# Will Team Diversity Enhance or Reduce Virtual Team Performance? A Two-Dimensional Deep-Level Diversity Perspective

Qiurong Song
Wuhan University
Wuhan, Hubei, China
qiurong.song@whu.edu.cn

Yan Zhang
Wuhan University
Wuhan, Hubei, China
yzhang2015@whu.edu.cn

Yongqiang Sun
Wuhan University
Wuhan, Hubei, China
sunyq@whu.edu.cn

## Abstract

In recent years, diversity in virtual teams has become a major concern for both scholars and practitioners. However, most of existing studies concentrate on surface-level diversity while lose sight of deep-level diversity. To address this gap, this study explores the different impacts of two deep-level diversities, i.e., information diversity and value diversity, on team performance through identifying two opposite mechanisms (i.e., team efficacy and mutual trust) and further investigates the interrelationship between two diversities. We conduct an online survey to collect 72 valid questionnaires from leaders of virtual teams to examine our research model. The findings indicate that information diversity contributes to team performance through improving team efficacy and mutual trust while value diversity inhibits team performance as it reduces team efficacy and mutual trust. Further, there is a positive relationship between information diversity and value diversity. Finally, we discuss theoretical and practical implications, and limitations of this study.

## 1. Introduction

In the digital age, information communication technologies (ICTs) have increasingly provided the opportunities for team members to collaborate with their colleagues in different areas, which in turn introduces the virtual teams in globalized works [1]. Over the past year, with the outbreak of the Covid-19 pandemic, virtual teams become more prevalent due to the limitation of offline teamwork. In general, virtual teams are made up of employees with different background, skills, knowledge and experience to facilitate high competitive advantage by enhancing the internal operations. However, Horwitz and Horwitz [2] point out that such diverse teams also bring some challenges and thus lead to suboptimal performance. In other words, although prior studies find a significant link between team diversity and team performance, their findings are inconsistent [3]. On the one hand, some studies hold a social categorization view and indicate that team diversity encourages team members to form cliques by categorizing themselves based on demographic characteristics [4], which can harm the mutual trust and interactions among team members and thus negatively influence team performance [5, 6]. On the other hand, other studies take an information processing perspective and indicate that team diversity can be considered as an information resource that could bring rich and diverse information, knowledge and views to teams, which thus enhances the team efficacy and in turn positively affect team performance [7].

However, these studies mainly focus on the demographic differences (e.g., age, gender) among team members, i.e., surface-level diversity. According to Mannix and Neale [8]), team members are not only different in demographic characteristics, but also have disparate attitudes and beliefs. Therefore, there are two types of diversity: surface-level diversity and deep-level diversity [9]. Harrison and Klein [10] indicate that deep-level diversity will even have a much greater impact on group cohesion and performance than surface-level diversity. Unfortunately, there are only limited studies concentrate on how deep-level diversity influence team performance. In order to address this research gap, this study tries to concentrate on the deep-level diversity and investigates how such deep-level diversity can contribute to team performance through changing the team efficacy and mutual trust. Further, Jehn, Northcraft [11] posit that deep-level diversity includes both information diversity (i.e., differences in team members' knowledge bases) and value diversity (i.e., differences in members' thinking about team's tasks and goals), and these two different diversities may influence team outcomes differently [12, 13]. Based on this, the first research objective of this study is to explore the different impact of information diversity and value diversity on team performance through identifying team efficacy and mutual trust as two contrary mediating mechanisms.

Moreover, existing literatures suggest that one type of diversity may influence team performance by correlating to another types of diversity [4]. For example,

Phillips and Loyd [14] find that difference in demographic characteristics can influence team performance by motivating team members to obtain different knowledge, which indicates that there are interrelationships among different diversities. According to Mohammed and Dumville [15], team members' shared understanding of relevant knowledge can directly affect team processes and enable members to work together to formulate accurate teamwork and task predictions [15], which suggests that information diversity and value diversity are interrelated. Thus, the second research objective of this study is to investigate the interrelationship between information diversity and value diversity.

This study contributes to existing literatures in three ways: first, this study concentrates on deep-level diversity and explores the impacts of two dimensions of deep-level diversity (i.e., information diversity and value diversity) on virtual team performance, which extends prior team diversity studies that mainly focus on the role of surface-level diversity. Second, this study reveals the different impacts of two deep-level diversities---information diversity and value diversity---on team performance through identifying team efficacy and mutual trust as two mediating mechanisms, which is helpful for understanding the inconsistent relationships between team diversity and team performance in previous research. Third, this study investigates the interrelationship between information diversity and value diversity, which expands existing deep-level diversity literature by indicating that information diversity not only can contribute to team performance directly but also can reduce team performance through enhancing value diversity among team members.

## Literature Review and Theoretical Background

### Team Diversity

Team diversity is defined as the differences among team members in different dimensions, such as age, gender, nationality, functional background, task skills, values, and political preferences [16]. Team diversity is generally divided into two categories: surface-level diversity and deep-level diversity [9, 17]. Specifically, surface-level diversity refers to differences in age, gender, race and other demographic factors that are visible to individuals while deep-level diversity is defined as differences in attitudes and beliefs among team members [9].

Previous research has found that there is a significant relationship between team diversity and team performance, however, their findings are inconsistent [3]. On the one hand, some studies hold a social categorization perspective and indicate that team diversity can have a negative impact on performance by contributing to forming cliques, leading to some members' anxiety and stress, which are detrimental to mutual trust and in turn team collaboration and innovation [4, 18]. On the other hand, some studies take an information processing perspective and suggest that team diversity contributes to varied information resources that bring rich and diverse information, knowledge and perspectives to team and thus improve team efficacy, which positively affects team performance [7, 19]. However, most of these studies focus on the differences in demographic characteristics (i.e., surface-level diversity) among team members while lose sight of differences in team member's beliefs and attitudes (i.e., deep-level diversity). According to Harrison, Price [9], deep-level diversity usually have a stronger effect on group cohesion and performance than superficial or demographic diversity. Therefore, we try to concentrate on the impact of deep-level diversity on the team performance in this study.

Further, existing literatures suggest that deep-level diversity can be classified into two dimensions: information diversity and value diversity [11]. In general, informational diversity refers to differences in the knowledge base and perspectives that members bring to a workgroup [11], which emphasizes the differences that may arise due to differences in educational background, training, and work experience. On the other hand, value diversity refers to the differences in how members of a workgroup view their true mission, goals, or assignments [11]. Lovelace, Shapiro [13] suggest that there are inconsistent findings of the impact of two-dimensional diversity on team performance for the meaning of the two dimensions of diversity is quite different. Following this logic, this study tries to identify the different impacts of information diversity and value diversity on team performance. Specifically, according to the information processing and social categorization perspective that has been identified as vital mechanisms to explain the impact of team diversity, we identify team efficacy and mutual trust as the mediators through which information diversity and value diversity can influence team performance.

Virtual teams are of geographically and/or organizationally dispersed coworkers that communicate using telecommunications and information technologies to accomplish an organizational task[20, 21]. Previous research has found that communication mode moderates the relationships between team diversity and team outcomes and there are significant differences between the face-to-face and virtual heterogeneous teams[22, 23].

For example, when team members communicate with instant messaging devices, the elimination of visual cues will reduce the visibility of team members' different interaction styles, and the visibility of negative reactions to team diversity, reducing the negative impact of information and value diversity on a team[23]. Therefore, the impact of information diversity and value diversity on virtual team performance is different from face-to-face teams and needs further research.

### Team Efficacy and Mutual Trust

Team efficacy as a team member's perception of the team's ability to accomplish a specific task, is individuals' confidence (or belief) in their ability to successfully complete the team's work [24, 25]. Team efficacy derives from individual members of a team, and then creates a sense of confidence within the whole team that allows the team to persevere in the face of difficulty [26] and thus is strongly linked to group-level beliefs. According to Bandura [27], team efficacy beliefs as the results of team member's cognitive processing for the useful information that acquired through individual past experience, social persuasion and emotional states, can contribute to team performance significantly [28, 29]. In general, the same experience may lead to different efficacy beliefs for different individuals due to their different information backgrounds, knowledge structures, and different individual interpretations [27, 30].

On the other hand, team members also interact frequently with each other, in which interpersonal trust is another critical factor among team members. According to McAllister [31], interpersonal trust has both cognitive and affective bases. On the one hand, people choose to trust someone based on a priori knowledge of their competence and reliability, i.e., cognition-based trust [32]. On the other hand, affective trust is based on emotional ties between individuals [31]. Team-level mutual trust is similar to and interrelated with interpersonal trust in that it points to members' overall perception of trust in the team as a whole [33, 34]. It involves trust shared collectively by team members [35], which is influenced by the organizational rule system, collective attributes, and member characteristics that provide the basic expectations for interactions within the organization [36]. In teams, team members build mutual trust through social and emotional attachments on the one hand, and through task-based relationships on the other hand [37], such as progress reporting and knowledge exchange.

## Research Model and Hypotheses Development

Based on the theoretical background, we propose our research model as shown in Figure 1. The model takes deep team diversity as an entry point to scientifically and systematically explore the different impact of information diversity and value diversity on team performance through team efficacy and mutual trust. Further, we also investigate the interrelationship between information diversity and value diversity. Finally, we develop our hypotheses as follows:

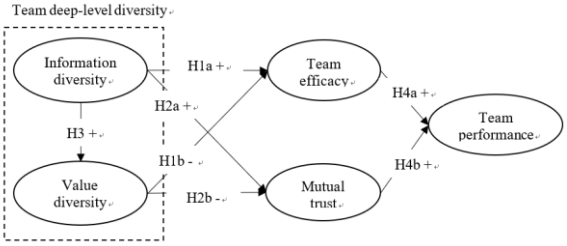


**Figure 1. Research Model**

### Effects of Two Types of Diversity

Some researchers argue that teams can positively impact team performance by increasing diversity of information leading to innovation, information and knowledge [38-40]. Specifically, information diversity as the differences in information backgrounds and knowledge structures of team members, can facilitate the exchange of information resources among team members [41]. In knowledge work, such information resources can contribute to information sharing, thereby enhancing team-level self-confidence and team efficacy [27]. On the other hand, team information diversity can contribute to the diversity of the organization's potential information and skill base because containing members with different information and education background in teams generally can enhance team's ability to acquire and utilize information [42], which thus encourage members to develop positive perceptions of task-specific team capabilities. Therefore, we propose that:
H1a: Information diversity is positively related to team efficacy.

Values are enduring beliefs that shape individual and group behavior and can help us understand the attitudes and motivations of team members. Team value diversity reflects the differences in perceptions of their true tasks, goals, or missions among members [11]. Based on similarity-attraction theory, individuals generally get along well with similar persons as they expect that their attitude, beliefs and values can be strengthened and supported [43]. Therefore, the diversity of work values may lead to awkward or difficult interactions because of

the large differences in attitudes and principles of handling work [44]. Besides, team value diversity is also positively associated with team conflict [11], which affects inter-team dialogue and is detrimental to team innovation effectiveness [45]. Therefore, we believe that value diversity may be detrimental to intra-team communication, coordinate activities and confidence within the team [46, 47]. Therefore, we propose that:
H1b: Value diversity is negatively related to team efficacy.

When different team members have unique information, the team needs to develop connections between the information and perform knowledge integration to accomplish their tasks. Knowledge integration and joint decisions negotiation occur via interaction among team members, which allows them to learn from each other, develop collective knowledge, and facilitate communication and action [42, 48, 49].Team members with differences in knowledge backgrounds need more progress reporting, information exchange, and knowledge sharing to achieve common tasks, thus allowing cognitive trust to be built through task-based relationships and affective trust to be developed in the close communication required by the task, increasing the level of mutual trust in the team [50, 51]. Therefore, we propose that:
H2a: Information diversity is positively related to mutual trust.

Empirical studies prove that values are generally indispensable in discussing interpersonal relationships and team success [52]. Similar values maintain mutual trust and interaction among team members to accomplish tasks [5, 6]. The diversity of team members' attitudes toward work and handling principles will affect team members' evaluation of other members' work principles and ability to perform. Team member will tend to trust other members when they are perceived with integrity and ability to execute well [53], while work attitudes and principles that differ too much from their own may be detrimental to this assessment, thus reducing team trust. Furthermore, individuals whose work values differ more from other members may be less socially attractive and may experience negative social interactions, such as exclusion from team interactions and discussions [54, 55], which may lead to feelings of distrust toward other members. Differences in work values between members can also bring about the misunderstanding of other people's intentions, motivations and behaviors, which decreases the initial trust level in teams [56]. Therefore, we propose that:
H2b: Value diversity is negatively related to mutual trust.

## Interrelationship between Information Diversity on Value Diversity

According to team mental model theory, team members' shared and well-organized understanding of relevant knowledge can encourage team members to work together to facilitate a common understanding on teamwork and work predictions [15]. Whereas different information backgrounds will influence team members' perceptions of team work goals, work organization, etc. Also, similarity-attraction theory suggests that people are attracted to similar people and avoid communicating with people who hold different views from their own as a way to reduce the stress of the ensuing conflict [57]. Therefore, information diversity has a negative effect on team member communication, preventing team members from forming a coherent view of the team's true mission, goals or tasks, and thus positively enhancing the team's work value diversity. Therefore, we propose that:
H3: Information diversity will be positively related to value diversity.

## Effect of Team Efficacy and Trust on Performance

Team efficacy as a team member's perception of the team's ability to accomplish a specific task, is the confidence (or belief) in their ability to successfully complete the team's work [24, 25]. Rapp, Bachrach [58] suggest that team efficacy determines the things that team members choose to do, the effort they put into achieving team goals, and how persistent team members are in the face of adversity. In general, teams with high efficacy are more likely to set challenging goals and insist on in difficult situations, which thus arouses the high motivations of team members and improves team performance [28, 29, 59]. Therefore, we propose that:
H4a: Team efficacy is positively related to team performance.

On the other hand, mutual trust is built through ongoing intensive relationships between team members. In general, climate and culture of trust in a team is more likely to provide the confidence and flexibility needed to accomplish team tasks [60]. Further, Kyu and Cho [61] suggest that mutual trust among team members is beneficial for team collaboration, task coordination, and knowledge sharing among team members, which thus positively contribute to team performance. Therefore, we propose that:
H4b: Mutual trust is positively related to team performance.

## Research Method

### Sample

An online survey was conducted during November 2020 to December 2020 to examine our research model. Data were collected from team leaders from 90 virtual teams that were established and operated during the COVID-19. The virtual teams include course project teams, research project teams and competitions teams that facilitates by undergraduates. Specifically, we randomly selected 90 virtual teams in several universities in China based on several online courses and CUMCM (Contemporary Undergraduate Mathematical Contest in Modeling). These team members were unable to communicate face-to-face offline during the quarantine of the COVID-19 outbreak. Therefore, team members collaborate with each other using information communication technologies, i.e., audioconference and electronic chat tools. We then provided an online questionnaire to 90 team leaders of these 90 virtual teams and ask them to finish the questionnaire based on their evaluation on the overall situation of their team. Finally, 72 valid questionnaires were returned, with a valid response rate of 80%.

The size of teams ranges from 2 members to more than 7 members, includes 2 members (4.2%), 3 members (11.1%), 4 members (23.6%), 5 members (34.7%), 6 members (15.3%), 7 members (2.8%) and more than 7 members (8.3%). In addition, there are 37.5% teams have less than 20% males, 23.6% teams include 21%-40% males and 13.9% teams own more than 60% males. Further, the age of all participants were ranging from 17 to 23 as they are all undergraduates.

### Measures

All measures were adapted from existing literatures and developed in English, and then were converted to Mandarin Chinese using reverse translation. Specifically, information diversity and value diversity were measured using a four-item scale proposed by Hobman, Bordia [62]. Mutual trust was measured using a four-item scale that adopted from Pinjani and Palvia [63]). Team efficacy was measured using a five-item scale raised by Mosley Jr, Boyar [64]. Team performance was measured using an 8-item scale, which was following Van De Ven and Ferry [65]. All variables were measured using the 7-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree).

## Research Results

As this study was conducted at the team level, and the sample size was relatively small, we then choose Partial least squares (PLS) method to test our research model [66]. Specifically, we use the SmartPLS2.0 as the data analytic tool.

### Measurement Model Test

The reliability of the measure was evaluated using Composite Reliability, Average Variance Extraction (AVE) and Cronbach's Alpha coefficient. As shown in Table 1, the composite reliability of the five latent variables in this study were greater than the benchmark value of 0.700; the AVE were greater than the benchmark value of 0.500; the Cronbach's Alpha were greater than the benchmark value of 0.700, reflecting a good reliability of the measurement model.

The convergent validity was evaluated using loadings and cross-loadings. As shown in Table 2, the values of item loadings in the focal variables were significantly higher than items of other variables on the focal one, further confirming that the measurement model of this study has good convergent and discriminant validity. The discriminant validity was also tested using the criterion that the square root of AVE is greater than the correlation value between the latent variables [67]. As shown in Table 3, the constructs' square roots of AVE for were greater than their correlation coefficients, suggesting the good discriminant validity.

**Table 1. Descriptive Statistics and Reliability**

| | Mean | Std. Dev | AVE | CR | α |
|---|---|---|---|---|---|
| **ID** | 3.646 | 1.931 | 0.636 | 0.875 | 0.811 |
| **MT** | 5.601 | 1.398 | 0.719 | 0.911 | 0.869 |
| **TE** | 5.494 | 1.320 | 0.781 | 0.947 | 0.930 |
| **TP** | 5.122 | 1.316 | 0.659 | 0.939 | 0.926 |
| **VD** | 3.566 | 1.732 | 0.765 | 0.928 | 0.897 |

Note: ID=information diversity, MT=mutual trust, TE=team efficacy; TP=team performance, VD=value diversity, CR=Composite Reliability, α= Cronbachs Alpha;

**Table 2. Loading and Cross-loading**

| | ID | MT | TE | TP | VD |
|---|---|---|---|---|---|
| **ID1** | **0.818** | -0.065 | -0.121 | -0.074 | 0.509 |
| **ID2** | **0.794** | -0.032 | 0.073 | 0.069 | 0.449 |
| **ID3** | **0.729** | 0.027 | 0.020 | 0.141 | 0.390 |
| **ID4** | **0.846** | -0.178 | -0.131 | -0.149 | 0.581 |
| **MT1** | -0.210 | **0.893** | 0.714 | 0.665 | -0.471 |
| **MT2** | 0.042 | **0.791** | 0.649 | 0.521 | -0.251 |

| | | | | | |
|---|---|---|---|---|---|
| **MT3** | 0.034 | **0.807** | 0.588 | 0.517 | -0.329 |
| **MT4** | -0.138 | **0.896** | 0.756 | 0.649 | -0.402 |
| **TE1** | 0.071 | 0.718 | **0.880** | 0.631 | -0.285 |
| **TE2** | -0.005 | 0.749 | **0.900** | 0.629 | -0.404 |
| **TE3** | -0.056 | 0.575 | **0.801** | 0.380 | -0.234 |
| **TE4** | -0.164 | 0.720 | **0.905** | 0.650 | -0.412 |
| **TE5** | -0.141 | 0.744 | **0.929** | 0.632 | -0.385 |
| **TP1** | 0.117 | 0.528 | 0.517 | **0.784** | -0.341 |
| **TP2** | 0.021 | 0.533 | 0.499 | **0.823** | -0.285 |
| **TP3** | -0.068 | 0.403 | 0.406 | **0.723** | -0.183 |
| **TP4** | -0.093 | 0.603 | 0.574 | **0.864** | -0.396 |
| **TP5** | 0.095 | 0.540 | 0.473 | **0.811** | -0.243 |
| **TP6** | -0.068 | 0.547 | 0.541 | **0.848** | -0.358 |
| **TP7** | -0.089 | 0.640 | 0.685 | **0.805** | -0.332 |
| **TP8** | -0.074 | 0.674 | 0.623 | **0.826** | -0.384 |
| **VD1** | 0.590 | -0.357 | -0.335 | -0.277 | **0.911** |
| **VD2** | 0.576 | -0.216 | -0.180 | -0.218 | **0.780** |
| **VD3** | 0.475 | -0.415 | -0.424 | -0.414 | **0.890** |
| **VD4** | 0.531 | -0.504 | -0.419 | -0.450 | **0.911** |

Note: ID=information diversity, MT=mutual trust, TE=team efficacy; TP=team performance, VD=value diversity;

**Table 3. Square Roots of AVEs and Correlations**

| | ID | MT | TE | TP | VD |
|---|---|---|---|---|---|
| **ID** | **0.797** | | | | |
| **MT** | -0.093 | **0.848** | | | |
| **TE** | -0.066 | 0.801 | **0.884** | | |
| **TP** | -0.030 | 0.699 | 0.677 | **0.812** | |
| **VD** | 0.616 | -0.437 | -0.398 | -0.397 | **0.875** |

Note: ID=information diversity, MT=mutual trust, TE=team efficacy; TP=team performance, VD=value diversity; the numbers in the diagonal row are square roots of the AVE.

## Common Method Bias

Since the data were collected by means of self-reported scales, respondents were susceptible to artificial covariation between predictor variables and validity variables due to the influence of consistency motives and social expectations, resulting in the so-called common method biases. In order to address this issue, this study used Harman's one-way test to conduct exploratory factor analysis on all variables, and the existence of common method bias was determined by the results of unrotated factor analysis [68]. The variance explained by the first factor of all variables in this study was 33.21%, which is less than 40%. Based on the above analysis, it indicates that there is no significant common method bias in the data measured in this study.

## Structural Model Test

The results of structural model are shown in Figure 2. The results indicate that there are positive effects of information diversity on team efficacy (β=0.288, t=2.337) and mutual trust (β=0.283, t=2.180), supporting hypothesis H1a and H2a. on the other hand, value diversity has significantly negative impacts on both team efficacy (β=-0.575, t=5.313) and mutual trust (β=-0.611, t=4.889), supporting H1b and H2b. Further, there is a significant positive effect of information diversity on value diversity (β=0.616, t=6.244), supporting hypothesis H3; Finally, both team efficacy (β=0.327, t=2.394) and mutual trust (β=0.437, t=3.440) can influence team performance significantly, so H4a and H4b are supported. The research model explained most variances of value diversity ( $R^2$ =0.379), team efficacy ($R^2$=0.210), mutual trust ($R^2$=0.241), and team performance ($R^2$=0.527).

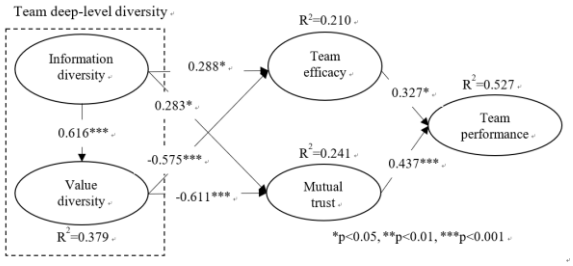


**Figure 2. Structural Model Testing**

# Discussions and Implications

## Discussions

This study proposes and empirically tests a model of the effect of deep-level team diversity on virtual team performance. Specifically, two dimensions of deep-level diversity---information diversity and value diversity, can influence team performance by changing team efficacy and mutual trust among team members. Further, there is also an interrelationship between information diversity and value diversity. We then summarize the key findings of our research as follows:
First, the results show that information diversity can enhance team efficacy and thus contribute to team performance, which is consistent with prior team diversity studies that hold information processing perspectives [7]. Specifically, information diversity can improve information composition and knowledge management in teams of enhancing team member's information background and knowledge structure, which motivates team members to exchange and share knowledge and thus positively affect team efficacy and team performance [69]. On the other hand, this study

finds that information diversity, which may is positively related to mutual trust among team members, which is opposite with similarity-attraction theory that indicates differences in information background may reduce social attraction among members and thus lead to a decreased mutual trust within teams [54].

Second, our research findings indicate that value diversity, on the one hand, had a significant negative effect on team efficacy because differences in team member's perceptions of their tasks, goals, missions and work principles can trigger team conflict and in turn inhibits effective interactions among team members. On the other hand, the result shows that value diversity is negatively associated with mutual trust among team members because differences in how members of a workgroup view their true mission, goals, or assignments can induce member's feelings of distrust [44, 55, 56], which is consistent with existing team diversity literatures that hold a social categorization view.

Third, the results suggest that information diversity is positively related to value diversity, which indicates that differences in knowledge base among team members can motivate them perceive their tasks, goals, missions and work principles differently. Further, the findings of our research also indicate that information diversity not only contribute to team performance directly, but also through enhancing value diversity among team members.

## Implications for Research

Our research has several research implications for existing literatures. First, this study broadens existing team diversity literatures by investigating the impacts of two dimensions of deep-level diversity (i.e., information diversity and value diversity) on team performance. Previous researches mainly focus on the impact of surface-level diversity but ignore the important role of deep-level diversity in team works. In order to address this issue, this study concentrates on deep-level diversity among team members and identifies two dimensions of deep-level diversity in virtual teams, i.e., information diversity and value diversity, and then explore the impacts of these two deep-level diversities on team performance, which hence extends existing literatures on team diversity.

Second, this study reveals the different effects of two deep-level diversities (i.e., information diversity and value diversity) on team performance through identifying team efficacy and mutual trust as two mediating mechanisms, which is beneficial for researchers to understand the inconsistent relationships between team diversity and team performance. Specifically, this study finds that information diversity can enhance team efficacy and mutual trust among team members while value diversity reduces team efficacy and mutual trust conversely, which indicates that two dimensions of deep-level diversity can influence team performance differently and thus provides reasonable explanations for the inconsistent findings of the relationships between team diversity and performance in prior studies.

Third, this study expands literatures on deep-level team diversity by investigating the interrelationship between information diversity and value diversity. Previous literature on deep-level diversity generally consider the two dimensions of diversities as juxtaposed. This study finds a positive relationship between information diversity and value diversity and reveals that information diversity, on the one hand, improves team efficacy and mutual trust among team members directly. In contrast, it also can reduce team efficacy and mutual trust by enhancing value diversity, which thus in turn extends literatures on deep-level diversity.

## Implications for Practice

Our research also has several practice implications. First, our findings indicate that deep-level team diversity can affect team outcomes significantly. So managers in practice should not ignore the important role of differences in attitudes and beliefs among team members when forming teams. In particular, as results of our study show that information diversity can enhance team efficacy and mutual trust in team interaction and in turn contributes to team performance while value diversity can reduce team diversity and mutual trust and thus decreases team performance, managers should encourage team member's differences in knowledge base but weaken their differences in true mission, goals, or assignments.

Second, our research findings indicate that information diversity is positively related to value diversity, which suggests that managers should use performance incentives and other means to encourage team members to communicate with each other, share and exchange more knowledge about their perceptions of the value, goals and assignments of the team's work and thus reduces team member's value diversity to make the team interactions more efficiency.

## Limitations

Although this study has made some meaningful explorations of both theory and practice, there are still some limitations. First, since the data collection was mainly focused on teams formed by Chinese college students, our findings may be affected by the characteristics of college students and characteristics of

collectivism culture. Thus, future research could examine our research model in different team setting and different cultures to verify whether our findings are still applicable or not. Second, this study used cross-sectional data to examine the research model. However, the deep-level diversity may change over time, therefore, scholars can conduct longitudinal studies to explore the impact of deep-level diversity in the future. Finally, this study only explored the impact of deep-level team diversity on team performance at the team level, and future research could consider conducting individual-level related studies or conducting cross-level studies.


[1] Mathieu, J.E., et al., *A century of work teams in the Journal of Applied Psychology.* Journal of Applied Psychology, 2017. **102**(3): p. 452-467.

[2] Horwitz, S.K. and I.B. Horwitz, *The effects of team diversity on team outcomes: A meta-analytic review of team demography.* Journal of Management, 2007. **33**(6): p. 987-1015.

[3] van Knippenberg, D. and J.N. Mell, *Past, present, and potential future of team diversity research: From compositional diversity to emergent diversity.* Organizational Behavior and Human Decision Processes, 2016. **136**: p. 135-145.

[4] Phillips, K. and C. O'Reilly, *Demography and Diversity in Organizations: A Review of 40 Years of Research*. 1998. p. 77-140.

[5] Dose, J.J. and R.J. Klimoski, *The diversity of diversity: Work values effects on formative team processes.* Human Resource Management Review, 1999. **9**(1): p. 83-108.

[6] Liang, T.-P., et al., *The impact of value diversity on information system development projects.* International Journal of Project Management, 2012. **30**: p. 731–739.

[7] Cox, T.H., S.A. Lobel, and P.L. McLeod, *Effects of ethnic group cultural differences on cooperative and competitive behavior on a group task.* Academy of Management Journal, 1991. **34**(4): p. 827-847.

[8] Mannix, E. and M.A. Neale, *What Differences Make a Difference?:The Promise and Reality of Diverse Teams in Organizations.* Psychological Science in the Public Interest, 2005. **6**(2): p. 31-55.

[9] Harrison, D., et al., *Time, Teams, and Task Performance: Changing Effects of Surface- and Deep-Level Diversity on Group Functioning.* Academy of Management Journal, 2002. **45**: p. 1029-1045.

[10] Harrison, D.A. and K.J. Klein, *What's the difference? Diversity constructs as separation, variety, or disparity in organizations.* Academy of Management Review, 2007. **32**(4): p. 1199-1228.

[11] Jehn, K.A., G.B. Northcraft, and M.A. Neale, *Why differences make a difference: A field study of diversity, conflict, and performance in workgroups.* Administrative Science Quarterly, 1999. **44**(4): p. 741-763.

[12] Miron-Spektor, E., F. Gino, and L. Argote, *Paradoxical frames and creative sparks: Enhancing individual creativity through conflict and integration.* Organizational Behavior and Human Decision Processes, 2011. **116**(2): p. 229-240.

[13] Lovelace, K., D.L. Shapiro, and L.R. Weingart, *Maximizing cross-functional new product teams' innovativeness and constraint adherence: A conflict communications perspective.* Academy of Management Journal, 2001. **44**(4): p. 779-793.

[14] Phillips, K. and D. Loyd, *When Surface and Deep-Level Diversity Collide: The Effects on Dissenting Group Members.* Organizational Behavior and Human Decision Processes, 2006. **99**: p. 143-160.

[15] Mohammed, S. and B. Dumville, *Team Mental Models in a Team Knowledge Framework: Expanding Theory and Measurement Across Disciplinary Boundaries.* Journal of Organizational Behavior, 2001. **22**: p. 89-106.

[16] Knippenberg, D.v. and M.C. Schippers, *Work Group Diversity.* Annual Review of Psychology, 2007. **58**(1): p. 515-541.

[17] Harrison, D.A., K.H. Price, and M.P. Bell, *Beyond Relational Demography: Time and the Effects of Surface- and Deep-Level Diversity on Work Group Cohesion.* Academy of Management Journal, 1998. **41**(1): p. 96-107.

[18] Garrison, G., et al., *Globally distributed teams: the effect of diversity on trust, cohesion and individual performance.* SIGMIS Database, 2010. **41**(3): p. 27–48.

[19] Choi, J.N., R.H. Price, and A.D. Vinokur, *Self-efficacy changes in groups: effects of diversity, leadership, and group climate.* Journal of Organizational Behavior, 2003. **24**(4): p. 357-372.

[20] Townsend, A.M., S.M. DeMarie, and A.R. Hendrickson, *Virtual teams: Technology and the workplace of the future.* Academy of Management Perspectives, 1998. **12**(3): p. 17-29.

[21] Majchrzak, A., et al., *Technology Adaptation: The Case of a Computer-Supported Inter-Organizational Virtual Team.* MIS Quarterly, 2000. **24**(4): p. 569-600.

[22] Carte, T. and L. Chidambaram, *A Capabilities-Based Theory of Technology Deployment in Diverse Teams: Leapfrogging the Pitfalls of Diversity and Leveraging Its Potential with Collaborative Technology.* J. AIS, 2004. **5**.

[23] Staples, D.S. and L. Zhao, *The Effects of Cultural Diversity in Virtual Teams Versus Face-to-Face Teams.* Group Decision and Negotiation, 2006. **15**(4): p. 389-406.

[24] Gibson, C., A. Randel, and P. Earley, *Understanding Group EfficacyAn Empirical Test of Multiple Assessment Methods.* Group & Organization Management - GROUP ORGAN MANAGE, 2000. **25**: p. 67-97.

[25] Bandura, A., *Exercise of Human Agency Through Collective Efficacy.* Current Directions in Psychological Science - CURR DIRECTIONS PSYCHOL SCI, 2000. **9**: p. 75-78.

[26] Kozlowski, S. and K. Klein, *A multilevel approach to theory and research in organizations: Contextual,*

*temporal, and emergent processes.* Multi-level theory, research, and methods in organizations: Foundations, extensions, and new directions, 2012.

[27] Bandura, A., *Self-efficacy: The exercise of control*. Self-efficacy: The exercise of control. 1997, New York, NY, US: W H Freeman/Times Books/ Henry Holt & Co. ix, 604-ix, 604.

[28] Campion, M.A., G.J. Medsker, and A.C. Higgs, *Relations between work group characteristics and effectiveness: Implications for designing effective work groups.* Personnel Psychology, 1993. **46**(4): p. 823-850.

[29] Gully, S., et al., *A Meta-Analysis of Team-Efficacy, Potency, and Performance: Interdependence and Level of Analysis as Moderators of Observed Relationships.* The Journal of applied psychology, 2002. **87**: p. 819-32.

[30] Bandura, A., *Self-efficacy mechanism in human agency.* American Psychologist, 1982. **37**(2): p. 122-147.

[31] McAllister, D.J., *Affect- and cognition-based trust as foundations for interpersonal cooperation in organizations.* Academy of Management Journal, 1995. **38**(1): p. 24-59.

[32] Luhmann, N., et al., *Trust and Powers*. 1979, Chichester [West Sussex]: Wiley.

[33] de Jong, B., K. Dirks, and N. Gillespie, *"Trust and Team Performance: A Meta-Analysis of Main Effects, Contingencies, and Qualifiers".* Academy of Management Proceedings, 2015. **2015**: p. 14561-14561.

[34] Fulmer, A. and M. Gelfand, *At What Level (and in Whom) We Trust : Trust Across Multiple Organizational Levels.* Journal of Management, 2012. **38**: p. 1167-1230.

[35] Costa, A.C., A. Fulmer, and N. Anderson, *Trust in Work Teams: An Integrative Review, Multilevel Framework, and Future Directions.* Journal of Organizational Behavior, 2017. **39**.

[36] Kramer, R., *Collective Trust within Organizations: Conceptual Foundations and Empirical Insights.* Corporate Reputation Review, 2010. **13**.

[37] Peters, L. and R. Karren, *An Examination of the Roles of Trust and Functional Diversity on Virtual Team Performance Ratings.* Group & Organization Management - GROUP ORGAN MANAGE, 2009. **34**: p. 479-504.

[38] Hoisl, K., M. Gruber, and A. Conti, *R&D Team Diversity and Performance in Hypercompetitive Environments.* Strategic Management Journal, 2016. **38**.

[39] Chung, K. and L. Hossain, *Measuring Performance of Knowledge-Intensive Workgroups Through Social Networks.* Project Management Journal, 2009. **40**: p. 34-58.

[40] Rink, F. and N. Ellemers, *The Role of Expectancies in Accepting Task-Related Diversity: Do Disappointment and Lack of Commitment Stem From Actual Differences or Violated Expectations?* Personality and Social Psychology Bulletin, 2007. **33**(6): p. 842-854.

[41] Richter, A., et al., *Creative Self-Efficacy and Individual Creativity in Team Contexts: Cross-Level Interactions With Team Informational Resources.* The Journal of applied psychology, 2012. **97**.

[42] Dahlin, K., L. Weingart, and P. Hinds, *Team Diversity and Information Use.* Academy of Management Journal, 2005. **48**: p. 1107-1123.

[43] Byrne, D.E., *The attraction paradigm*. 1971, New York: Academic Press.

[44] Zellmer-Bruhn, M., et al., *When and how do differences matter? An exploration of perceived similarity in teams.* Organizational Behavior and Human Decision Processes, 2008. **107**: p. 41-59.

[45] Tang, C. and S. Naumann, *Team diversity, mood, and team creativity: The role of team knowledge sharing in Chinese R & D teams – CORRIGENDUM.* Journal of Management & Organization, 2016. **23**: p. 1.

[46] Hackman, J.R., *Groups that work (and those that don't)*, ed. J.R. Hackman. 1990, San Francisco: Jossey-Bass.

[47] Tasa, K., S. Taggar, and G. Seijts, *The Development of Collective Efficacy in Teams: A Multilevel and Longitudinal Perspective.* The Journal of applied psychology, 2007. **92**: p. 17-27.

[48] Soule, D. and A. Edmondson, *Situated Knowledge and Learning in Dispersed Teams.* British Journal of Management, 2002. **13**: p. S17-S34.

[49] De Dreu, C., B. Nijstad, and D. Knippenberg, *Motivated Information Processing in Group Judgment and Decision-Making.* Personality and social psychology review : an official journal of the Society for Personality and Social Psychology, Inc, 2008. **12**: p. 22-49.

[50] Henttonen, K. and K. Blomqvist, *Managing distance in a global virtual team: The evolution of trust through technology-mediated relational communication.* Strategic Change, 2005. **14**: p. 107-119.

[51] Kirkman, B., et al., *Five challenges to virtual team success: Lessons from Sabre Inc.* Academy of Management Executive, 2002. **16**.

[52] Wang, X. and J. Huang, *The relationships between key stakeholders' project performance and project success: Perceptions of Chinese construction supervising engineers.* International Journal of Project Management, 2006. **24**(3): p. 253-260.

[53] Jarvenpaa, S., K. Knoll, and D. Leidner, *Is Anybody Out There? Antecedents of Trust in Global Teams.* J. of Management Information Systems, 1998. **14**: p. 29-64.

[54] Chattopadhyay, P., *Beyond direct and symmetrical effects: The influence of demographic dissimilarity on organizational citizenship behavior.* Academy of Management Journal, 1999. **42**(3): p. 273-287.

[55] Chattopadhyay, P. and E. George, *Examining work externalization through the lens of social identity theory.* The Journal of applied psychology, 2001. **86**: p. 781-8.

[56] Chang, H.-H., S.-S. Chuang, and S. Chao, *Determinants of cultural adaptation, communication quality, and trust in virtual teams' performance.* Total Quality Management, 2011. **22**: p. 305-329.
[57] Williams, H.M., S.K. Parker, and N. Turner, *Perceived dissimilarity and perspective taking within work teams.* Group & Organization Management, 2007. **32**(5): p. 569-597.
[58] Rapp, T.L., et al., *The Role of Team Goal Monitoring in the Curvilinear Relationship Between Team Efficacy and Team Performance.* Journal of Applied Psychology, 2014. **99**(5): p. 976-987.
[59] Seijts, G., G. Latham, and G. Whyte, *Effect of Self and Group Efficacy on Group Performance in a Mixed-Motive Situation.* Human Performance - HUM PERFORM, 2000. **13**: p. 279-298.
[60] Erdem, F., J. Özen-Aytemur, and N. Atsan, *The relationship between trust and team performance.* Work Study, 2003. **52**: p. 337-340.
[61] Kyu, C.O.K. and E. Cho, *The Mechanism of Trust Affecting Collaboration in Virtual Teams and the Moderating Roles of the Culture of Autonomy and Task Complexity.* Computers in Human Behavior, 2018. **91**.
[62] Hobman, E., P. Bordia, and C. Gallois, *Perceived Dissimilarity and Work Group InvolvementThe Moderating Effects of Group Openness to Diversity.* Group & Organization Management - GROUP ORGAN MANAGE, 2004. **29**: p. 560-587.
[63] Pinjani, P. and P. Palvia, *Trust and knowledge sharing in diverse global virtual teams.* Information & Management, 2013. **50**: p. 144–153.
[64] Mosley Jr, D.C., et al., *A production self-efficacy scale: An exploratory study.* Journal of Managerial Issues, 2008. **20**: p. 272-285.
[65] Van De Ven, A.H. and D.L. Ferry, *Measuring and assessing organizations*. 1980, New York, N.Y.: Wiley.
[66] Lohmoller, J.-B., *The PLS Program System: Latent Variables Path Analysis with Partial Least Squares Estimation.* Multivariate Behavioral Research, 1988. **23**(1): p. 125-127.
[67] Peng, X. and F. Lai, *Using Partial Least Squares in Operations Management Research: A Practical Guideline and Summary of Past Research.* Journal of Operations Management, 2012. **30**.
[68] Hao, Z. and L. Long, *Statistical remedies for common method biases.* Advasnces in Psychological Science, 2004. **12**(06): p. 942-942.
[69] Mesmer-Magnus, J.R. and L.A. DeChurch, *Information sharing and team performance: A meta-analysis.* Journal of Applied Psychology, 2009. **94**(2): p. 535-546.