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The Consequences of Educational Specialty and Nationality Faultlines for Project Teams

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Abstract

This study examines the effects of educational specialty and nationality faultline strength on the team processes of task-relevant information sharing and social interactions and subsequent team performance using data from 308 individuals working in 50 student project teams. We found that educational specialty faultline strength negatively predicted task-relevant information sharing, and that nationality faultline strength negatively predicted off-task social interactions. Furthermore, task-relevant information sharing enhanced team performance and heightened identity salience. The theoretical and practical implications of our findings are discussed.

Keywords

faultline, diversity, team

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A large body of research on group diversity has found that it has important implications for group functioning and performance in organizations (Horwitz & Horwitz, 2007; Williams & O'Reilly, 1998). However, this research has been criticized for relying on one-dimensional diversity indicators, which may cause researchers to overlook the combined and interactive effects of multiple dimensions of diversity (Jackson, Joshi, & Erhardt, 2003; Van Knippenberg & Schippers, 2007). In the real world, people typically perceive themselves as members of multiple social groups, and they consider these group memberships simultaneously when forming relationships (Crisp & Hewstone, 2007; Kramer, 1991). Reflecting this perspective, Lau and Murnighan (1998) suggested that an alignment of multiple demographic attributes determines social categorization and intergroup relationships within a team. In particular, when multiple attributes coincide with one another, strong *faultlines* may form that divide a team into salient subgroups. On the contrary, when multiple attributes *crosscut* one another (weak faultlines; Brewer & Miller, 1984), it may be difficult to categorize members into distinct subgroups (Crisp & Hewstone, 2007; Urban & Miller, 1998). Because strong faultlines increase the likelihood of within-subgroup cohesion and identification and between-subgroup discrimination, they may increase conflicts and disrupt social relationships among subgroups within a team (Lau & Murnighan, 1998).

The notion of faultlines is theoretically appealing and has attracted much recent research interest. The findings, however, often show unclear patterns of effects (van Knippenberg & Schippers, 2007). For example, although most studies show that faultlines disrupt group functioning and performance (e.g., Homan et al., 2008; Li & Hambrick, 2005; Molleman, 2005; Rico, Molleman, Sanchez-Manzanares, & Van der Vegt, 2007), some studies show positive effects (e.g., Lau & Murnighan, 2005), or curvilinear effects (e.g., Gibson & Vermeuleon, 2003; Thatcher, Jehn, & Zanutto, 2003).

One reason for this inconsistency may be that previous research typically treated all individual attributes as equally important for subgroup categorization. However, the extent to which attributes affect such categorization may differ. Some attributes can become more salient than others when they are activated by relevant contextual stimuli (Lau & Murnighan, 1998; Pearsall, Ellis, & Evans, 2008). Therefore, one critical step in faultline research may be to identify which demographic attributes are salient in a given situation, and then compute the strength of relevant faultlines. For example, in a study of international teams composed of members from various regions, nationality may be a salient attribute, more salient than gender or age. Focusing on the effects of nationality-based faultlines in such teams may thus provide researchers more insights on how team dynamics unfold than would focusing

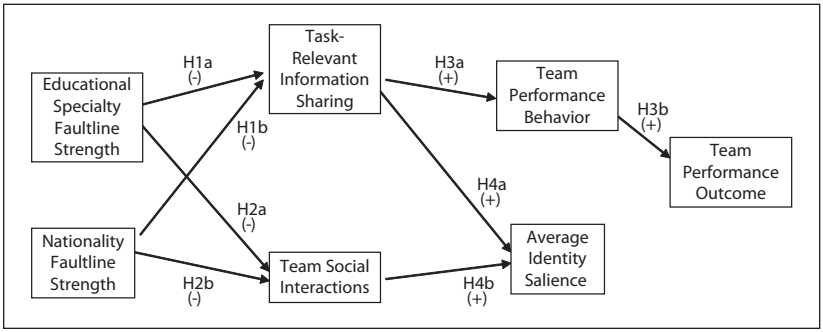

Figure 1. Summary of hypotheses relating team faultlines, processes, and outcomes

on faultlines that reflect such general demographic attributes as gender or age (Earley & Mosakowski, 2000; Li & Hambrick, 2005; Polzer, Crisp, Jarvenpaa, & Kim, 2006). Similarly, when working on a team project for which different kinds of expertise are expected from different members, educational and/or functional specialties often take center stage, making it important to focus on interactions among subgroups based on those qualities (Phillips & Lord, 2006; Rico et al., 2007; Sawyer, Houlette, & Yeagley, 2006).

In the current study, we focused on nationality and educational specialty faultlines in international student project teams. This type of team, comprised of members of various nationalities and various kinds of expertise, may provide a context in which both nationality and educational specialty are salient compared to other personal attributes. We examined two faultlines by linking them to two different team processes, namely task-relevant information sharing and social interactions (friendship behaviors). We selected these processes because they represent different aspects of team dynamics and have rarely been investigated together in previous faultline research (cf. Phillips, Mannix, Neale, & Gruenfeld, 2004). Further, we examined whether faultlines and their resulting team processes influence the salience of team members' personal identities. Research on social categorization processes has shown when and how social group memberships, often created temporarily in laboratory experimentation, become salient and thus influence self-definitions (Ellemers, Spears, & Doosje, 2002; Oakes, 1987). It is less clear how task and social processes in naturally occurring groups influence personal identities. In this study, longitudinal observations of natural groups allowed us to investigate how faultlines affect project team processes, subsequent team performance behaviors, performance outcomes, and members' identity salience. Figure 1 presents our conceptual model.

Theory and Hypotheses

Lau and Murnighan (1998) developed faultline theory to clarify subgroup dynamics within teams. According to the social identity perspective (Tajfel & Turner, 1986; Turner, Hogg, Oakes, Reicher, & Wetherell, 1987), people categorize themselves and others into different social groups, which then serve as sources of their social identities. An awareness of group memberships can activate interpersonal biases that favor in-group members and disfavor out-group members (Wilder, 1986). Likewise, members of a team can be categorized into different subgroups based on their social attributes. When multiple categories are convergent, that is, there are high within-subgroup similarities and high between-subgroup differences on those attributes, strong faultlines are present. These faultlines result in subgroup formation and this heightens intergroup comparison and bias (Brewer, 1979). For example, a strong gender faultline would exist in a mixed-gender team where women are similar on several other attributes (e.g., they are all young and work in human resources) and also differ from a homogeneous male subgroup (e.g., older men working on research and development). A weak gender faultline would exist in a mixed-gender team where the members of either gender were neither similar on attributes other than gender nor different from members of the other gender.

Faultlines and Team Processes

Task-relevant information sharing has been one major focus for studies in group decision making (e.g., Phillips et al., 2004; Stasser & Titus, 1985). In this study, we examined both the quantity and quality of information exchange among team members. Educational specialty is a task-relevant attribute that is associated with specific types of knowledge and task perspectives (Hambrick & Mason, 1984; Hitt & Tyler, 1991). Team members with different educational backgrounds may provide access to a wider knowledge base, which can be utilized to improve the quantity and quality of information shared within teams. Realizing the potential benefits of cognitive variety, however, requires more than the mere presence of different perspectives. Team members must also believe that there is value in one another's knowledge (Cramton & Hinds, 2005). Effort must be expended to avoid misperceptions and misunderstandings, hold productive debates, and prevent negative feelings towards dissimilar others in the team (Shaw & Barrett-Power, 1998). Otherwise, team members may fail to pool their unique information (Stasser & Titus, 1985).

We argue that educational specialty-based subgroups in a team are less likely to effectively share information when they are divided by strong faultlines—that is, differences in educational curricula converge with differences on other individual attributes. When faultlines make subgroup identities salient, members are likely to seek positive distinctiveness for their subgroups, resulting in ingroup favoritism and outgroup discrimination (Brewer, 1991). Subsequently, rather than seeking complementary information from outgroup members, ingroup members are likely to rely on one another for inputs (Abrams, Wetherell, Cochrane, Hogg, & Turner, 1990).

Previous studies have found that faultlines that split teams along educational curricula lines have destructive effects on the sharing and integration of information (e.g., Rico et al., 2007; Sawyer et al., 2006). Even though people may value different insights and perspectives from dissimilar others (Cramton & Hinds, 2005), such informational benefits are more likely to occur in situations with weak subgroup divisions (e.g., Phillips et al., 2004; Rink & Ellemers, 2010). When subgroup divisions are substantial, these potential benefits may be offset by strong faultlines that hamper team interaction processes and performance (Phillips et al., 2004; Rico et al., 2007). Therefore, we hypothesize

Hypothesis 1a: Educational specialty faultline strength will be negatively related to task-relevant information sharing within a team.

Faultlines formed on the basis of nationality can also have consequences for the sharing of task-relevant information among team members. National origin is a potent factor in affecting an individual's values, cognitive schema, language, and behavior (Hambrick, Davison, Snell, & Snow, 1998). It shapes the content and structure of an individual's trait hierarchy (Turner, 1985). Particularly in an international team context, nationality is likely to be more salient than other social attributes, such as gender and age, for it is a readily accessible source of categorization and often relates to interpersonal relationships and behavior (Earley & Mozakowski, 2000; Hambrick et al., 1998; Li & Hambrick, 2005). Communication between people from different national backgrounds often involves overcoming language barriers and resolving tensions and conflicts due to cultural differences (Hambrick et al., 1998). When nationality differences coincide with differences among members on other attributes, salient national subgroups can become cohesive and biased against outgroups. In this situation, information sharing may be weakened.

Empirical studies of international teams have found that strong nationality faultlines were related to communication barriers, conflicts, and behavioral

disintegration, which in turn hampered performance (Earley & Mosakowski, 2000; Li & Hambrick, 2005). Thus, we propose

Hypothesis 1b: Nationality faultline strength will be negatively related to task-relevant information sharing within a team.

Strong task-based educational specialty faultlines also may be consequential for team social interactions, which we define as off-task behavior among team members. Because they can make it hard to communicate and reach consensus, differences based on such attributes as educational specialty can dampen satisfaction with the team and reduce members' motivation to sustain social relationships with one another (Katz & Kahn, 1978; O'Reilly, Caldwell, & Barnett, 1989). These problems are likely to be exacerbated when educational specialties align with other personal attributes (Rico et al., 2007). Reflecting the principle of social homophily, people often choose similar members with whom to interact and befriend (McPherson & Smith-Lovin, 1987). Perceived similarity is a well-established predictor of liking and social interactions (Byrne, 1971). Therefore, we propose

Hypothesis 2a: Educational specialty faultline strength will be negatively related to team social interactions.

The same logic applies to nationality faultlines. Holding separate world views and steeped in different cultures, people from different nations may find it challenging to understand each other and accept one another's values and beliefs. Furthermore, language barriers tend to impede communication, which can further accentuate social categorizations based on nationality. Consistent with this view, research on faultlines has found that teams with strong nationality subgroups typically experience reduced trust and increased hostility (Earley & Mosakowski, 2000; Polzer et al., 2006). Therefore, we predict that nationality faultlines will impede social interactions among team members. Specifically,

Hypothesis 2b: Nationality faultline strength will be negatively related to team social interactions.

Team Processes and Team Performance Behaviors and Outcomes

Through information sharing, team members can establish a transactive memory system—a shared awareness of who knows what within their teams.

This may facilitate their work in many ways (see DeChurch & Mesmer-Magnus, 2010; Moreland, 1999). For example, they can better locate resources, make better plans, coordinate activities more effectively, and solve more quickly and easily any problems that arise. We refer to behaviors such as these, which are directly relevant to performing team tasks, as team performance behaviors. We differentiate between such penultimate performance behaviors and the ultimate outcome of team performance on the task. Effective performance behaviors should be predictive of subsequent performance outcomes (Mathieu, Maynard, Rapp, & Gilson, 2008). Thus, we propose the following two hypotheses:

Hypothesis 3a: Task-relevant information sharing will be positively related to team performance behaviors, such as the effective use of resources and implementation of decisions.

Hypothesis 3b: Team performance behaviors, such as the effective use of resources and implementation of decisions, will be positively related to team performance outcomes.

Team Processes and Identity Salience

Whether unique individual attributes and related identities become salient in a specific situation depends on whether contextual stimuli activate a view of the self as distinct from others in the team (Brickson, 2000). This distinctiveness can be derived from comparisons between ingroup and outgroup members (Oakes, 1987), or, in a more general way, between the self and all other members of the team (Gaertner, Sedikides, & Graetz, 1999).

Task-related information sharing and social interactions serve as contextual stimuli by providing opportunities to exchange idiosyncratic information, observe teammates' behaviors, and deepen one's understanding of others' values and beliefs. Through these methods, team members can gain insights into themselves and other team members, allowing them to gauge whether their personalities and attitudes are similar or different. Intensive intragroup contexts make one's personal identity more salient (Hogg & Turner, 1987) and heighten awareness of the unique self. Thus, we propose

Hypothesis 4a: Task-relevant information sharing will be positively related to team members' identity salience.

Hypothesis 4b: Team social interactions will be positively related to team members' identity salience.

Method

Participants

A total of 390 undergraduate students from 64 project teams were invited to participate in the study. All students were enrolled in multiple sections of an organizational behavior (OB) course at an internationally diverse university in Australia. One of the authors was involved in teaching some of the class sessions, but none of the other instructors or participants was aware of the research hypotheses in this study. Some of the course content was relevant to team diversity, but overall the course covered a wide range of OB topics, such as groupthink, conflict, and decision making. During the semester, students worked in small teams (functioning like companies) to complete a business project as part of the course requirements. These student teams had many characteristics in common with project-based teams in organizations. They represented intact, meaningful work units that had considerable autonomy. Allowing project leaders to form their teams based on members' work experiences and expertise areas also reflected the procedures used in many business settings. Much of the team functioning centered around decision making, but teams also engaged in production and/or service activities. It should be noted that the student teams, like real work teams, were sometimes formed on the basis of members' prior familiarity, which may have affected team processes and performance (Moreland, 1999). Therefore, compared with the randomly formed student teams in most laboratory studies (e.g., Lau & Murnighan, 2005; Pearsall et al., 2008), teams in our study may have had limited range of faultline strength.

We collected three surveys and retained only teams with a response rate from members of 50% or higher. The final sample included 308 individual team members in 50 teams. Respondents' age ranged from 16 to 35 years, with an average age of 20.72 (SD = 2.94). Fifty-nine percent of the participants were male. Their average college education experience (measured as number of courses completed) was 12.83 (SD = 8.20). The average team size was 6.16 members (SD = 1.02).

Procedure

Following the submission of student "résumés" in the first week of class, instructors "hired" a CEO for each team on the basis of his or her likely ability and motivation to lead a class project. These hiring decisions were based on several measures, including grade point average (GPA), prior experience as a team leader in other courses, leadership in extracurricular organizations,

and work experience. The CEOs were reminded of the liabilities of working with friends and the benefits of working in a diverse group. Then, they were asked to select company members from among the remaining student résumés. Each company developed an idea to provide a product or service, wrote a business plan for that idea, and then executed the plan. Instructors reviewed the plans and monitored each team's activities, to maintain some quality control. However, all venture capital, profits, and losses were the responsibility of the teams. Teams' financial results varied widely, ranging from losses as high as $2,500 (AUD) to profits as high as $10,000 (AUD). Team projects included fashion shows, golf tournaments, and such products as wine, apparel, food, and so on.

We collected data at four points in time. At Time 1 (2nd week of the semester), we obtained self-reports of individual attributes, which were used to assess faultlines (371 returned surveys; 95% response rate). At Time 2 (5th week of the semester), we collected self-reports of task-relevant information sharing and social interactions (352 returned surveys; 90% response rate). At Time 3 (10th week of the semester), we obtained members' evaluations of team performance behaviors and identity salience (315 returned surveys; 81% response rate). Finally, at Time 4 (13th week of the semester) we obtained the instructors' grades of the team project reports. We included only teams with at least one piece of individual attribute data for 75% or more of the team members (because the program we used calculates faultline scores only for teams with a response rate of 75% or greater), and responses on all of the other surveys from 50% or more members of the team.

A one-way analysis of variance that compared teams with high response rates to those that were removed from our final analyses indicated that there were no differences in such team characteristics as size, proportion of males, years of education, or any other measures. We also conducted analyses based on teams with 60% and 75% response rates or greater, respectively. All of the analyses yielded similar patterns of results. Therefore, we report here the results for the sample of 50 teams based on a 50% response rate.

Measures

Faultline strength. Educational specialty faultline strength and nationality faultline strength were calculated using the program developed by Chung, Shaw, and Jackson (2006), which is based on Shaw's (2004) algorithm (see Shaw, 2004 for a detailed description; see Choi and Sy, 2010, Kunze & Bruch, 2010, and Sawyer et al., 2006, for applications). Compared to other measures (e.g., Thatcher et al.'s, 2003, *Fau* index), Shaw's measure reflects

the extent to which subgroups based on one defining attribute are internally homogeneous on other attributes, and different from one another on these attributes. The final faultline strength was the product of within-subgroup alignment and the reciprocal of cross-subgroup alignment in attributes. In this study, besides educational specialty and nationality, we included in our faultline measures, gender, age, and education level, because these are generally important demographic attributes relating to student group processes (Jackson et al., 2003).

The calculation of, for example, nationality faultline strength started by assigning members to subgroups based on the defining attribute (i.e., nationality). The algorithm then computed both within-subgroup similarity and between-subgroup difference on other relevant attributes (i.e., gender, age, education level and specialty). A relatively strong nationality faultline would be present in a team if members of nationality-based subgroups were both internally homogeneous in terms of gender, age, education level and specialty, and dissimilar from team members of other nationality subgroups on these attributes.

In this study, we had five categories of nationality: Australia/New Zealand (48%), United States (10%), European Union (15%), Asia (25%), and other countries/regions (2%). Educational specialty included five categories: business (53%), humanities/social sciences (20%), law (2%), information technology (2%), and multiple majors (23%). Gender was coded as male (=1) versus female (=2). Because Shaw's (2004) algorithm requires categorical data, we coded age into three categories: less than 20 (41%), 20-25 (50%), and older than 25 (9%). Because the normal course load at the university was four courses per semester, we coded education level (measured as amount of college courses completed) into six categories: less than 5 (14%), 5 to 8 (31%), 9 to 12 (22%), 13 to 16 (12%), 17 to 20 (9%), and greater than 20 courses (12%). It should be noted that although Shaw's measure takes into account the number and size of categories for each attribute used to calculate faultline strength, it does not differentiate among the levels of salience of each category. That is, subgroups with smaller numbers of people may be more salient than larger subgroups.

Task-relevant information sharing. We developed ten items specifically to assess the quality and quantity of information sharing during the team project work. Items (see Table 1) were rated using a scale that ranged from 1 (strongly disagree) to 6 (strongly agree). We conducted a principal components analysis with varimax rotation to check its dimensionality and found only one factor with an eigenvalue greater than one. Coefficient alpha for these items was .86.

Table 1. Results of Principal Component Analyses of Team Processes and Outcomes

Items	Task-relevant information sharing (Time 2)	Team social interactions (Time 2)	Team performance behaviors (Time 3)	Identity salience (Time 3)
When the group works together, almost everyone brings great ideas to help deal with whatever task we face.	**.796**	.167	.204	.128
We maintain a high exchange of ideas in our group.	**.730**	.157	.246	.114
At group meetings, members regularly bring with them enough information for us to be able to make decisions and solve problems.	**.727**	.140	.061	.096
When the group faces a problem, members always have lots of ideas that we can use to solve it.	**.725**	.022	.207	.007
When discussing an issue, group members provide plenty of information to help in making a decision.	**.702**	.100	.276	–.005
We can almost always count on the information provided by group members to be accurate and useful.	**.696**	.064	.237	–.004
When the group faces a problem, the ideas some members have for solving it are often pretty stupid. (reverse-scored).	**.593**	.136	.021	.098

(continued)

Table 1. (continued)

Items	Task-relevant information sharing (Time 2)	Team social interactions (Time 2)	Team performance behaviors (Time 3)	Identity salience (Time 3)
There are only one or two members in the group who have useful ideas about the group project. (reverse-scored).	**.557**	.251	.169	.116
Our group members rarely party together. (reverse-scored)	.039	**.847**	.053	.117
Members of our group do not stick together outside of class and class-related activities. (reverse-scored)	.170	**.784**	.106	–.006
Our group members would like to spend time together once the semester ends.	.319	**.686**	.071	.063
Members of my group would go out alone rather than get together as a group for a social event. (reverse-scored)	.198	**.619**	.162	–.151
Once our group has made a decision, we implement the decision very effectively.	.146	.151	**.807**	.088
Our group has devised a good method for making sure that all our work gets done well and on time.	.185	.093	**.766**	.094
Once the group decides what needs to be done, it usually takes twice as long as it should for the tasks to be completed. (reverse-scored)	.161	.145	**.751**	–.073

(continued)

Table 1. (continued)

Items	Task-relevant information sharing (Time 2)	Team social interactions (Time 2)	Team performance behaviors (Time 3)	Identity salience (Time 3)
We often make decisions about what the group should do, but then nothing really happens. (reverse-scored)	.148	.225	**.744**	–.064
Our group made very effective use of the skills, abilities and interests of our individual group members.	.250	.073	**.719**	.297
We delegate our group work well.	.217	–.039	**.712**	.128
Our group made sure that a task was assigned to the best person in the group to perform that task.	.151	–.037	**.709**	.096
Working with my team on the group project this semester has made me more aware of my own unique personality, beliefs and values.	.133	.044	.111	**.861**
Working with my team on the group project this semester has made me more aware of my own unique ways of working with other people.	.162	.126	.129	**.834**
Working with my team on the group project this semester has made me more aware of how different I am from some of the other members of my group.	.035	–.120	.065	**.746**

Note: Rotation Method: Varimax with Kaiser Normalization. Four factors had an eigenvalue greater than 1. In total four factors explained 61% of the variance.

Team social interactions. We assessed social interactions among team members using four items adapted from the group social integration scale in Widmeyer, Brawley, and Carron's (1985) Group Environment Questionnaire (see Table 1). Team members rated statements using a scale that ranged from 1 (strongly disagree) to 6 (strongly agree). Coefficient alpha for these items was .75.

Team performance behaviors. Nine items (see Table 1) were developed to assess two types of performance behavior—decision implementation (5 items) and resource use (4 items). Each item was rated on a scale that ranged from 1 (*strongly disagree*) to 6 (*strongly agree*). Principal component analysis with varimax rotation revealed a single factor solution, after deleting the reverse-coded item "group tasks were pretty much assigned randomly to group members," which showed substantially lower correlations with all other items (Schmidt & Stults, 1985). Coefficient alpha for these items was .88.

Team performance outcome. To assess the performance outcome of each project team, we used the final grade assigned to its project report by the instructor, which was based on a comprehensive evaluation of how effective the team was in setting up its goal, accomplishing the tasks, and generating positive financial results (e.g., Harrison, Price, Gavin, & Florey, 2002). Because the teams were distributed across multiple classes with different instructors, grades were standardized within each class.

Identity salience. Four items were developed to assess identity salience (see Table 1). Team members responded using a scale that ranged from 1 (*strongly disagree*) to 6 (*strongly agree*). Principal component analysis with varimax rotation yielded a one-factor solution, after deleting the reverse-coded item "working with my team on the group project this semester has made me more aware of how some of the members of the group are very much like me in many ways" (Schmidt & Stults, 1985). The average of an individual member's ratings of the other three items represented that person's identity salience. Coefficient alpha for these items was .75.

Control variables. We included as control variables average member university GPA, team size, proportion of females, and average member age. Using a 5-point scale that ranged from 1 (*no experience*) to 5 (*very extensive experience*), we also measured respondents' level of experience with working in diverse groups, and computed the average member experience for each group as a control variable. Only average GPA was related to any of the team process and outcome variables. To conserve statistical power, we excluded all other variables from our final analyses.

Analysis

Measurement reliability and discriminant validity. Task-relevant information sharing, team social interactions, performance behaviors, and identity salience were based on self-reports from the same team members, so we conducted exploratory factor analyses to establish their discriminant validity (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). We performed principal component analyses to ensure that the items used to assess each variable loaded on a single factor. Three reverse-coded items were found to be cross-loaded, including two items measuring information sharing—"the information that some members bring to group meetings is often filled with errors or is incomplete" and "some group members seem to withhold information in group discussions"; and one item measuring performance behaviors—"our group often assigned tasks to a member without really considering whether that person was the best one in the group to do the task". Following Schmidt and Stultz (1985), we removed these problematic items. Principal component analysis with varimax rotation yielded the final solution. As indicated earlier in the description of each measure, item intercorrelations (Cronbach's coefficient alpha) indicated satisfactory reliability. For all multi-item scales used in this study, team scores were created by averaging the relevant items (see factor analysis results in Table 1).

Aggregation. Three variables in our model—task-relevant information sharing, team social interactions, and team performance behaviors—were conceptualized at the team level and used the team as the referent (Chan, 1998). To justify the aggregation of these variables, we computed within-group agreement (r_{wg}) and intraclass correlations (ICCs), and conducted one-way analysis-of-variance F tests. Within-group agreement was satisfactory for these three variables (mean r_{wg} = .76, .92, .88, respectively), all above the recommended .70 cutoff value (James, Demaree, & Wolf, 1984). ICC(1) represents the proportion of the total variance at the individual level that can be explained by team membership, and ICC(2) indicates the reliability of the team means (Bliese, 2000). ICC(1) values typically range from .05 to .20 in the organizational literature (Bliese, 2000), and a cutoff of .60 is recommended for ICC(2) (Glick, 1985). Results generally supported aggregation. For task-relevant information sharing, ICC(1) = .11, ICC(2) = .41, $F(49, 229) = 1.69$, $p < 0.01$; for team social interactions, ICC(1) = .29, ICC(2) = .69, $F(49, 229) = 3.25$, $p < 0.01$; for team performance behaviors, ICC(1) = .31, ICC(2) = .70, $F(49, 214) = 3.36$, $p < .01$. The ICC(2) value for team information sharing was relatively low. However, given that the construct

was clearly defined at the team level and the measure tapped into information exchange by members in the team, and that we found satisfactory within-group agreement (r_{wg}) and significant between-group variance (F tests), we proceeded with aggregation of this variable, also acknowledging that results about relationships with information sharing might be underestimated (Chen & Bliese, 2002).

Identity salience was conceptualized and measured as an individual-level construct. Average of individual identity salience scores for a team reflected Chan's (1998) additive compositional model, or Klein and Kozlowski's (2000) configural team properties, both of which require no demonstration of within-group agreement or consistency (Chan, 1998; Klein & Kozlowski, 2000). As predicted, an analysis of variance (ANOVA) yielded a nonsignificant F-statistic and a negative ICC(1) value, thus indicating greater within- than between-group variance, $F(49, 217) = 0.82$, *ns*; ICC(1) = –.03. Further investigation, however, revealed that the negative ICC(1) value was a result of low between-group variance, but not a problem of within-group agreement (the mean r_{wg} value was .79). As George and James (1993) point out, low between-group variance can result in artificially low reliability estimates like ICC, but it should not preclude the aggregation once agreement within teams has been demonstrated. Therefore, we calculated the average identity salience in each team for subsequent analysis (e.g., see Langfred, 2007; and Marrone, Tesluk, & Carson, 2008; for examples).

Hypothesis testing. To test all the team-level relationships proposed in our model, we conducted a path analysis using LISREL 8 (Jöreskog & Sörbom, 1993). The size of our sample did not permit the meaningful application of a latent variable approach. However, our measures had been refined using the exploratory factor analyses described earlier. To gauge the model's fit, we first tested our hypothesized model and then compared it with several alternative models that were plausible on the basis of theoretical arguments. Goodness of fit was assessed using the root mean square error of approximation (RMSEA), standardized root-mean-square residual (SRMR) and comparative fit index (CFI) suggested by prior studies (RMSEA < .10, SRMR < .08, and CFI close to .95; Hu & Bentler, 1999; Steiger, 1990). Finally, we tested all the hypothesized relationships by examining the path coefficients for these relationships.

Furthermore, the team literature suggests that task-relevant and interpersonal processes are typically intertwined and correlated with each other (e.g., De Dreu & Weingart, 2003; Marks, Mathieu, & Zaccaro, 2001). Although their causality is unclear, we accounted for this relationship by specifying a correlation between information sharing and social interactions. For the

Table 2. Means, Standard Deviations, and Correlations

Variable	M	SD	1	2	3	4	5	6	7	8
1. Average GPA	2.97	0.84	__							
2. Specialty faultline strength	0.07	0.06	–.12	__						
3. Nationality faultline strength	0.11	0.07	–.05	.12	__					
4. Task-relevant information sharing	4.68	0.40	–.36**	–.22	.00	(.86)				
5. Team social interactions	3.42	0.69	–.25	–.19	–.33*	.49**	(.75)			
6. Team performance behaviors	4.39	0.67	–.07	–.14	–.07	.59**	.37**	(.88)		
7. Team performance outcome	0.05	0.92	–.59**	.04	–.10	.32*	.21	.17	__	
8. Average identity salience	4.75	0.34	–.09	–.40**	.00	.50**	.17	.44**	.05	(.75)

Note: $N = 50$. Values in parentheses are reliability coefficients for the measures.
*$p < .05$. **$p < .01$.

control variable of average GPA, we specified a path from it to all the team process and outcome variables.

Results

Table 2 presents means, standard deviations, correlations, and reliability coefficients for all the variables of interest. As expected, educational specialty faultline strength and nationality faultline strength correlated negatively with most of the process and outcome variables. Task-relevant information sharing was positively correlated with team social interactions and outcomes. The values of standard deviation for two faultline strength variables were fairly low, which implies that their explanatory power could be limited.

Model Comparisons

To gauge model fit, we first tested the hypothesized model and then compared it with several alternative models (see Table 3). The hypothesized model (Model 1 in Table 3) had an adequate fit, $\chi^2 = 17.96$ ($df = 11$, $p < .10$), RMSEA = .09, CFI = .93, SRMR = .06. Because faultline strength may

Table 3. Summary of Path Analysis Fit Indices

Model	Description	χ^2	*df*	RMSEA	CFI	SRMR
Model 1	Hypothesized model	17.96	11	.09	.93	.06
Model 2	Model 1 with two direct paths: educational specialty faultline strength to performance behaviors; nationality faultline strength to performance behaviors	17.62	9	.12	.91	.06
Model 3	Model 1 with two direct paths: educational specialty faultline strength to performance outcome; nationality faultline strength to performance outcome	15.30	9	.10	.93	.06
Model 4	Model 1 with two direct paths: educational specialty faultline strength to identity salience; nationality faultline strength to identity salience	10.95	9	.06	.98	.04
Model 5	Model 1 with two direct paths: task-relevant information sharing to performance outcome; team social interactions to performance outcome	17.89	9	.12	.91	.06
Model 6	Model 1 with a direct path from team social interactions to performance behaviors	17.24	10	.10	.92	.06
Model 7	Model 1 with a direct path from identity salience to performance outcome	16.54	10	.10	.93	.06
Model 8	Model 1 with a direct path from educational specialty faultline strength to identity salience	11.42	10	.02	.98	.05

directly influence team performance and identity salience, we also tested three alternative models with direct paths from the two faultline strength variables to team performance behaviors (Model 2 in Table 3), to performance outcome (Model 3 in Table 3), and to average identity salience (Model 4 in Table 3), respectively. The first two models did not fit the data significantly better than the hypothesized model, for Model 2, $\Delta\chi^2(2) = 0.34$, *ns*; for Model 3, $\Delta\chi^2(2) = 2.66$, *ns*, and none of the added paths were significant. Nevertheless, Model 4 showed a significant improvement in fit, $\Delta\chi^2(2) = 7.01$, $p < .05$. Further examination revealed that educational specialty faultline strength was negatively related to average identity salience ($\beta = -.30$, $p < .05$).

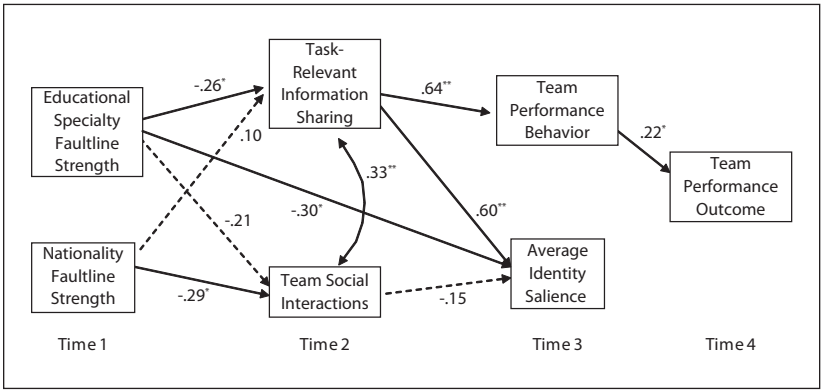

Figure 2. Results of revised model
All of the reported paths are standardized coefficients. Average GPA, which was included in the model predicting all the process and outcome variables, was related to task-relevant information sharing ($\beta = -.42$, $p < .01$), team social interactions ($\beta = -.28$, $p < .05$), and team performance outcome ($\beta = -.64$, $p < .01$).
*$p < .05$. **$p < .01$.

We tested the direct effects of information sharing and social interactions on performance outcome by adding two paths from those process variables to the outcome (Model 5 in Table 3). The model fit the data adequately, but was not significantly better than the hypothesized model, $\Delta\chi^2(2) = 0.07$, *ns*. We tested another alternative model by adding a path from team social interactions to performance behaviors (Model 6 in Table 3). Again, the model fit the data adequately, but not significantly better than our preferred model, $\Delta\chi^2(1) = 2.14$, *ns*. Finally, we were interested in whether average identity salience would be related to team performance outcome, because research has shown that strong identification with a team is associated with greater satisfaction, more extrarole behavior, and positive group climate (Riketta & Van Dick, 2005). Therefore, identity salience might dampen these positive outcomes because it weakens group identification. To explore this issue, we tested an alternative model by adding a path from average identity salience to performance outcome. This model (Model 7 in Table 3) did not provided a significantly better fit than the hypothesized model, $\Delta\chi^2(1) = 1.42$, *ns*, and the path from average identity salience to performance outcome was not significant.

Therefore, we added the path from educational specialty faultline to average identity salience into our hypothesized model and accepted the results as our final model (Model 8 in Table 3). This model provided a good fit, $\chi^2 = 11.42$ ($df = 10$, $p > .10$), RMSEA = .02, CFI = .98, SRMR = .05. Figure 2

presents the results of the final model, which was used to test all the hypotheses.

Tests of Hypotheses

Hypotheses 1a and 1b proposed that educational specialty and nationality faultline strength would be negatively related to task information sharing. We found that educational specialty faultline strength was negatively related to information sharing ($\beta = -.26$, $p < .05$), supporting Hypothesis 1a. However, nationality faultline strength was not related to information sharing ($\beta = .10$, *ns*), which failed to support Hypothesis 1b.

Hypotheses 2a and 2b proposed that the strength of two faultlines would be negatively related to team social interactions. Results show that nationality faultline strength was negatively related to social interactions among team members ($\beta = -.29$, $p < .05$), whereas educational faultline strength was not ($\beta = -.21$, *ns*). These results only support Hypothesis 2b but not Hypothesis 2a.

Hypothesis 3a predicted that task information sharing would be associated with performance behaviors. We found a significant relationship between these two variables ($\beta = .64$, $p < .01$), providing support for the hypothesis. Hypothesis 3b predicted that effective resource use and decision implementation would be related to performance outcome. This hypothesis also received support ($\beta = .22$, $p < .5$).

Hypotheses 4a and 4b proposed that both task information sharing and team social interactions would be related to average identity salience within the team. We found that task information sharing was significantly associated with average identity salience ($\beta = .60$, $p < .01$), supporting Hypothesis 4a. However, the relationship between team social interactions and identity salience was not significant ($\beta = -.15$, *ns*), failing to support Hypothesis 4b.

To better gauge the indirect effects in Figure 2, we tested them using bootstrap analyses (based on regressions with the same variables) with 95% bias-corrected confidence intervals, because our sample size was small (Efron & Tibshirani, 1993). Results confirmed the significance of all the indirect effects: for educational faultlines and performance behaviors through information sharing, the mean was –2.09 (95% confidence interval CI = [–4.59, –0.42], not containing zero); for educational faultlines and average identity salience through information sharing, the mean was –0.74 (95% confidence interval CI = [–1.90, –0.21], not containing zero); and for information sharing and performance outcome through performance behaviors, the mean was 0.42 (95% confidence interval CI = [0.06, 0.85], not containing zero). Overall, the results supported all three indirect effects.

Discussion

The development of faultline theory is a promising approach for dealing with some of the thorny problems associated with team composition and diversity. Using a sample of student project teams, we found that educational specialty and nationality faultline strength predicted the internal team processes of task information sharing and social interactions, respectively. Information sharing in turn predicted subsequent performance. Further, we also found that sharing information among team members heightened the salience of their personal identities.

Compared to earlier studies that found inconsistent support for the impact of faultlines on work teams, our results were supportive of this impact. We believe this is substantially due to the attributes examined in our study, which were particularly relevant to the composition of the work teams and the tasks in which they were engaged. In addition, in contrast to other measurement approaches used to assess faultlines in natural settings (e.g., Thatcher et al.'s, 2003, Fau index), our measure of faultline strength captures both the extent to which subgroups are internally homogeneous on multiple attributes and also the degree of difference between subgroups on the same attributes. That is, our measure of faultline strength captures both within-subgroup alignment and between group differentiation.

Theoretical Implications

Our results indicate that the strength of both educational specialty and nationality faultlines in project teams can shape task-related and socially oriented processes. Using Shaw's (2004) measure, which captures the degree to which distinct, internally homogeneous subgroups (faultlines) are present in teams, we found that faultline strength was related to task and off-task processes. More interestingly, the pattern of our findings was consistent with predictions grounded in a two-dimensional taxonomy of diversity attributes and team processes (Jackson, May, & Whitney, 1995; Milliken & Martin, 1996). That is, educational specialty (task) and nationality (social) faultlines played different roles in shaping the interactions of team members. Strong educational faultlines were negatively associated with task information sharing, and strong nationality faultlines were negatively associated with social interactions. As noted earlier, the task context of project teams in our sample made team members' educational specialty and nationality attributes salient. Categorizing subgroups on the basis of these two attributes subsequently shaped distinct team processes. These results corroborate Lau and

Murnighan's (1998) contention that a team's task context can influence the salience, activation and consequences of demographic faultlines.

In earlier research, strong educational specialty faultlines were found to weaken task-relevant information sharing and performance (Phillips & Lord, 2006; Phillips et al., 2004; Rico et al., 2007). Our results were consistent with these earlier studies. In a related study, Choi and Sy (2010) proposed and found that task-related (tenure-based) and relation-oriented (gender, race and age) faultlines would predict task and relationship conflict, respectively. These authors also found that task faultlines were positively related to relationship conflict. This crossover effect may reflect the pervasive social categorization processes induced by faultlines based on individual attributes. That is, once multiple attributes align with one another to create deep cracks (strong faultlines) in teams, negative team processes, such as reduced trust and weakened social integration (e.g., Polzer et al., 2006; Rico et al., 2007), are more likely to occur.

In addition, our findings suggest that identity salience can be influenced by educational faultlines and information sharing activities relevant to the team's task. Members may become aware of similarities and differences while sharing information about their task. Intensive task-relevant discussions during and outside of the class may have enhanced team members' understanding of one another's unique characteristics, creating a kind of decategorization process—group-based stereotypes and biases may have receded as interpersonal contact grew (Brewer & Miller, 1984). We found that educational faultlines were negatively associated with both information sharing and identity salience, which implies that as strong faultlines make one's social identities salient, they may hinder interpersonal contact with outgroup members. Consequently, team members tend to focus on group properties, instead of personal characteristics (Ellemers et al., 2002; Oakes, 1987).

Finally, although we found no relationship between nationality faultline strength and team performance (as mediated through task information sharing), it is premature to conclude that nationality faultlines are irrelevant to the performance of work teams. Early in a team's life, team members may learn about each others' role expectations and performance goals while socializing. In our sample, the relationship between team social interaction and information sharing was moderately high, which suggests that socially oriented activities might function to improve performance, maybe by enhancing task information sharing.

Practical Implications

Our study has several practical implications. First, the negative relationships we observed between faultline strength and beneficial team processes suggest

that managers may wish to evaluate faultline strength when forming teams. Although real work settings have more complex structures (e.g., multiteam systems and member rotation among teams), when there is at least some staffing flexibility and a pool of potential team members with differing attribute profiles, such an evaluation could be useful to identify and/or avoid problematic team compositions. For example, when selecting team members, managers should seek to avoid creating teams with strong faultlines by cross-cutting team members' attributes, such that boundaries between ingroup and outgroup members become less distinct (Brewer & Miller, 1984).

Unfortunately, the distribution of attributes in a population of potential team members may mean that it is not possible to create teams that are devoid of structural faultlines. In such situations, there are several ways to neutralize their negative effects. For example, the presence of a transformational leader, who inspires members with a compelling vision and acts as a role model, can orient the team toward common goals (Kunze & Bruch, 2010). Further, the negative effects of faultlines might also be counteracted by creating a strong sense of team identification (Bezrukova, Jehn, Zanutto, & Thatcher, 2009; Jehn & Bezrukova, 2010), providing specific guidelines regarding key aspects of the work (Molleman, 2005; Rico et al., 2007), and infusing a belief in value in diversity (Cramton & Hinds, 2005; Homan, van Knippenberg, Van Kleef, & De Dreu, 2007). Our results also suggest that faultline management training may prove useful when it targets educational differences and their implications for team performance. Compared to nationality faultlines and social interactions, educational faultlines and information sharing were more consequential for performance in the teams we studied.

Methodological Strengths and Weaknesses

As explained earlier, we did not use random assignment when creating teams, which may have restricted the range of faultline strength and thereby underestimated any faultline effects. This nonrandom team design also confounded our results with members' prior history and familiarity. That is, some students might have formed teams based on their friendships or experiences working in previous classes, which also likely influenced teams' information processing approaches and subsequent task performance (Gruenfeld, Mannix, Williams, & Neale, 1996; Murnighan & Conlon, 1991).

Second, we studied two salient structural faultlines relevant to our research context. This approach focuses on the objective features of social situations and contrasts with the approach of others who assessed team members' direct perceptions of such faultlines (cf. Jehn & Bezrukova, 2010). Although we agree that subjective perceptions of faultlines can influence team processes,

we believe that focusing exclusively on subjective faultlines could lead researchers to miss the impact of actual attribute distributions within the team (cf. Moreland, in press). It may also be useful to consider contextual variables that contribute to the salience of a particular demographic attribute (cf. Pearsall et al., 2008). However, identifying a contextual variable that directly makes faultlines salient is not always feasible in real organizational situations.

Finally, although there are similarities between the student teams in our study and teams in real work settings, there are certainly differences as well (e.g., organizational structure and interfunctional relationships), which might limit the generalizability of our results. Future research that replicates those results in other settings, using other research designs would bolster confidence in the validity of our model.

Future Research

In the end, we would also like to suggest several directions for future research. First and foremost, our findings suggest that group members use multiple identities to categorize one another (Crisp & Hewstone, 2007), resulting in multiple faultlines being present within teams. These results have important implications for faultline research because most of that research has examined the effects of only one type of faultline (see exceptions in Bezrukova et al., 2009; Choi & Sy, 2010; Molleman, 2005). Future faultline research needs to attend to the possibility that more than one faultline may develop and shape team dynamics.

Secondly, our results point to the potential beneficial consequences of faultlines that occur within cohesive subgroups (Gibson & Vermeuleon, 2003; Lau & Murnighan, 2005). Under some circumstances, teams that have splintered into subgroups due to strong faultlines may be able to leverage the characteristics of those subgroups to achieve performance gains. For example, subgroups formed due to differences in functional specializations of team members may be able to achieve high levels of performance by assigning team tasks to those subgroups with the highest level of functional competence in particular tasks. Such mindful creation of subgroups may be more likely to occur when team members believe value can be created from the diversity present in a work team (Cramton & Hinds, 2005; Homan et al., 2007). Additional research is needed to fully understand the psychological and behavioral mechanisms that link faultlines to positive team outcomes.

Social network analysis, for example, may be a powerful tool for mapping out how faultlines affect communication and socialization patterns within and across subgroups (cf. Reagans & Zuckerman, 2001).

Although much prior research has investigated faultlines' impact on team processes, most of that work has focused on conflicts among team members (e.g., Choi & Sy, 2010; Homan et al., 2007; Jehn & Bezrukova, 2010; Li & Hambrick, 2005; Molleman, 2005; Pearsall et al., 2008; Thatcher et al., 2003). We suggest that future faultline research focus on other emergent states and behavioral processes in teams, such as emotion and mood, group potency, and group leadership (Mathieu et al., 2008; cf. Kunze & Bruch, 2010). In addition, studies of project teams can examine the interaction of time and faultlines by obtaining attitudinal and behavioral measures at meaningful time points during the teamwork process (Gersick, 1988).

Last but not least, a more practical focus is to examine how to effectively manage team faultlines. Recent work has begun to consider moderators that can nullify the negative effects of faultlines (Bezrukova et al., 2009; Homan et al., 2007; Kunze & Bruch, 2010). For example, in a study of work teams in a multinational company, Kunze and Bruch (2010) found that transformational leadership neutralized the negative effects of age-based faultlines on employees' productive energies. Likewise, using a sample of work teams in a Fortune 500 information-processing company, Bezrukova et al. (2009) found that information-based faultlines enhanced group performance when team identification was high. Research considering the role of contextual factors, such as task characteristics and diversity climate (Chung et al., 2011), can shed light on approaches for organizations to use to effectively manage the performance of diverse teams.

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