An Examination of Team Effectiveness in Distributed and Co-located Engineering Teams

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Abstract

Student project teams are an important and integral part of many engineering classrooms. This paper examines the social- and task-related dimensions of such co-located and distributed teams. Studies of distributed teams in the workplace observe that members often face social issues of building trust and cohesion that co-located teams do not. It is posited that distributed teams in the classroom must struggle with similar issues, and therefore skew into operating in a task focused fashion. In contrast, it is suggested that co-located engineering teams in the classroom regard teamwork from a socially-oriented viewpoint. A questionnaire was administered to co-located and distributed engineering student teams to assess members' self-rated team effectiveness and their team challenges. The results suggest that co-located teams, in some ways, may indeed be more socially oriented in comparison with distributed teams, and that this social orientation may be detrimental to team effectiveness. Likewise, distributed teams appear to be relatively more task focused. This paper discusses implications for engineering and design education that focus on balancing social- and task-orientation in order to improve team effectiveness.

Introduction

Globally distributed product development teams are ubiquitous in many industries, allowing collaboration across countries, cultures, and disciplines. Distributed collaboration provides the opportunity to decrease development and production costs and reduce cycle time, but these potential gains are not without trade-offs. The day-to-day logistics of operating as a distributed team presents both social and technical challenges that can lead to a "virtual gap" in team performance from traditional co-located teams [1, 2].

Similarly, both co-located and distributed teams have been adopted in engineering design classrooms [3, 4], particularly as more and more universities develop curricula to address the needs of mid-career and international students who take courses through distance learning programs.

This paper describes a study of the self-assessed team effectiveness of co-located and distributed project teams in two different engineering courses. The overarching goal of this study was to better understand key social- and task-related dimensions of, and their influences to, co-located and distributed teams in an engineering classroom, and to gain some insights to help educators provide students with more informative and satisfying team experiences, and improve their future performance in teams in the workplace. As the world becomes more and more "flat" through Internet connections, it is important for educators to understand the different behaviors of distributed and co-located teams and to intervene accordingly for achieving most desirable education results.

The social dimensions of teams reflect how individual members relate to each other interpersonally, while task dimensions refer to how members relate to the work at hand and how that work will be accomplished. All teams, including co-located and distributed, are affected by both dimensions to a certain extent, and there is evidence to suggest the two dimensions are somewhat interdependent [5]. These social and task dimensions are relevant not only to a student's current team experience, but may have impact on students' overall view of teams both in academic settings and in their future professional careers. Negative experiences working on teams in school can lead to poor associations and learned habits later on. Positive, satisfying experiences with teams during university education can potentially play a role in improving a student's ability to succeed at working in teams in the future.

Depending on the level of influence of the social and task dimensions, the work style of a team can be either socially oriented or task oriented. A *socially oriented* team usually has high level of social presence [Short et al 1976] in the sense that the team members feel more of their personal relationships and the attachment of their work to these relationships. Such teams tend to view team cohesion as paramount and consider resolving task related issues dependent on their social dynamics. A *task oriented* team, on the other hand, is more task focused, so therefore views their performance on a task/project as the driver for their work. In such teams, social relationships are either less achievable due to communication, cultural and/or geographical barriers or are consciously detached from task related issues as a result of, e.g., professional training. It is conceivable that these different outlooks of teamwork style will have bearing on how each type of team views their own effectiveness.

The *hypothesis* of this work is that *distributed teams in the classroom tend to have task orientation in the way they function, while co-located teams tend to have a social orientation.* This conjecture is based on the belief that distributed teams have less social presence and face more barriers to building the same type of social relationships and cohesion than co-located teams, so therefore must operate in a task focused fashion. Co-located teams tend to have more social context than distributed, so therefore operate more with a social orientation. Social presence theory [6] considers the degree of personal connection that a particular telecommunication technology affords groups of people. Meeting with someone face-to-face has high social presence, while communicating through email has lower social presence. In the workplace, higher social presence generally gives teams a stronger sense of "being there" with their teams. However, high social presence can sometimes be a hindrance, as teams can become distracted by social interactions [7].

To test the hypothesis in the class project settings, this research takes "project task" as independent variable, "team functions" as dependent variable, and "level of distribution" as control variable, as shown in Figure 1. Various factors may influence the work style of a team, including task types, culture differences, communication technologies, and levels of professional trainings. This research is focused on the *level of distribution of teams*. More specifically, the research examines how co-location, and "far" and "near" distances may influence teams' work style, and consequently the team effectiveness, in engineering class project settings. The team effectiveness here refers to how the team functions, and not the work product of the team itself.

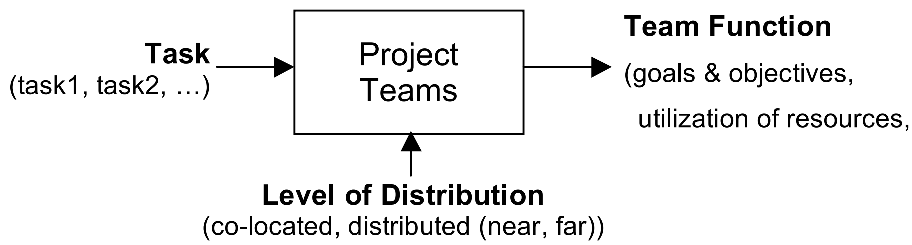

Figure 1: Overview of Research Approach

To measure the achievement or the emphasis of team functions, team members were asked provide their own assessment or ratings of the performance of a set of selected team functions. During the process of testing the above general hypothesis, several research questions were addressed:

- Are there differences in the way distributed teams rate themselves on measures of team effectiveness as compared to co-located teams? It might be expected that distributed teams would rate themselves lower on most functions, especially the social functions, because of the inherent challenges in establishing a common working approach in a non co-located environment.
- Are there any correlations between these measures that can suggest what aspects of teaming are of particular importance, as well as likely candidates for special attention in the classroom?
- What are some ways that "far" and "near" distant distributed teams in the classroom differ? Not all distributed teams are created equal. Teams that are "far" distant are sufficiently dispersed that they never meet in person, while "near" distant teams are in close enough proximity that they can occasionally meet as whole in person. In fact, Allen [8] suggests that 50 feet is the maximum distance at which teams may be thought of in "collaborative co-location." Does the opportunity to engage face-to-face occasionally mean that "near" distant teams are more effective or cohesive than "far" distant teams?
- Which common team challenges are most often cited by co-located and distributed teams in engineering courses?

Related work

Distributed teams have been studied extensively in research in a number of fields, from computer science and mechanical engineering to organizational behavior and psychology. Appropriately, much of this work focuses on collaborative technologies and systems. However, as Thompson [9] points out, social and operational aspects of a team are also important. In their important study on the social aspects of virtual teams, Jarvenpaa and Leidner [10] describe the role of trust in virtual teams as a quality that is difficult to attain and also to maintain, but that certain team conditions such as shared history and cultural similarity may facilitate trust. Maznevski and Chudoba [11] found that effective virtual teams developed a "rhythm" of regular in person meetings in addition to virtual interaction.

Geographically dispersed teams in the classroom have been the subject of a number of studies, including long term examination on the effect of enabling collaborative technologies in the product development classroom [12, 13], studies of modes of team communication in both distributed and co-located teams [14, 15], and cognitive models of teams and team members [16]. Jin and Geslin [17] compared the design outcome performance of distributed teams of engineering students using instant messaging to communicate in a free form fashion and using a structured system to limit the scope of their discussions. The study found that restricting discussion was linked to teams who were able to explore design space more effectively. However, no studies have looked specifically at the role of social dimensions in distributed teams in the engineering classroom.

Methods

The first group studied ("distributed") is a master's level course in engineering team management in the industrial and systems engineering department at the University of Southern California. The course was composed of 33 students. 11 of these were off-campus students who were full-time working engineers dispersed across the East Coast, Pacific Northwest, and Southern California in aerospace, automotive, and other industries. The remaining 22 students were full-time on-campus, some of whom had extensive work experience and some of whom had none. The teaching staff divided the class into 8 project teams of 3 to 5 members, each of which included at least one of the off-campus working students. Their project involved observing, analyzing, and making recommendations for a real-world team to improve their performance as a team.

The second course ("co-located") is a senior level course in design methodology in the department of aerospace and mechanical engineering. All 33 students were full-time on-campus, and several had limited working experience in the form of internships. The students chose which other students they wanted to work with, resulting in 8 teams of 3 to 6 members. Their projects involved addressing an open-ended, ill-defined mechanical design problem using various methodologies presented in class.

These two sets of teams differ in many important ways, in particular the types of projects they worked on, the level of work experience of the team members, and the way teams were formed. Rather than compare the characteristics of in a controlled way, the aim of this research is to look at each as a distinct case with some salient points of comparison.

In both classes, after the completion of the final projects, each student completed a 2-page questionnaire. This questionnaire was adapted from one developed by Alexander [18], and was selected because it broadly addressed both social and task dimensions and was written in language that all participants would be able to understand. Students individually rated their teams on ten team effectiveness characteristics on a scale of 1 (low) to 7 (high). The questionnaires noted which team each student belonged to, but was otherwise anonymous. Students were informed that the questionnaires would not be graded. The team effectiveness characteristics rated were:

1. Goals and objectives. The team's ability to understand and agree on commonly understood goals.
2. Utilization of resources. Team member resources are recognized as well as utilized.
3. Trust and conflict. The degree of trust among team members, and ability of team to handle conflict openly.
4. Leadership. Sharing of leadership roles among team members.
5. Control and procedures. Effective procedures for team functioning that team members support and use to regulate team function.
6. Interpersonal communication. Communication between team members is open and individuals participate.
7. Problem-solving/decision-making. Established procedures for group problem solving
8. Experimentation/creativity. Ability to try new or different ways of doing work as a team.
9. Evaluation. The frequency with which a team examines their own functions as a team.
10. Cohesion. The level of enjoyment of working together as a team.

The questionnaire included two additional questions to gain a sense of team meeting frequency and the challenges faced by the team. Each individual stated how often their team met (monthly, every 2 weeks, weekly, twice weekly, or 3 times per week or more). The questionnaire listed five behaviors that are commonly found in teams Each respondent was also asked to check off all common challenges found in working in teams. These included *social loafing*, a phenomenon in which individuals who are in groups tend to put forth less effort than when working alone [19], *relationship conflict* between team members that are personal rather than related to the task at hand [20], and *team commitment* to group decisions [21]. In addition, two team challenges noted in popular business literature [22] were included because they were deemed relevant to student experience on teams: *avoidance of accountability*, which is an unwillingness of a team member to call out others on their poor performance to avoid embarrassment of telling someone they are doing a bad job, and *inattention to results*, a tendency of individuals to care about things other than the team outcome. For example, an individual might care only about his/her interests but not about how the team overall performs. These were phrased as follows in the questionnaire:

- Social loafing. One or more members contribute significantly less than others to the project.
- Strong personality conflict between team members.

- Individual team members lack buy-in or commitment to team decisions
- Team members unwilling to call others on their lapses in performance
- Team members put their own needs ahead of the needs of the team as a whole

Results

Team effectiveness characteristics

Table 1 shows the average ratings by the surveyed teams for all of the team effectiveness characteristics, along with the standard deviation for each. If the average values were within a half standard deviation of each other, the two were considered approximately the same. If they were not, they were considered different. Overall, distributed teams rated their ability to formulate goals by far the highest (6.10), followed by team cohesion (5.65). In contrast, members of co-located teams rated their teams' level of trust (6.06), interpersonal communication (6.00), and cohesion (6.00) almost equally, the highest of any criteria. This suggests that distributed teams had a stronger focus on the project work itself (goal setting), while the co-located teams had positive emphasis on the social aspects of their teams. This also makes sense in the contexts of the composition of the classes themselves. Many members of the distributed teams had never met one another in person, while the co-located teams were undergraduates who had taken several classes together in the past. As expected, the co-located teams rated themselves slightly higher on all ten team effectiveness criteria on average (5.60 compared to 5.32).

Table 1 Average rating for each team effectiveness characteristic by distributed teams and co-located teams

	Avg. Distributed	***Std dev.***	**Avg. Co-located**	***Std dev.***	**Compare**
Goals & Obj.	6.10	*0.83*	5.85	*0.89*	Same
Utilization of Resources	5.58	*1.09*	5.53	*1.26*	Same
Trust & Conflict	5.16	*1.27*	6.06	*0.92*	Co-located higher
Leadership	5.29	*1.24*	5.21	*1.49*	Same
Control & Proc.	5.19	*1.19*	5.18	*1.38*	Same
Interpersonal Comm.	5.58	*1.09*	6.00	*0.98*	Same
Problem Solving	5.19	*1.35*	5.35	*1.30*	Same
Experi-mentation	5.03	*1.20*	5.50	*1.11*	Same
Evaluation	4.39	*1.43*	5.32	*1.39*	Co-located higher
Cohesion	5.65	*1.11*	6.00	*1.04*	Same

It was anticipated that the two types of teams would differ on many of the ratings. However, the data suggests that there is a dichotomy between the distributed and co-located teams on two fronts. The first is in *Trust and Conflict*. Co-located student teams, on average, rated their teams higher than the distributed teams. This issue of trust is of particular importance because it underlies several of the other social team effectiveness characteristics, including Interpersonal communications and Cohesion, although there was not a noticeable difference in the ratings of these between the two groups. The second team effectiveness characteristic is *Evaluation*, rated lower by distributed teams than co-located. Evaluation is a key element of team functioning, and effective teams typically assess their team functioning throughout a project in order to improve their overall effectiveness [21].

Consider these results from the point of view of a social versus task oriented style: If distributed teams are more task oriented, they would likely view themselves generally less able to handle issues like building trust and resolving conflict. Likewise, if co-located teams are more socially oriented, they might regard themselves as cohesive and "easy to work with," and generally believe that they are effective evaluators of their own team functioning, whether they actually are or not. This possibility is consistent with the findings.

Table 2 Average rating for each team effectiveness characteristic by "near" distant teams and "far" distant teams

	Avg. "Near" distant	***Std dev.***	**Avg. "Far" distant**	***Std dev.***	**Compare**
Goals & Obj.	6.19	*0.87*	6.00	*0.89*	
Utilization of Resources	5.71	*1.06*	5.33	*1.51*	Same
Trust & Conflict	5.43	*1.12*	5.00	*1.67*	Same
Leadership	5.38	*1.47*	5.33	*0.52*	Same
Control & Proc.	5.38	*1.20*	4.67	*1.21*	Near distant higher
Interpersonal Comm.	5.81	*0.98*	5.33	*1.51*	Same
Problem Solving	5.14	*1.42*	5.33	*1.63*	Same
Experi-mentation	5.19	*1.17*	4.83	*1.33*	Same
Evaluation	4.29	*1.65*	4.67	*1.03*	Same
Cohesion	5.81	*1.08*	5.50	*1.52*	Same

"Far" distant compared with "near" distant teams

The distributed group included 6 teams that had at least one distance member who was considered "near" enough to meet with their on-campus counterparts at least once during the project. The remaining 2 teams had at least one "far" distance member that prohibited the whole team from meeting in person. The average ratings of each group were compared in Table 2, and they were somewhat unexpectedly found to be quite comparable. Only one criteria, *Control and procedures,* was found to be more than 0.5 standard deviation apart between the cases. It was expected that the inability to meet face-to-face would cause "far" distant teams to rate many of the effectiveness criteria lower than the "near" distant teams, but in fact they generally did not. Control and procedures relates to a team's operational process and planning, and it makes intuitive sense that "far" distant teams would find it more difficult to establish satisfying working approaches than near distant teams, although it would also make sense that other task/procedure criteria such as evaluation and experimentation would also be rated lower by the "far" distant teams.

Table 3 Distributed teams. Spearman correlations between team effectiveness characteristics. Statistically significant correlations shown in Bold. For n=31, Rs = 0.356 for a=0.05, except for "interpersonal communication" where n = 30, Rs = 0.362 for a=0.05

	Utilization of Resources	Trust and Conflict	Leader-ship	Control & Proc.	Inter-personal Comm.	Decision-making	Experi-mentation	Evaluation	Cohesion
Goals and Objectives	**0.79**	**0.61**	**0.36**	**0.48**	**0.75**	0.30	0.11	0.26	**0.56**
Utilization of Resources	_	**0.54**	**0.37**	**0.53**	**0.67**	**0.39**	0.31	**0.40**	**0.60**
Trust and Conflict	_	_	**0.48**	**0.54**	**0.83**	**0.46**	0.23	0.19	**0.85**
Leadership	_	_	_	**0.52**	**0.58**	**0.51**	-0.02	0.33	0.29
Control and Procedures	_	_	_	_	**0.57**	**0.51**	0.30	0.29	**0.55**
Interpersonal Comm.	_	_	_	_	_	**0.63**	0.14	0.24	0.24
Decision-making	_	_	_	_	_	_	0.20	**0.41**	**0.41**
Experi-mentation	_	_	_	_	_	_	_	0.24	0.24
Evaluation	_	_	_	_	_	_	_	_	0.22
Cohesion	_	_	_	_	_	_	_	_	_

Correlations between team effectiveness criteria

Table 3 and Table 4 show the Spearman correlations between each of the 10 team effectiveness characteristics with each other for both the distributed and co-located cases. It would be expected that the 10 team effectiveness characteristics would generally have some level of interdependence between them. While the correlations shown in the tables do not demonstrate interdependence *per se*, they do show which tasks have links. These tables show a number of statistically significant correlations (in bold) between most of the effectiveness characteristics and each other, but not *Experimentation* and *Evaluation*. In the case of co-located teams, many correlations were shown between Experimentation and Evaluation and the remaining effectiveness characteristics. However, in the distributed case, there were no correlations (Experimentation) and only 2 correlations (Evaluation). Experimentation relates to a team's ability to vary their working approach and process during a project (not to be confused with their ability to experiment in a project), and seems to be a quality that is not consistent with the remaining criteria as it is in the co-located case. Evaluation relates to team operation and assessment, and individuals tend to rate it not as high as other criteria in the co-located case.

Table 4 Co-located teams. Spearman correlations between team effectiveness characteristics. Statistically significant correlations shown in Bold. For n=34, Rs = 0.340 for a=0.05

	Utilization of Resources	Trust and Conflict	Leader-ship	Control & Proc.	Inter-personal Comm.	Decision-making	Experi-mentation	Evaluation	Cohesion
Goals and Objectives	**0.52**	**0.44**	**0.38**	**0.55**	0.24	0.11	0.11	**0.47**	**0.54**
Utilization of Resources	_	**0.57**	**0.61**	**0.48**	**0.42**	0.34	0.19	**0.37**	**0.65**
Trust and Conflict	_	_	**0.55**	**0.57**	**0.70**	**0.36**	**0.39**	**0.46**	**0.65**
Leadership	_	_	_	**0.35**	**0.35**	0.32	0.25	0.33	**0.38**
Control and Procedures	_	_	_	_	**0.47**	**0.36**	**0.51**	**0.44**	**0.65**
Interpersonal Comm.	_	_	_	_	_	**0.40**	**0.51**	0.21	**0.56**
Decision-making	_	_	_	_	_	_	**0.41**	**0.58**	**0.58**
Experi-mentation	_	_	_	_	_	_	_	0.28	0.29
Evaluation	_	_	_	_	_	_	_	_	**0.51**
Cohesion	_	_	_	_	_	_	_	_	_

Other inconsistencies between distributed and co-located correlations are found in *Trust and Conflict* and *Control and Procedures*. For co-located teams, Trust and Conflict was statistically significantly correlated with every other characteristic, while there were two (Evaluation and Experimentation) that there were no significant correlations with for the distributed case. This same pattern is repeated for Control and Procedures. No other team effectiveness characteristic had significant correlations with each and every other characteristic. This suggests that, in co-located teams, these two characteristics play an important role in defining the way a team views what is valued in the way it carries out its work.

A team with a social orientation will view Trust and Conflict as very important, and it is conjectured that this high level of perceived cohesion means that the team feels the Controls and Procedures it has in place work well already, whether they are or not in reality. Likewise, a team with a task orientation view of projects will view their primary goal as completing their task at hand, leaving little extra time and energy to building trust (as in Trust and Conflict) or for outlining common control and procedures for team functioning. Instead of shoring up these aspects of team interaction, a task oriented team will spend that time and effort on completing that task itself.

It should be noted that the socially influenced outlook of co-located teams was pronounced only through contrast and comparison with the distributed teams. Looking at the results of co-located teams alone, there would be no suggestion that the teams might have a particular view on how they view their work.

Meeting frequency

The distributed class, on average, met 3.66 times per month with their team. The co-located teams, on average, met slightly more frequently at 3.88 times per month. Interestingly, for the co-located teams, there are statistically significant correlations between every team effectiveness criteria (except goals) and meeting frequency – the more often a team met, the higher rated the criteria. No such significant correlations between any of the team effectiveness criteria and meeting frequency were found for the distributed case. When the distributed teams met more often, it did not also mean an increase in team effectiveness ratings. This could be due to the nature of distributed team meetings held by the students. As suggested by others [7], distance meetings may lack the informal social cues associated with building trust and cohesion in teams, and simply increasing the frequency of such meetings may be not be sufficient for building this trust.

Team challenges

For both distributed and co-located teams, the most cited team challenges were "social loafing" and "team members unwilling to call others on their lapses in performance." For co-located teams, "team members put their own needs ahead the needs of the team as a whole inattention to results" was cited equally as often as "lapses in performance" as a problem. The fact that both groups noted the same major concerns about their teams is somewhat unexpected, but at the same time, these concerns relate to basic team functioning, regardless of collaboration technology.

For distributed teams, each member cited 1.32 team challenges while co-located teams cited fewer challenges on average (0.71). The overall average number of complaints per team member was higher for distributed teams than co-located (1.26 vs 0.73). However, the distributed class discussed team challenges in course material at length, and in general students were older and more experienced in working with others. This additional awareness of team challenges make have amplified the team members' sensitivity to them.

Discussion and conclusions

First, the research questions posed at the beginning of the paper are addressed:

Are there differences in the way distributed teams rate themselves on measures of team effectiveness as compared to co-located teams?

In this study, distributed teams rated themselves lower on average on only two of the measures, Trust and Conflict and Evaluation. In some sense, it might be expected that distributed teams would rate themselves lower on many more of the measures than the co-located teams. However, if the hypothesis that distributed teams are somewhat more task-oriented and co-located teams are more socially oriented is true, then it would likely be the case that co-located teams would rate themselves higher on Trust and Conflict than distributed teams in particular.

Are there any correlations between these measures that can suggest what aspects of teaming are of particular importance, as well as likely candidates for special attention in the classroom?

The expectation was that there would be interlinking between many of the effectiveness criteria, but distributed teams had less interlinking on Experimentation, Evaluation, Trust and Conflict, and Control and procedures. If a distributed has more of a task-focus, these results make some sense – distributed teams would be too focused on their work to assess much less vary their working procedures. And trust and conflict are characteristics that might be challenging to focus on in practice. In contrast, if a co-located team has a social orientation, they would certainly link Trust and Conflict with many more of aspects of teaming, and it may make such teams over confident in their facility with team working approach (Evaluation, experimentation, control).

What are some ways that "far" and "near" distant distributed teams in the classroom differ?

In this study, "far" and "near" distant teams differed only on one measure, Control and procedures. In which far distant teams rate themselves lower. This result was consistent with what might be expected for teams that have less opportunity to meet face to face.

Which common team challenges are most often cited by co-located and distributed teams in engineering courses?

Both cases cited the same top two concerns: Social loafing and inability to call others on their poor performance.

It should be noted that there are several potential confounding factors in this analysis. Distributed teams had specific coursework in teamwork and team dynamics, and might have been more sensitive to their performance as teams than the co-located teams, who had no training in teamwork. The distributed teams also tended to include members who were older and often had more work experience. Finally, the co-located teams were generally made up of individuals who were very familiar with each other, and this level of familiarity was less true for the distributed teams.

Implications

This study may have some implications for the classroom in the way educators prepare students for working in teams. Often, students are put in teams to give them a "real world" experience, but they are given little training or guidelines on how to operate as an effective group on a basic social level, much less help teams in trouble correct operational problems partway through a project. This very issue of providing adequate infrastructure and training is one of the reasons that teams fail as put forth by Hackman [23].

The results of this study are consistent with the hypothesis. Comparison of co-located student engineering teams with distributed teams suggests that co-located teams are more socially oriented while distributed are more task focused. The challenge for co-located teams is that they tend to mistake high cohesion for good working approach. If one's team seems to get along, one might conclude that there is no need to impose structure or process. This is not to say that cohesion is not an important facet of team functioning. In fact, it is critical to smooth team interaction. However, the cohesion of student teams in the classroom may be somewhat different than in the workplace. Student teams made up of members who already know each other from other courses or are friends may have difficulty in expressing task-based disagreement on work or working approach (also known as good conflict) for fear of embarrassing their fellow teammates [20]. The recommendation for co-located teams is to counter the (perhaps detrimental) social influence with additional task emphasis to help them perform more effectively as a team. Course instructors might, for example, institute frequent task-based deadlines (milestones) to keep teams focused on their work and reduce socialization. They may also encourage co-located student teams to present their work as a group to provide some social pressure for accomplishing work. In particular, teams that are self-selected may run the risk of having too much cohesion [24], and it may also be useful for teams to be formed specifically by instructors according to guidelines such as those proposed by Katzenbach and Smith [21]. One of their guidelines for effective teams is that they include individuals with three complementary skills, including technical/functional skills (engineering ability, for example), interpersonal skills (ability to interact with others), and decision-making skills (ability to solve problems and move the team along). When teams self select, they tend to focus on the interpersonal ("I picked my teammate because we're friends") or technical/functional skills ("I picked my teammate because she's aced the mid-term"), but less on decision-making skills that are critical to making a team succeed, or the right combination of all skills on a team. The interpersonal mix of teams might be further engineered through personality tests, as done by Wilde [25].

Likewise, the results of this study also suggest that distributed teams may have a task-oriented outlook. The sense of being separated by distance and time may help virtual teams keep a task focus by reducing the opportunity to have social interaction. The risk in virtual teams is that they may have too little cohesion. A phenomena in virtual teams is that of "face time." When other team members cannot personally observe remote members working, they may believe that these teammates are not doing work, whether or not they actually are. In the case of "near" distant teams, there may be opportunity to build social interaction through occasional meetings with all team members meeting face-to-face, but this is much more difficult with "far" distant teams who cannot meet in person in a classroom situation. It is more challenging to encourage a social orientation in distributed teams than it is to encourage a task orientation in co-located teams because of basic logistical and technical challenges of working at a distance.

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