The effect of different dimensions of conflict on measures of team-member effectiveness

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The Effect of Different Dimensions of Conflict on Measures of Team-Member Effectiveness

Lawrence M Strenger, Behzad Beigpourian, Matthew W. Ohland, Daniel M. Ferguson

Abstract

CONTEXT
Conflict in teams can have both positive and negative effects for teams. Too much conflict in teams can decrease team performance. Conflict is multidimensional, including task conflict, process conflict, and relationship conflict.

PURPOSE
In engineering classes, we want student teams to perform well. If conflict hinders their performance or perception of effectiveness, it will help to know which kind of conflict is of greatest importance. This will help instructors to identify which teams might require intervention.

METHODS
We collected data assessing the task, relationship, and process conflict of 81 teams in course at an Australian university. We also assessed how each team perceived their team members’ effectiveness and used stepwise multiple linear regression to explore which types of conflict have the greatest relationship to team-member effectiveness.

RESULTS
Process conflict had the greatest association with team-member perceived effectiveness, but both task and process conflict had a significant association. Both task and processes conflict negative impacted perceived effectiveness. Relationship conflict was not associated with team-member perceived effectiveness.

CONCLUSIONS
If students in teams cannot resolve process conflict to define responsibilities within the team, the team’s performance is likely to decrease. Scaffolding from instructors may reduce harmful (often process and relationship) conflict and help students understand the importance of necessary (often task) conflict.

KEYWORDS
Team-member effectiveness, task conflict, process conflict, relationship conflict
Introduction

Just like design or mathematics, teamwork is an important skill that universities try to teach their engineering students. For college level engineering programs to be recognized by the Accreditation Board for Engineering and Technology (ABET), graduating students should not just possess technical skills; the “ability to function on multidisciplinary teams” is also expected [1]. Thus, engineering instructors are encouraged to use teamwork in their classrooms.

However, when teams are formed, it is common for conflicts to occur and cause problems in teams [2], [3]. Conflicts between individuals or groups of individuals on a team can be quite complex. Team-based conflicts are typically categorized into three different groups: relationship conflict, task conflict, and process conflict [4]. Classification of a conflict is dependent upon what the disagreement pertains to. This paper examines how these types of conflicts impact the perceived effectiveness of engineering student teams.

Relationship conflict is typically due to personality differences among teammates or disagreements on issues which are not related to a team’s task [4]. Relationship conflict is usually expressed through tension, animosity, and annoyance between group members [5]. It can cause team members to spend more time focusing on off-task issues and make team members less cooperative and receptive to others’ ideas [4]. While there is conflicting research regarding the impact of other conflict types on performance, there is a broad consensus that relationship conflict has an adverse effect [6]–[8]. Relationship conflict is considered to negatively affect performance regardless of when it occurs in a team’s lifecycle [9].

Task conflict is the result of differences in opinion regarding the content of a group’s work [4]. This type of conflict reflects differing ideas within a group relating to how the team will fulfil its objectives. Task conflict is often considered to have a positive impact on team performance as the differing opinions make teams explore ideas further and come up with improved solutions [10]. Task conflict has also been found to be more effective when it is most prevalent in the middle of a team’s lifecycle [9]. Multiple studies support task conflict’s positive impact [5], [11]. However, there is conflicting research regarding the overall effect of task conflict, as some studies have found a negative correlation between task conflict and team performance [12], and recent research has helped explain the complexity in measuring the effect of task conflict [13].

Process conflict is the result of disagreements regarding the methods and operations a team uses to complete its tasks [5]. Process conflict is similar to task conflict as both are relevant to team goals. However, process conflict pertains more to the logistics of team actions than what these actions will ultimately accomplish. Process conflict relates to how resources are utilized and how responsibilities are distributed between individuals, while task conflict focuses on what these resources are used for and what these individuals are trying to accomplish. Process conflict often reflects inefficiency, unfair distributions of work, and a lack coordination between team members [14]. While some research has found that process conflicts which occur early in a
team’s lifecycle can improve team efficiency, in most studies, this form of conflict has been found to correlate negatively with team performance [2], [8], [9].

Studies have also found that the magnitude and direction of the relationship between the various conflict types and team performance is affected by a wide variety of situational factors. The way in which a conflict is handled, regardless of conflict type, greatly determines its relationship with team performance [15]. Virga and colleagues found that the detrimental effects of relationship conflict were reduced when the individuals involved were conscientious or neurotic (Virga et al., 2014). Jehn’s work, “A Multimethod Examination of the Benefits and Detriments of Intragroup Conflict”, found that task conflict tended to have negative effects on groups with routine tasks and positive impacts on teams with non-routine work [5]. Task conflict’s impact on performance has also been found to be dependent upon how the conflict is addressed and the levels of trust and cooperation within a group [16], [17]. The team’s purpose and the length of its lifetime can affect conflict and productivity’s relationship as well. In their meta-analysis, O’Neill and colleagues found relationship and process conflict to be most detrimental for organizational teams and least detrimental for laboratory teams; they also found that teams which have a larger lifetime are more negatively impacted by these forms of conflict [8].

The medium over which a group communicates can also affect the relationship between conflict types and performances. The study “Relationship, task and process conflicts on team performance: The moderating role of communication media” found that process and task conflict generally have a positive effect on teams communicating face to face, but a negative impact on teams communicating via computer messaging; it also found that process conflict reduced the performance of teams communicating through a video conference medium, while task conflict did not have a significant effect on these teams [18].

Studies have also found many interactions between the various types of conflict. De Wit and colleagues found task conflict to have a more negative effect on a team when it coincides with significant process and relationship conflict [19]. The same study also found relationship conflict more detrimental to performance when it is paired with process conflict. These findings have been attributed to the fact that process and relationship conflicts likely increase frustration between team members, making all forms of disagreement more toxic. The study also found that process and relationship conflicts have a very high intercorrelation. Additional studies have found evidence of a significant intercorrelation between task and relationship conflict as well [6], [20], [21]. O’Neill and colleague’s meta-analysis found that relationship and process conflict in student-based teams have a relatively large negative effect on performance (ρ of -.17 and .11 respectively) while task conflict’s effect was much less significant (ρ of -.04) [8]. The study also found that student teams were more negatively affected by relationship and process conflict than laboratory teams, but less affected than organizational teams; task conflict’s effect on student teams was less significant than its effect on both organizational and laboratory teams. In 2017, Yen Hsu examined the relationships among team conflict, trust, work values, and cooperation for software engineering teams in industry. The study found all types of conflict to have a negative correlation with team trust and cooperation [22].
This paper’s study examines the relationship between the various forms of conflicts and the perceived team-member effectiveness of students in engineering teams. Due to the many factors of variability and the interactions between the conflict types, it is unlikely the conclusions of less targeted investigations will adequately reflect the dynamics of conflict and team performance specific to student engineering teams. Studies which focus on student teams and engineering teams will provide the most relevant results. In addition, while a large amount of past research examines conflicts effects on “performance”, this study examines the effect on team member “effectiveness”. The two concepts are very similar, but the major difference is team performance generally relates to the quality of the result of a team’s work while team effectiveness relates to how well a team works together.

Methods

Data was collected using the CATME system for forming and managing teams, through its peer evaluation instrument [23]. This report examines data from a junior level design engineering course. In this class, 320 students on 81 teams completed the surveys. The class demographics are shown in tables 1 and 2 below. The course lasted one semester, and the students were required to participate in three CATME peer evaluations at various points in the term. This report examines the only the responses from the first evaluation. The data represents the level of task conflict, process conflict, relationship conflict, and perceived effectiveness within all 81 teams at that point in the semester.

<table>
<thead>
<tr>
<th>Gender</th>
<th>Number</th>
<th>Percent (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>50</td>
<td>15.6</td>
</tr>
<tr>
<td>Male</td>
<td>187</td>
<td>58.4</td>
</tr>
<tr>
<td>Other</td>
<td>3</td>
<td>.9</td>
</tr>
<tr>
<td>Declined to answer</td>
<td>80</td>
<td>25.0</td>
</tr>
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Table 1. Gender distribution in sample

<table>
<thead>
<tr>
<th>Race/ethnicity</th>
<th>Number</th>
<th>Percent (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asian</td>
<td>128</td>
<td>40.0</td>
</tr>
<tr>
<td>Black</td>
<td>2</td>
<td>.6</td>
</tr>
<tr>
<td>Hispanic</td>
<td>15</td>
<td>4.7</td>
</tr>
<tr>
<td>American Indian or Alaskan Native</td>
<td>1</td>
<td>.3</td>
</tr>
</tbody>
</table>
In CATME peer evaluations, students evaluate their teammates’ effectiveness in five dimensions of teamwork: contributing to team’s work; having relevant knowledge, skills, and abilities; interacting with teammates; expecting quality; and keeping the team on track [23]. The instrument uses a behaviourally anchored rating scale (BARS). The BARS format provides brief descriptions of the expected behaviours of a teammate at five different levels of effectiveness. A student categorizes their teammates and themselves based which description in the close most closely aligns with their effectiveness. A value from one to five was assigned to each level of the scale, with a score of 1 representing minimal effectiveness and a score of 5 optimal effectiveness. A student would evaluate all other members and themselves in these dimensions. To quantify how team-member effectiveness was collectively perceived by all the members of a team, these ratings were then averaged across all dimensions and all members of a team. It is important to stress that this score estimates team member effectiveness based on the team member perceptions.

The CATME peer evaluations also asked a series of questions designed to evaluate the levels of the various conflict types within a team. Three different questions are asked about each of the three conflict types. These questions were taken from Jehn and Mannix’s study, “The Dynamic Nature of Conflict: A Longitudinal Study of Intragroup Conflict and Group Performance” in which they use these questions measure the various conflict types for groups in masters level management courses [9]. The full questions are listed in this study’s appendix. The students’ responses were based on a five-point Likert scale. Agreement with the questions is designed to reflect conflict within a group, so high scores reflect high levels of conflict in a group. For each conflict type, team responses were averaged to get a quantitative value for the teams’ task, process, and relationship conflict.

Some students failed to respond all questions in the peer evaluation. The questions they ignored were not factored into the team’s average score.

Results

After attaining the quantitative values for the perceived effectiveness and conflicts in student teams, a backward stepwise multiple linear regression was used to determine how the various conflict values affect the perceived team effectiveness with a \( p < .05 \) representing significance. The data set met all regression assumptions. The data reflected linearity and homoscedasticity, there was no multicollinearity, and the residuals reflected normality.
Results are summarized in Table 3. The initial multiple regression model (step 1) with all conflict types found both task and process conflict to be significant predictors of perceived effectiveness. Relationship conflict was not found to be significant in the model, so it was removed from the regression model. In step 2, both process and task conflict were again found to be significant, making this the final regression model. In the model, both process conflict ($\beta = -0.303$) and task conflict ($\beta = -0.235$) were found to be negative predictors for perceived effectiveness with process conflict having the largest effect. The regression equation for determining perceived effectiveness from conflict values is as follows:

Team member effectiveness = 5.254 - 0.376 (Process Conflict) - 0.458 (Task Conflict)

### Table 3.

*Perceived effectiveness of students based on the tasks, process, and relationship conflict*

#### Step 1: Initial Regression with task, process, and relationship conflict

<table>
<thead>
<tr>
<th>Variable</th>
<th>$B$</th>
<th>SE $B$</th>
<th>$\beta$</th>
<th>$R^2$</th>
<th>$F$ for change in $R^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>5.254*</td>
<td>0.297</td>
<td>_</td>
<td>0.237</td>
<td>7.961</td>
</tr>
<tr>
<td>Task Conflict</td>
<td>-0.362*</td>
<td>0.173</td>
<td>-0.235</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Process Conflict</td>
<td>-0.425*</td>
<td>0.174</td>
<td>-0.303</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relationship Conflict</td>
<td>-0.102</td>
<td>0.250</td>
<td>-0.050</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Step 2: Final Regression with only task and process conflict

<table>
<thead>
<tr>
<th>Variable</th>
<th>$B$</th>
<th>SE $B$</th>
<th>$\beta$</th>
<th>$R^2$</th>
<th>$F$ for change in $R^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>5.254*</td>
<td>0.297</td>
<td>_</td>
<td>0.235</td>
<td>11.988</td>
</tr>
<tr>
<td>Task Conflict</td>
<td>-0.376*</td>
<td>0.173</td>
<td>-0.244</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Process Conflict</td>
<td>-0.458*</td>
<td>0.174</td>
<td>-0.327</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

$Note$: $B$ is unstandardized beta, SE $B$ is the standard error for the unstandardized beta, and $\beta$ is the standardized beta. *$p < .05$. This data comes from a total of 81 observations.

### Discussion

The most immediate point is that the regression equation seems to have a very large intercept value for something measured on a five-point scale. It almost appears as if a team with
nearly zero process conflict and task conflict would have a score larger than 5 on a 5-point scale. However, the minimum score for each type of conflict is 1.0, which would predict an average team-member effectiveness rating of 4.42. This isn’t a surprising result for a team with very little conflict of either type.

This study was designed to see how the various types of conflict impact the perceived team-member effectiveness of students in engineering teams. The peer evaluation data indicates that task conflict and process conflict have a significant negative relationship with perceived effectiveness. While this study cannot prove causality between these conflicts and the perceived effectiveness, it is possible that the presence of task and process conflict results in members having a worse perception of team effectiveness. This study’s focus on perception may be the reason for some differences between its results and those of past research. Although the results found task conflict to have a negative relationship with perceived effectiveness, it is possible that this may reflect how task conflict affects students’ enthusiasm and optimism, rather than how it affects their effectiveness more broadly (though overall effectiveness and performance might suffer as a secondary effect).

This study’s findings also show that relationship conflict is not significantly associated with perceived team-member effectiveness in student engineering teams. These findings disagree with those of many similar studies which have found that relationship conflict correlates negatively with perceived effectiveness [6]–[8]. It may be that the task orientation of engineering students diminishes the effect of relationship conflict in engineering teams [24].

These findings suggest that to improve students’ perceived effectiveness, instructors should give the most attention to resolving task and process conflicts in engineering student teams.

**Conclusion**

This study intended to examine how various forms of conflict in research affect the perceived effectiveness of a team. Past research has found that conflict’s effects on perceived team effectiveness are situational, varying based on factors like team lifetime and team composition. Student engineering teams share more similarities in their tasks, their composition, and their lifetime with each other than with other types of teams. Focusing solely on student engineering teams reduces variability compared to those of studies considering all types of groups.

The results of this study suggest that engineering students’ views of team-member effectiveness are significantly related to the amount of task conflict they encounter. While some past research has indicated that team effectiveness improves due to task conflict, and this form of conflict should be encouraged, it does not appear that students feel this way while working in engineering teams. It is possible that engineering students are so focused on task completion that they do not understand the positive effects of task conflict. When students experience task
conflict within their team, many may assume it is counterproductive, causing it to negatively affect their perception of team member effectiveness. In courses involving student teams, instructors should endeavour to explain the benefits of task conflict, so students do not assume it solely reflects dysfunction.

Like task conflict, process conflict was found to negatively impact perceived effectiveness on student engineering teams. These findings correspond with the conclusions of many past studies regarding process conflict’s negative impact on team performance. Due to this correspondence, it is likely that the decrease in the students’ perceived effectiveness with process conflict is representative of a decrease in real team performance. Instructors should be aware of and address process conflict on their student teams as it appears to have the most clear negative impact on student teams’ perceived and actual effectiveness according to the findings of this study and past research.

Limitations and Future Research

While this study measures student engineering teams’ perceived effectiveness and conflict and examines the relationship between these characterises, the research should not be considered reflective of how conflict types affect teams’ true level of productivity. Further study could focus on measuring the true performance of teams. Another topic future research could examine is the relationship between team satisfaction and perceived effectiveness in order to gain a greater understanding of how satisfaction may have impacted the relationships observed in these engineering teams.

This study does not account for how other factors may have impacted the relationship between perceived effectiveness and conflict types over the semester. The team’s task has been found to influence conflict’s relationship with perceived effectiveness [5]. The teams were expected to work on many different tasks over the course of the semester. While this research tries to minimize this effect on the data by only taking the results from the first evaluation of the semester, it is still possible that teams progressed to different points in projects and worked on different assignments even if the CATME assessment taken at the same time. This may have affected the relationship between the conflict types and effectiveness. The study also does not account for the impact of the methods which teams use to address their conflicts; recent studies have found that the way a team deals with a conflict changes the effect that the conflict has on their performance [15]. An additional topic of future research could be examining how various conflict management methods impact conflict’s relationship with perceived effectiveness.

This study’s sample size was not large or diverse enough to assume this model is applicable to all student engineering teams. The data was taken from a single course at one Australian university. It is therefore possible that the atmosphere and culture of this university and class could yield results which are not applicable to other schools and courses. Furthermore, the class primarily consisted of Asian and White males. As students with different cultural and demographic backgrounds may perceive conflict differently, the sample’s lack of diversity may
impact the results. In future research, similar studies should be done at different universities with more diverse samples to see if they yield similar results to those of this study. It is also a limitation that the racial/ethnic composition of the participants was measured using classifications typical of demographic measurement in the United States. Aboriginal Australians were not included as a racial/demographic category, but it is possible many students from this background were part of this study.

Finally, this study analyses the various types of conflicts’ relationships with perceived effectiveness using linear regression analysis. While a linear model provides an adequate simplistic representation of each conflict’s impact, its lack of sophistication limits the scope and applicability of these results. Linear regression assumes a conflict will have the same impact regardless of when it occurs in a team’s lifecycle, but past research has shown that this is not the case [9].

References:


Work Group Diversity, Conflict, and Performance

Author(s): Lisa Hope Pelled, Kathleen M. Eisenhardt and Katherine R. Xin

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<table>
<thead>
<tr>
<th>Question Type</th>
<th>Sub-Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>Task Conflict [9]</td>
<td>How much conflict of ideas is there in your work group?</td>
</tr>
<tr>
<td></td>
<td>How frequently do you have disagreements within your work group about the task of the project you are working on?</td>
</tr>
<tr>
<td></td>
<td>How often do people in your work group have conflicting opinions about the project you are working on?</td>
</tr>
<tr>
<td>Relationship Conflict [9]</td>
<td>How much relationship tension is there in your work group?</td>
</tr>
<tr>
<td></td>
<td>How often do people get angry while working in your group?</td>
</tr>
<tr>
<td></td>
<td>How much emotional conflict is there in your work group?</td>
</tr>
<tr>
<td>Process Conflict [9]</td>
<td>How often are there disagreements about who should do what in your work group?</td>
</tr>
<tr>
<td></td>
<td>How much conflict is there in your group about task responsibilities? (reversed scale)</td>
</tr>
<tr>
<td></td>
<td>How often do you disagree about resource allocation in your work group? (reversed scale)</td>
</tr>
</tbody>
</table>