Conflict, Culture, and Performance in Virtual Teams: Results from a Cross-cultural Study

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Abstract
The relationship between different types of conflict and performance in virtual teams is still unclear. Therefore, this paper tries to shed light on the relationship between conflict and team performance as well as the moderating role of culture. Using survey and archival data of 1,683 virtual teams from 23 countries from a massively multiplayer online game (MMOG), this study’s findings show that task conflict is positively related to team performance while process conflict is negatively related to team performance. Furthermore, while collectivistic culture is positively related to performance, it also moderates the conflict-performance relationship. Whereas the team performance of collectivistic teams is highly affected by both types of conflict, team performance of individualistic teams is hardly affected by task conflict and almost not affected by process conflict. We provide a detailed discussion of our findings in the conclusion of the paper and highlight the implications for both research and practice.

1. Introduction
Continuous advances in information and communication technologies (ICT) offer new opportunities for geographically distributed work. Today, an increasing number of organizations and corporations is relying on technology-enabled distributed teams [41]. Though these teams are often difficult to manage and often don’t meet the expectations concerning their performance goals. Even though many scholars have studied the dynamics of distributed team work [11], the results regarding virtual team dynamics are not yet conclusive. In particular, it is unclear if and how the dynamics which are found in virtual teams can be explained or predicted by existing models of traditional teams. In this paper we use the term “virtual team” for our study of distributed teams. Although the defining elements of a virtual team are not yet finally determined [8], a minimum consensus in the literature is that a virtual team consists of (a) two or more members who (b) work together interactively in order to reach joint goals, while (c) at least one person works at a different location, organization or at a different time so that (d) communication and coordination of work are predominantly based on ICT media. The importance of conflict in teams prior to decision making has long been stated by researchers [32]. Scholars have consistently argued that some phenomena like conflict occurring in traditional teams can be higher on geographically distributed teams compared to collocated teams [44] [15] [40] and high levels of conflict have been shown in distributed teams [4]. Communication in virtual teams, besides the growing advances in technology, still requires a great deal of effort [56]. Gestures and nonverbal nuances are not easily captured or transmitted what makes interaction and consensus building difficult [56]. These communication and coordination difficulties create great potential for conflict in virtual teams [22]. On the other hand, research also finds that virtuality can reduce team process losses associated with conflicts commonly experienced by face-to-face teams [36]. However, the extent and effects of conflict in virtual teams have been found to depend on several factors. The members’ perception of having a common group identity within virtual teams lowered the amount of conflict [44] while the ability of virtual teams to manage their conflict depended on how teams adapted their virtual technology to handle their conflict [48]. Other studies found that female team members of virtual teams perceived group conflict as more readily resolved than male members [38]. Regarding the conflict resolution, studies found that successful virtual teams tend to manage their internal conflict by using
either competitive or collaborative conflict management styles [43] where collaborative conflict management styles have a positive impact on satisfaction, perceived decision quality, and participation [46]. When looking at virtual teams in several countries, the culture of the team members has to be taken into consideration. Individuals from different cultures differ regarding their communication and group behaviors [23]. Hence, as cultural values affect cooperation [3], culture is seen as one of the challenges virtual teams face. Thus, while there are certainly many potential interesting factors to study about virtual teams, we focus on different types of conflict and its effect on performance of virtual teams and on the moderating role of culture. We focus on conflict because previous research suggests that virtual teams find conflict not only common, but especially difficult to isolate and handle [15] [40]. Influenced by Jehn’s [26] typology of intragroup conflict, research has largely focused on distinguishing different conflict types, most notably task versus relationship conflict [37]. In her later work, Jehn [27] added a third type of conflict, process conflict, which has so far not been studied as intensely. We concentrate on isolating two different types of conflict (task and process conflict) and investigate their influence on performance in a virtual context. Understanding these influences and relationships is, in our opinion, a necessary antecedent to build the adequate management styles. We draw on three streams of research to formulate our hypotheses regarding the influence of different types of conflict on performance in a virtual team. First, we draw on streams of literature regarding different types of conflict [32] [6] and their implications for different outcomes such as performance and satisfaction [30] [27]. Second, we investigate the moderating influence of culture [20] on the relationship of conflict and the outcome variables. Third, we rely on the literature on virtual teams to address the unique context and the challenges it poses to the management of conflict [35]. Our study is guided by three questions: First, how do different types of conflict, namely task and process conflict, influence the team performance of a virtual team? Second, how does culture affect team performance? Third, how might culture influence the relationships between both types of conflict and performance? In pursuing these questions, we seek to bring empirical evidence to bear on the virtual team dynamics regarding conflict, culture, and performance with the team. Presently to the best of our knowledge, these relationships have not been studied in the context of an MMOG regarding virtual teams. In addition to contributing to the literature on virtual teams by investigating the influence of culture, our research also contributes to the literature on conflict by looking at the different types of conflict, especially as process conflict has not been investigated in many empirical studies, and its effect on team performance in virtual teams is unknown so far. We approach our research questions by using the unique advantages of an online game. These games are said to be natural laboratories for studying virtual teams in their environment [2]. This context allows us to obtain objective team output data as well as perceptual data in a setting in which participants are highly engaged over an extended period of time. Team members in this setting are physically dispersed and interact through the use of computer-mediated communication technologies. The remainder of this paper is organized as follows. First, we give an overview of the relevant literature. Next, our theory and hypotheses are presented, followed by a description of the research method. We then display the results of our study. Finally, the study’s results, contributions of and limitations are discussed.

2. Theoretical foundations and hypotheses

2.1 Conflict

There are three main types of conflict, relationship conflict, task conflict, and process conflict differing in their object of disagreement. While relationship conflict is a perception of personal antipathies and incompatibility between individuals [25] task conflict is said to be a perception of disagreements among individuals about the content of their decisions, tasks, objectives and procedures. The interaction between task conflict and relationship conflict and their implications on different outcomes has been studied for years [32]. Research on conflict has demonstrated the negative effects relationship conflict has on group effectiveness [6]. While task conflict has been studied for years, process conflict is not yet as established [16]. Thus, to gain further insights into these types of conflict, we concentrate on task and process conflict. We define conflict as the experience between or among individuals that their goals or interests are incompatible or in opposition to one-another [37].

2.1.1 Task conflict

The term task conflict refers to people being aware of differences in their opinions about tasks. Task conflict also implies conflict about ideas [1]. Even though task conflict may come with intense discussions about tasks and also excitement, this type of conflict is not associated with such negative personal outcomes
and emotions as is relationship conflict. Although the effect of relationship conflict on performance is mostly claimed to be negative [30] [27], the relationship between task conflict and performance is less clear. A meta-analysis suggests that these inconsistent findings regarding task conflict and performance can to some extent be explained by the task type: Teams facing highly complex tasks appear to be less impaired by task conflict [6] [16]. Yet, the empirical results of studies examining the relationship between task conflict and outcomes such as performance are not consistent and often contradictory [39]. Some studies report a positive relationship between task conflict and performance [26] [47] [1] [25]. Task conflict can improve the quality of decision. This can occur due to different reasons: The interaction due to differences in points of view and opinions may improve the outcome compared to the individual perspectives [51] and task conflict may promote communication and the consideration of alternatives [28] [44]. The positive impact of a moderate level of task conflict on performance has been shown several times, depending on the types of tasks involved [26] [52]. When regarding and researching task types, findings suggest that complex cognitive tasks enable teams to benefit from task conflict, since the different opinions about the work and the exchange of ideas may generate higher outcomes [32] [26]. Groups who experience task conflict therefore make better decisions, since this type of conflict may encourage greater understanding of the issues being considered [53]. Other studies have reported that the groups did not benefit from the advantage of different viewpoints on a task [14] [30]. Although many studies observe a positive effect, task conflict does not always lead to better performance. Studies of student teams have reported a negative relationship between task conflict and performance [29]. Research also has demonstrated that task conflict is only beneficial to teams when it is not complicated by, and does not degenerate into, affective or process conflict [31]. Some studies found that while task conflict had a positive impact on performance in traditional teams, this relationship was not true for virtual teams [15]. Other studies found a negative relationship between task conflict and performance [6] [26] [58] or did not find any relationship between the two variables at all [7] [30]. Thus, although task conflict has the potential to be beneficial for outcomes, research suggests it must be managed carefully through open, collaborative communication [15].

Regarding these inconsistent results, this study should shed light on these relationships in a virtual context. Regarding the literature discussed above, we believe that our context, namely an MMOG and the virtual teams in this game, is highly complex. As mentioned, groups may benefit from task conflict when they work on complex tasks, because it can increase the consideration of alternatives and viewpoints [28] [44]. However, virtual teams using computer-mediated communication technologies must use more time and effort than face-to-face groups to express their opinions and viewpoints. In spite of this inconsistency, we consider task conflict to be beneficial to the group’s performance of the virtual teams. Therefore, we hypothesize the following:

\[ H_1: \text{Task conflict in a virtual team is positively related to team performance.} \]

2.1.2 Process conflict

Studies have identified a third type of conflict, namely process conflict [27] [33]. Process conflict can be defined as conflict about how things should be handled and how to proceed in order to accomplish tasks. It handles issues such as resource delegation and duties. This type of conflict is the least examined type, since so far studies mainly concentrated more on task and relationship conflict. Process conflict has been shown to decrease productivity [24] and foster the likelihood to abandon the team [32]. The logic behind this relationship is that when a group argues about responsibilities and duties, individuals are dissatisfied with the uncertainty caused by the process conflict and feel a greater desire to exit the group [32]. In addition, process conflicts interfere with task quality and often lead the focus to irrelevant discussions on the capabilities of team members [27]. Subsequently, discussions about task assignments in groups lead to ineffective work performance [33]. Process conflict is not yet as established as task and relationship conflict [16], which is why this study examines this third type of conflict in combination with task conflict in the virtual context. Therefore we hypothesize the following:

\[ H_2: \text{Process conflict in a virtual team is negatively related to team performance.} \]

2.2 Culture

Cultural values can affect cooperation [3]. Of the various cultural values identified, the one which has arguably received the most attention is individualism-collectivism. In individualistic cultures, the needs, values, and goals of individuals take precedence over those of the group, whereas in collectivistic cultures, the needs, values, and goals of the group take precedence over those of the individual [13]. Variations in individualism-collectivism should influence personal tendencies to cooperate in group situations. For individualists, cooperation should prove
attractive only if working with others leads to personal benefits that cannot be obtained by working alone. In other instances, cooperative contributions to group performance and well-being have the effect of diminishing personal resources that could otherwise be directed towards more personally satisfying pursuits. In contrast, cooperation is consistent with the self-definition of collectivists who favor the pursuit of group interests [60]. Culture can therefore directly affect the level of cooperation. A general consensus in research is that collectivists tend to be more cooperative, whereas individualists are more competitive [42]. Collectivist's tendency to display cooperative behavior in a group setting contributes to differences in performance [34] [3]. Working with others in a group and making contributions to the team performance helps collectivists in their self-fulfillment and strengthens their group identity, while individualists view their contributions to groups as being less important [10]. Members from individualistic cultures improve their performance more because of the recognition they get for it, while members from collectivistic cultures improve their performance because of the gains for their group [61] [9]. Culture can also affect cooperation through the mediation of certain cooperation mechanisms. The insertion of mechanisms between culture and cooperation helps to explain why collectivists cooperate more than individualists do (for example, one can say that collectivists tend to share common goals and have stronger group identity). Following the line of reasoning, we hypothesize the following:

$H_4$: Culture in a virtual team is related to team performance such that collectivist teams have higher levels of team performance than individualistic teams.

The relationship between conflict and group outcomes such as performance needs to take the moderator roles of other variables into consideration [6] [31]. Culture influences the interpretation and reaction to conflict [37]. The present study seeks to improve the understanding of the relationship between conflict and team performance by testing not only the direct effects but also the moderating role of culture. Individualism as one dimension of culture has been identified as particularly relevant in the context of study teams [55]. Individualistic cultures operate more from the “outcome-oriented” model of conflict in terms of seeing conflict as closely related to the outcome [59]. Literature agrees that members of collectivist cultures place a high value on in-group harmony [19]. The preference for harmony among members of some collectivist cultures leads them to perceive disagreements as differences in opinion, which would not be considered as disagreements by members of cultures where diversity of opinion is more positively valued [54]. Results for the country as moderator variable showed that conflict had weaker correlations with team performance in studies conducted in the US than in studies conducted in the Netherlands [6]. They argue that the Netherlands value harmony and consensus higher, while in the US power, autonomy and independence are more valued. The findings indicate that when harmony and consensus are highly valued, conflict has a stronger impact on performance [6]. Therefore we hypothesize the following:

$H_5$: Culture of a virtual team moderates the relationship between task conflict and performance such that the positive impact of task conflict on performance will be stronger for collectivistic teams than for individualistic teams.

$H_6$: Culture of a virtual team moderates the relationship between process conflict and performance such that the negative impact of process conflict on performance will be stronger for collectivistic teams than for individualistic teams.

![Figure 1. The research model](image)

### 3. Method

#### 3.1 The Online Game Context

As described in an article in Science [2], scholars in the social sciences are beginning to discover the research potential of virtual worlds. Despite the fact that most research involving virtual gaming has been focused on anthropological ethnography and sociological participation observation [57], this virtual setting holds great potential for quantitative empirical research: the availability of a vast amount of behavioral data from users collected in an unobtrusive way. The context of an online game in this study has the advantage of being highly engaging and psychologically meaningful to participants compared to laboratory simulations [64] [62]. Often the relationship between players is compared to the relationship between co-workers in their real job [62]. Research shows that most players are older than was previously thought and likely to be more social than the common stereotype suggests [12] [64]. Yet, systematic and representative research has remained elusive and rare [63]. And even though researchers
admit that online games are not a perfect analogue to all aspects of organizations in the offline world (due to eventual guise of offline identities and sometimes lower stakes), online games do open a window into the future of real-world business leadership and offer a “sneak preview of tomorrows business world” [50].

Our data was derived from a popular browser based MMOG called Travian. The advantages of this game are manifold: On the one hand, it is free of charge. There are no subscription fees or initial costs, which opens the game to more casual players and not just “hard-core” gamers with a higher willingness to pay. On the other hand, being browser-based, it also lowers the entry barrier for new players, because no special client software needs to be installed on the computer. These factors provide for a broad user base and make it particularly interesting for scientific research. The game itself is a real-time strategy game (RTS). Players start out as chieftains of their own villages and seek to gain natural resources, build armies and expand their realms. The game is timed to last approximately one year, at which one entity being deemed the winner based on the fastest completion of a certain building called “wonder of the world”. The game is played with up to 25,000 users on one server, using scarce resources, and only one actor or team can win. Actors soon find themselves in a social dilemma [5] which is typical for the social dilemmas present in any organization that coordinates labor parts. The actors have to cooperate with other actors to protect their territory and resources and to successfully expand their realm. In the race to dominate, actors form teams of up to 60 members under a leading chieftain. Teamwork, diplomacy and negotiation skills play a crucial role in this context leading to complex team structures and interactions between and among teams. In the later stages of the game it becomes quite important for alliances to collaborate effectively, negotiate, and team up with other alliances. Alliance members become colleagues, and losing a village or contingents of soldiers causes real emotions, suggesting psychological involvement. Due to the characteristics of Travian, teams within Travian can be regarded as virtual teams following our definition.

3.2 Sample and Procedure

In our approach, we use data taken directly from the computer servers and enhance it with a questionnaire which is distributed to subscribed players in virtual teams. Specifically, we obtained the data from two sources: a survey sent to the team members and archival data from the log-files of the game server. We employed several sampling criteria. First, we used game servers that were running for around 200 days. This way we ensured that teams had been established and team membership was stable. Second, we restricted the sample to players who were part of a team, and excluded those playing alone. Third, we focused on players who were over 18 years of age. Using these criteria, we identified 1,683 teams with 11,295 members from 23 countries, namely Argentina, Austria, Bulgaria, Chile, China, Germany, Greece, Hong Kong, Hungary, Italy, Mexico, Norway, Poland, Portugal, Russia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, UK and USA. To make sure that we survey players with high levels of engagement in the game, we posted a link to the survey on the login page of the game for a relatively brief period of time – three days in May 2008. Therefore, since the professional playing of Travian requires players to log-on several times a day casual players who do not log onto the game regularly were less likely to be part of our sample. The questionnaire was only available for the players one time. In case they closed the questionnaire, they were not able to do it again. This way we ensured that no player could answer twice. The average age of the surveyed players was 28, ranging from 18 to 69 years and 19% of the sample was female. The average team size was 41 players ranging from 4 to 60 players.

3.3 Measures

**Dependent Variable.** The data on team performance was obtained directly from the log-files of the game server.

**Independent Variables.** The data on task conflict and process conflict was obtained from the members’ survey. The three items for task conflict and three items for process conflict were derived from Jehn and Mannix (2001) [32] and adjusted to the virtual context. The items were rated on a five-point Likert-type scale with anchors of “not at all” and “a great deal”. The measures showed acceptable reliabilities with Cronbach’s $\alpha = .80$ and $\alpha = .79$ respectively. Items were averaged to a single score per individual and the individual scores were aggregated to the team level. Corresponding ICC(1) values of 10% and 5% justified the aggregation. It is common in cross-cultural studies to compare countries known to differ on a given cultural value. However, this approach mixes up other country differences (e.g., economic, political, etc.) with differences in values. Moreover, a country’s border is relatively arbitrary: substantial differences in cultural values may be found within country, just as there may be similarities between countries. Accordingly, we adopted the approach employed in the GLOBE project where culture is assessed at the local (i.e., organizational) level. Individualism-collectivism was
assessed using the five-item in-group collectivism scale developed in the GLOBE project [20]. All items were rated on a five-point Likert-type scale with anchors of “strongly disagree” and “strongly agree”. The measure showed good reliability with Cronbach’s $\alpha = .80$. Items were averaged to a single score per individual and the individual scores were aggregated to the team level. Corresponding ICC(1) values of 15% justified the aggregation.

Control Variables. Data on gender, age and team tenure was obtained from the team member survey. Data on group size was obtained directly from the logs-files of the game.

4. Results

Players play in teams, and teams can be groups within countries. Thus, the players’ perception may be affected by grouping effects both at the team and the country level and therefore may not be independent of each other. The hypotheses involve predictors measured at only one level of analysis, the team, since we aggregated conflict and culture measures to the team level. These nested data structures call for hierarchical linear models (HLM) rather than ordinary least square (OLS) analysis [21] [49]. All predictors were standardized prior to hypotheses testing [17]. Table 1 shows means, standard deviations and correlations for study variables.

Table 1. Means, standard deviations and correlations for study variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>STD</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>28.32</td>
<td>4.10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>1.19</td>
<td>0.19</td>
<td>.05</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group Size</td>
<td>41.21</td>
<td>13.97</td>
<td>.00</td>
<td>-.16</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tenure</td>
<td>3.69</td>
<td>1.75</td>
<td>.03</td>
<td>-.15</td>
<td>.36</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Task Conflict</td>
<td>1.99</td>
<td>0.38</td>
<td>.10</td>
<td>-.06</td>
<td>.12</td>
<td>.15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Process Conflict</td>
<td>1.79</td>
<td>0.37</td>
<td>-.04</td>
<td>-.09</td>
<td>.07</td>
<td>.07</td>
<td>.69</td>
<td></td>
</tr>
<tr>
<td>Culture</td>
<td>5.13</td>
<td>0.65</td>
<td>.20</td>
<td>-.01</td>
<td>.17</td>
<td>.20</td>
<td>-.03</td>
<td>-.22</td>
</tr>
<tr>
<td>Team Performance</td>
<td>153332</td>
<td>177614</td>
<td>.08</td>
<td>-.17</td>
<td>.52</td>
<td>.63</td>
<td>.23</td>
<td>.10</td>
</tr>
</tbody>
</table>

* p < .05

Table 2 shows the results of HLM analyses for the predictors of team performance. Hypothesis 1 predicted that task conflict in a virtual team is positively related to team performance. As indicated in table 2, this hypothesis was supported ($\gamma = 30293, t = 6.77, p < .001$). Hypotheses 2 regarding the negative relationship between process conflict and team performance, was also supported ($\gamma = -11106, t = -2.56, p < .05$). Hypothesis 3, regarding the positive relationship between collectivistic culture and team performance, was also supported ($\gamma = 21646, t = 6.33, p < .001$). Hypothesis 4 stated that the positive relationship between task conflict and virtual team performance is moderated by culture. The interaction testing of this hypothesis was significant ($\gamma = 18662, t = 4.70, p < .001$). Hypothesis 5 stated that the negative relationship between process conflict and virtual team performance is moderated by culture. The interaction testing of this hypothesis was significant ($\gamma = -8604, t = -2.38, p < .05$). To interpret the results of the moderation hypotheses, we estimated the simple slopes for the relationship between task conflict and team performance, as well as for process conflict and team performance for teams 1 s.d. above and below the mean culture. The slopes plotted in Figure 2 and 3 illustrate the hypothesized relationships.

5. Discussion

This study provides support for all hypotheses. Task conflict positively influences the performance of a virtual team while process conflict negatively influences the team performance. These results are in line with previous research on conflict in teams. Still there is not much clarity about the role of task conflict on performance. As mentioned before some studies report a positive relationship between task conflict and performance [26] [47], while others report that groups did not benefit from the advantage of different viewpoints on a task [14] [30]. Our study demonstrated that in a virtual team environment where communication is computer-mediated and team members are dispersed but work together on a joint task, task conflict positively influences team performance. This is especially important concerning conflict management styles and virtual team leadership. Conflicts about tasks and ideas can be seen as beneficial to team performance. This should be taken into consideration when leading a virtual team especially since process conflict, on the other hand, negatively influences performance in this study. Hence, it is important to distinguish between conflict about tasks and procedures on the one hand and
conflict about duties on the other. While the first might be encouraged by the leader, the second should be avoided. Nevertheless, culture as observed in our study has to be taken into account when looking at conflict and working within virtual teams, may they be global or homogenous teams. As shown in our study, collectivistic-individualistic value orientation influences the relationship between conflict types and performance. As hypothesized, teams with a collectivistic culture are more influenced by conflict than teams with an individualistic culture, as demonstrated in figures 2 and 3. Task conflict was positively influenced by both orientations, affecting teams high in collectivism to a greater extent. Teams high in individualism are almost not affected by process conflict at all regarding team performance, while teams high in collectivism are highly impaired by process conflict. These results imply important insights that are valuable for the leadership and functioning of virtual teams. Conflict about ideas positively influences the performance of a virtual team that is high in individualism and even stronger of a virtual team that is high in collectivism. Conflict about how things should be handled negatively influenced performance for collectivistic teams but did not really have an impact on performance for individualistic teams. Team leaders should therefore take into consideration the culture of their team members. Especially in collectivistic orientated cultures, process conflict should be strongly avoided and task conflict should be encouraged. In individualistic cultures, task conflict may be encouraged by team leaders while process conflict need not necessarily be focus of attention.

Table 2. HLM results for team performance

<table>
<thead>
<tr>
<th></th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 2 Intercept</td>
<td>157399 (9684) ***</td>
<td>157434 (10048) ***</td>
<td>156171 (9931) ***</td>
</tr>
<tr>
<td>Level 1 Age</td>
<td>10540 (3146) ***</td>
<td>7249 (3103) *</td>
<td>6732 (3085) *</td>
</tr>
<tr>
<td>Gender</td>
<td>-14568 (3043) ***</td>
<td>-14387 (2978) ***</td>
<td>-14423 (2958) ***</td>
</tr>
<tr>
<td>Group Size</td>
<td>60121 (3322) ***</td>
<td>54528 (3306) ***</td>
<td>54215 (3296) ***</td>
</tr>
<tr>
<td>Tenure</td>
<td>89132 (3464) ***</td>
<td>79664 (3557) ***</td>
<td>78175 (3546) ***</td>
</tr>
<tr>
<td>Task Conflict</td>
<td>29239 (4498) ***</td>
<td>30293 (4473) ***</td>
<td>30239 (4436) *</td>
</tr>
<tr>
<td>Process Conflict</td>
<td>-11774 (3431) **</td>
<td>-11106 (4336) *</td>
<td>20225 (3431) ***</td>
</tr>
<tr>
<td>Culture</td>
<td>20225 (3431) ***</td>
<td>18662 (3967) ***</td>
<td>-8604 (3622) *</td>
</tr>
<tr>
<td>Task x Culture</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Process x Culture</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R²</td>
<td>.51</td>
<td>.53</td>
<td>.54</td>
</tr>
</tbody>
</table>

Note. Unstandardized parameter estimates are reported in the body of the table, with standard errors reported in parentheses.

* To provide an effect size comparable with moderator research [18], R²’s are estimated from ordinary least squares (OLS) regression that include a manager fixed effect.

* p < .05, ** p < .01, *** p < .001

Figure 2. Simple slopes for the interaction of culture and task conflict

Figure 3. Simple slopes for the interaction of culture and process conflict
6. Limitations and future research

A few limitations are worth noting. First, we employed a correlational design, which limits our ability to draw causal conclusions. However, this limitation is offset by the use of multiple sources of data and the temporal separation of survey data and performance data, which both mitigate self-report bias and reverse causality. In contrast to teams in actual work settings, this study was conducted in the context of a game, which may limit the extent to which the findings can be generalized. However, like many MMOGs, this particular game is highly engaging and requires many of the team-related skills and behaviors needed in virtual teams at work. Moreover, there are few technical and expertise barriers to playing the game, so the population is likely to be similar to the general population of computer literate adults who would be engaged in virtual teams at work. Furthermore, the items of task conflict and process conflict were highly correlated. This has already been shown several times for the distinction between task conflict and relationship conflict [53] and seems to happen here, too. These phenomena cannot be avoided since there are certain dynamics within the process of conflict. Task conflicts can be taken personally and then lead to relationship conflict, while relationship conflict can lead to criticism towards the other team members’ ideas [45]. Another limitation that has to be taken into account is that the measures of conflict are self-reported and then aggregated to the group level in order to reach an analysis at the group level. This method implies a so-called compositional group phenomenon. Though the indicators of agreement, such as ICCs, can be validated, this approach assumes that each member’s perception contributes equally to the conflict, which can be questioned [37].

Future research may build upon the results of this study in a number of ways. For example, we examined teams that were homogeneous in terms of culture, which provides important insight into transferring virtual team practices across cultures. Moreover, we only considered two different types of conflict. Future research might consider relationship conflict along with task and process conflict. In addition, previous research indicates the importance of culture for conflict resolution and management styles [46]. Including the management side of conflict in a virtual team context could deepen our understanding of the conflict processes in virtual teams. This investigation highlights the importance of cultural values in virtual team processes. Our findings suggest that while different types of conflict have different impacts on performance of a virtual team, the influence of culture as moderator must also be considered.

7. References

[38] M.R. Lind, “The gender impact of temporary virtual work groups,” IEEE transactions on


