also examined relationships between extraversion and perceptions of internal communication and cohesiveness. Similar to the lower level of influence felt by more extraverted individuals, extraversion and perceived cohesiveness were negatively related,  $B = -.10$ ,  $t(610) = -2.57$ ,  $\Delta R^2 = .01$ ,  $p < .05$ , as were extraversion and perceived internal communications,  $B = -.13$ ,  $t(609) = -3.29$ ,  $\Delta R^2 = .02$ ,  $p < .01$ . That is, introverted individuals perceived their teams to be more cohesive and more internally communicative than did extraverted individuals.

### QUALITATIVE DATA SUMMARY

*Skills gained.* As mentioned previously, I encouraged students to comment on specific skills they felt they had gained from the TeamXchange experience on the end-of-course survey. A listing of these skills is potentially useful to instructors who might be interested in the use of virtual and/or fluid team exercises. Some representative examples of learned skills are as follows (number of participants making each comment in parentheses):

- organization skills/time management (12),
- cooperation/compromise/teamwork/depending on others (8),
- written/communication/computer skills (7),
- flexibility (5),
- working in/better understanding of virtual teams (4), and
- leadership (2).

*Preferences for stable versus fluid teams.* I asked students to report whether they preferred stable or fluid teams after having had experience with both. A total of 69% favored stable teams, whereas 28% preferred teams that changed membership (3% left the item blank). A sampling of qualitative reasons for preferring stable teams is as follows:

- teammates know what to expect from each other (14),
- stability promoted growth and the ability to get to know people better (12),
- trust develops in teammates and you know they'll do a good job (3),
- greater feeling of camaraderie (3), and
- did not like getting to know new people each week (2).

Preferences for fluid teams included the following:

- allowing for new viewpoints on answers from previous weeks (5),
- allowing for introduction to new people (3),
- did not like team members in my previous team (3),
- broader experience overall with respect to the exercise (3), and
- creating more involvement among team members (2).

*Additional positive comments.* There were several favorable reactions to the exercise in addition to those already presented. For example, several students rated the exercise as being their "favorite aspect of the course." Others thought the project was a great idea for the class or had great potential but pointed out some areas of potential improvement (e.g., having teams meet face-to-face at first). Another thought the assignments were helpful and related to class and real-life situations, and four others thought the project was a new and interesting experience. Several were pleased that they did not have to arrange meetings with teammates, and one mentioned that it "forced me to keep up with the readings." Finally, out of all the comments provided on the weekly surveys, 26% focused on the fact that teams were "working well together."

*Additional negative comments.* Whereas several students reacted favorably to TeamXchange, some students were critical of the exercise. First, there was frustration about having grades depend on strangers. This was expressed in some of the weekly comments, 22% of which related to social loafing concerns, as well as on the end-of-course evaluation. Also, some students who said that it was a good experience also said that it depended on being with the "right people." Several other students indicated that the project was "too long" and should have been conducted in 4 to 6 weeks. Perhaps the 8-week version of the exercise would be perceived as less lengthy in the context of a

semester-long course. In light of the trend toward more hybrid class designs that incorporate an in-class and out-of-class component (e.g., Human et al., 1999; Hysong & Mannix, 2003), there might be a greater tradeoff in terms of class time to account for the time students spend engaged in the exercise out of class. In fact, in the time since this particular exercise administration, I have conducted a 4-week version of the exercise in another section of the same course, with equivalent self-reported learning outcomes. Thus, a shorter version of the exercise might provide similar benefits to students in terms of learning. Finally, opinions about the ease of use of WebCT were mixed. Some found maneuvering and cutting/pasting answers to be frustrating, whereas others found WebCT to be quite user-friendly.

## Discussion and Conclusion

### IMPLICATION OF FINDINGS

It appears that TeamXchange was beneficial in terms of learning outcomes, particularly for those lacking prior experience with virtual teams compared to those with prior experience. Consistent with the suggestion made by Leidner and Fuller (1997), the introduction of technology itself may have engaged these individuals and enhanced their confidence for working in virtual teams to a relatively greater degree. From a pedagogical perspective, the collaborative nature of the exercise also likely created greater shared understanding, communication, and participation from all students than if a traditional model had been used. More pragmatically, these results suggest that the exercise may hold particular value for individuals with less experience, particularly with regard to prior work on virtual teams. Because undergraduate students or students without prior work experience are less likely to have been exposed to a virtual team, TeamXchange appears to be particularly useful for these types of students.

At the same time, the exercise appears to have yielded similar learning outcomes for those having and not having prior experience with fluid teams, suggesting that benefits extend to both types of students. Arrow and McGrath (1995) note that we have tended to conceive of teams as consisting of the same members throughout the team lifespan. It seems as if this belief has carried over to the use of teams in classroom exercises. Typically, such teams are formed at the beginning of a term and left intact for the duration of the project/term. Again, more than 80% of the students in this class had never been part of a class-based team that subsequently experienced membership changes. Although learning results did not differ between those who did and did not have prior experience working in fluid teams, this appears to be an unfortu-

nate “experience and learning gap” because turnover in actual organizational teams is ubiquitous. Finally, results examining student confidence for working in virtual and fluid teams also were encouraging; addressed concerns raised by instructors and employers about providing sufficient real-life, technological experiences to students (e.g., Human et al., 1999); and support work suggesting the value of online learning experiences as a means of training students in the use of technology that they will use in the workplace (Berger, 1999).

A second goal of this article was to assess several team process variables and examine the extent to which they might differ in stable versus fluid teams, as well as among extraverts and introverts. First, results suggested that social loafing is less of an issue in fluid teams than in stable teams. That is, although the overall average standard deviation of participation scores was fairly low, the dispersion of reported participation scores was even less in fluid teams. Work in the broader teams area is consistent with this finding and suggests that team members tend to be on “better behavior” and more inhibited in the presence of strangers (e.g., Shah & Jehn, 1993). In fact, a sense of “false cohesiveness” may prevail, whereby members go out of their way to maintain good relations while getting to know one another (Longley & Pruitt, 1980). This might translate into decreased social loafing behavior in fluid teams and suggests potential benefits of rotating team members throughout the duration of class-based team projects.

On the other hand, results revealed that cohesiveness is greater in stable teams as compared to fluid teams. This supports the Dineen and Noe (in press) model in terms of team fluidity’s effects on cohesiveness but also suggests that the benefits of introducing fluidity to team projects might be offset by a decrease in cohesiveness in these teams. However, participants reported similar levels of perceived internal communication and influence regardless of team type. Also, results showed no significant increase or decrease in process variables over the two sets of 4 weeks of the exercise. This is particularly interesting in light of the debate between cues filtered out and SIP theorists introduced earlier (Daft & Lengel, 1986; Walther, 1992). The present results seem to support the cues-filtered-out perspective, although an important moderating variable identified by SIP supporters is anticipated tenure in the team. Due to the nature of this exercise, participants were largely unable to accurately predict their team tenure and may not have had enough time to develop effective relational patterns. Thus, the fact that cohesiveness did not appear to increase over time in stable teams might be due to the fact that these teams (a) could not accurately predict their tenure or (b) simply were not together for a long enough period of time.

A particularly interesting set of findings relates to perceptions of team processes by extraverted and introverted team members. Scholars have suggested that team projects might decrease perceived class size and facilitate greater participation among more reticent students (Leidner & Fuller, 1997), and some have suggested that decreases in evaluation apprehension might be even greater in an online environment. This was a particularly salient concern in the present class, as class size was large and the potential for individual participation and effective communication was lower. Current results support these previous suggestions and show that introverts actually felt *more* influence than extraverts during this exercise, and perceived greater cohesiveness and better internal communications. This suggests a “leveling of the playing field” in a sense, such that the negative effects often discussed appear to be reversed, at least in this virtual team exercise. Indeed, because extraverts tend to be more sociable, assertive, and experience positive affect (cf. Judge, Bono, Ilies, & Gerhardt, 2002), and Web-based communication tends to dampen the expression of these characteristics, they are likely to perceive relatively less cohesiveness, communication, and influence than they would in a face-to-face context. This is important because it suggests that conducting online team exercises might bring about more equivalent contributions from all team members. These benefits appear to generalize to both stable and fluid teams, as no interactive effects of team type were found with regard to relationships involving extraversion.

#### LESSONS LEARNED

There are several noteworthy lessons learned from TeamXchange that should be discussed. Overall, although the exercise seems to have met with a considerable level of success, there are several areas that could be improved, and student feedback/reactions will continue to help in this regard. A limitation particular to the version of the exercise reported in this article is that it did not allow for a direct comparison between virtual and face-to-face teams. That is, only a very small percentage of participants reported meeting teammates face-to-face, preventing accurate comparisons between virtual and nonvirtual teams in terms of outcomes such as cohesiveness. Thus, results are not necessarily generalizable beyond virtual teams. Also, learning and confidence outcomes were assessed anonymously and independent from other variables such as demographics and team-process variables, preventing a direct assessment of relationships among these variables.

Second, from an instructor’s perspective, TeamXchange was somewhat tedious. For example, I had to separately visit each team bulletin board on a weekly basis and copy and paste weekly case answers into a Microsoft Word

document for eventual grading after Week 4 of each session. After grading case answers, I provided feedback to each team via the team bulletin boards. Other administrative tasks included collapsing and reviewing peer evaluation data on a weekly basis and manipulating team-member bulletin board access in line with team assignments. Notably, in a later class where I conducted a 4-week version of the exercise, I found there to be an administration “learning curve” in that the process was quite a bit easier due to my prior experience.

Third, despite a rather stringent grading policy with respect to social loafing (i.e., peer evaluations and zero credit for nonparticipation in a given week), there were still several complaints about people not contributing equally. As previously mentioned, 22% of the *qualitative* comments made at the end of the peer evaluation forms pertained to social-loafing concerns. On the other hand, according to *quantitative* peer evaluation points, the problem was isolated to less than 5% of possible cases. Thus, it is possible that students were experiencing frustration over social loafing but not reporting it in quantitative evaluations. Although complete eradication of social loafing in any team project is infeasible, use of this project in the future may require additional measures to try to better combat this problem (see Berger, 1999, for examples).

Fourth, certain constraints of WebCT forced me to use individual team message boards as the primary communication medium for the exercise. According to theories of media richness (e.g. Daft & Lengel, 1986), this represents a fairly “weak” medium and is perhaps not the best representative of mediums commonly used by virtual teams. Chat rooms are a possibility in terms of creating a synchronous context for virtual teams; however, WebCT did not allow me to dedicate a private chat room solely to each team. In general, educators need to be aware of limitations related to their chosen exercise medium and should make all efforts to synchronize the nature of the exercise with an appropriate medium.

## CONCLUSION

TeamXchange represents an attempt to add two new dimensions to traditional classroom team projects. First, in conducting the exercise online through WebCT technology, it gave students a chance to experience working in a virtual team. Although traditional out-of-class team experiences have played an important role in educating future managers, they often present significant coordination problems. TeamXchange overcomes these types of obstacles because it is run out of class through WebCT classroom support technology and it does not require face-to-face meeting time. Second, moving students into and out of teams throughout the exercise allowed them to expe-

rience the benefits and drawbacks of team fluidity in terms of team-process issues. Also, students got the chance to compare experiences on both a stable and fluid team throughout the duration of the exercise. Finally, it allowed more introverted students to participate more openly and experience a feeling of influence in their teams, and it provided enhanced learning and confidence outcomes for those without prior virtual-team experience. Although several issues remain to be addressed, it provided a novel learning experience that is worthy of future attention and consideration.

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