SUBMISSION TYPE:

Poster

TITLE (85-character title, including spaces)

Interactive Effect between Vertical Diversity and Membership Fluidity on Coordination

Short Title (50 Characters or Less) Vertical Diversity and Membership Fluidity in Team

ABSTRACT (600-character abstract, including spaces)

This study investigated the interactive effects of vertical diversity in the level of expertise and membership fluidity on team coordination. A survey of a wide range of workplaces (Study 1) and an analysis of actual work teams using an HR data set from a firm (Study 2) revealed consistent results supporting our hypothesis, indicating that expertness diversity will be more positively associated with coordination in teams with high membership fluidity than in teams with low membership fluidity.

WORD COUNT (A complete paper with a maximum of 3,000 words. References, tables, and figures do not count toward the 3,000-word limit, but appendices do count toward the limit)

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Introduction

Vertical diversity

Work in organizations is a collaboration with a wide variety of people. Organizations have their objectives (Barnard, 1938), and teams are engaged in the tasks that are divided for organizational goals (Simon, 1947; Puranam, 2018). Many work teams are composed of members who are expected to possess task-related expertise, but the levels of which vary among individuals. This study examines the effects of individual differences in expertise levels within teams on team collaboration.

In previous studies, heterogeneity among individuals in a group has been referred to as "diversity," or the distribution of various attributes within a specific group or organization (e.g., Roberson, 2019; van Knippenberg & Scchippers, 2007). Among the different types of diversity, "horizontal" differences, such as the differences in race and gender, have received scholarly attention (Bunderson & Van der Veg7, 2018; Perry, 2019), while "vertical" differences, or the differences in the amount of valued resources possessed by each individual, have been studied only from the lens of social hierarchies in team structures, such as differences in power and status (e.g., Anderson & Brown, 2010; Greer et al., 2018; Halevy et al., 2011; Magee & Galinsky, 2008).

Scholars have noted that little is known about how the vertical diversity in the level of individual expertise on the team tasks (referred to as "expertness diversity") affects team functioning (Martins et al., 2013; Van der Vegt et al., 2006). Previous research has shown that teams with higher average levels of expertise perform better (Barrick et al., 1998; LePine, 2003). However, empirical evidence has been limited on the impact of its variation. To fill the gap, the present study focuses on the impact of vertical diversity in the expertise level on team processes, particularly on team coordination.

Effects of Vertical Diversity on Team Coordination

Coordination is one of the essential processes for team functioning. Team coordination is defined as an emergent phenomenon that integrates individual members' actions, knowledge, and goals to achieve a common goal and ensure that the team functions as a unified whole (Brannick et al., 1995). Many studies have indicated that coordination success has a significant impact on team performance (e.g., Arow et al., 2000; Cohen & Bailey, 1997).

In organizational team contexts, implicit coordination often plays an important role in improving team productivity (Rico et al., 2008). Implicit coordination is a process by which members adjust their own behavior to accomplish the team's task by predicting each other's behavior without explicitly discussing or confirming it, which is achieved by establishing routines and promoting mutual understanding among members (Rico et al., 2008).

Theories in social hierarchies in teams have suggested that implicit coordination will be facilitated by the vertical differences in power and status, because these differences provide team members with a prerequisite structure for interaction to induce clear expectancies about the appropriate behaviors in different ranks (Anderson & Brown, 2010; Halevy et al., 2011). A recent meta-analysis, however, did not support this coordination-enabling role of social hierarchy (Greer et al., 2018), suggesting that an elaborative examination of boundary conditions is required.

Based on this argument, vertical diversity in expertise levels will also likely facilitate coordination under certain conditions (Halevy et al., 2012; Woolley et al., 2008). As discussed in the following sections, we focus on team membership fluidity as one of the boundary conditions.

Team Membership Fluidity

Research in team literature has also suggested that implicit coordination will be hindered by changes in membership structure. It has been argued that member changes reduce team coordination by confusing their knowledge of role sharing and existing task execution practices (Li & van Knippenberg, 2021; Summers et al., 2012).

In theory, membership fluidity is a team property that refers to the degree of member changes participating in team interaction (Cohen et al., 1972; Mortensen & Haas, 2018). Team membership fluidity is high when members change frequently over time, whereas it is low when each member is continuously on the same team. Scholars have considered membership fluidity as an important organizational property that constitutes a work context and, thereby, guides team dynamics (Cohen et al., 1972; Hollenbeck et al., 2012; Mortensen & Haas, 2018).

Hypothesis

Combining these two lines of findings mentioned above on implicit coordination, we propose that vertical diversity within teams will likely complement coordination impediments from membership changes. Existing empirical studies supporting the coordination-enhancing role of vertical differences have examined cases where implicit coordination among members is difficult, such as basketball teams that must make time-constrained decisions (Halevy et al., 2012) and experimental pairs that must coordinate their decisions without any other cues (De Kwaadstemiet & van Dijk, 2010). Furthermore, a case study by Valentine and Edmondson (2015) reported that providing cues for role differentiation improved coordination in teams with fluid membership, where implicit coordination was hard to achieve.

Thus, we predict that vertical differences in the level of expertise enhance coordination in teams whose members are changed. It is hypothesized that the positive effect of vertical diversity on team coordination will be more prominent when membership is more fluid.

Hypothesis: Expertness diversity and membership fluidity within teams has interactive effect on team coordination. Specifically, expertness diversity will be more positively associated with coordination in teams with high membership fluidity than in teams with low membership fluidity.

Research Overview

We examined the hypothesis through two studies, utilizing different data sources. First, we conducted an Internet survey of a wide range of workplaces in Japan (Study 1). We asked workplace managers about coordination, expertness diversity, and membership fluidity in their workplaces. Then, we examined the hypothesis in the actual work team context by utilizing the field data, in this case, Human Resource (HR) data (organizational and personnel data) inside a Japanese firm (Study 2). We compared work teams with the same organizational culture and climate in the same firm.

Study 1

Method

Participants

We recruited 413 workplace managers who are responsible in workplace teams with multiple members in Japan via an Internet Survey firm. No observations were excluded from the analyses.

Measures

Expertness diversity. Participants were asked to evaluate the variance in the level of expertise among their team members (Harrison & Klein, 2007). They are instructed to rate the applicability of the statement "There is a wide variation in the level of knowledge and skills possessed" in their workplaces using scales ranging from 1 = not at all applicable to 5 = very applicable.

Membership fluidity. We used the ratio of individuals who have been in the same workplace for a year or more as a measure of the extent to which workplace membership is static over time (Bidwell, 2011; Oishi et al., 2015). Specifically, we asked participants to respond to the question, "What percentage of the members in your workplaces have been there for a year or more?" with a number ranging from 0% to 100%. *Team coordination.* Based on the three items of team coordination used in Anicich et al. (2015), we used two that were modified to be applicable to the workplace context: "In our workplace, we are able to make good use of the different skills we have from each other" and "In our workplace, we are able to coordinate the activities of team members to get the job done." Participants were asked to rate them using scales ranging from 1 = not at all agreeable to 5 = very agreeable.

Results

Table 1 shows the descriptive statistics. To test the hypothesis, we performed a regression analysis for team coordination with the expertness diversity, membership fluidity, and their interactions, including age as covariates. As the distribution was skewed toward the maximum (mean 88%, median 95%) and the skewness was larger than 0.5 in absolute value (-2.73), membership fluidity was used in the analysis with dummy coded (0 = low fluidity: equal to or more than the median, and 1 = high fluidity: less than the median). Also, for team coordination, we used the average score of two items (r= .63).

Insert Table 1 about here

The regression table is shown in Table 2. As predicted, a significant interaction between expertness diversity and membership fluidity was found ($\beta = .30$, p < .001). A simple slope analysis revealed that expertness diversity was positively associated with team coordination in teams with high membership fluidity (b = .28, p = .002; Figure 1). These results supported the hypothesis. Insert Table 2 & Figure 1 about here

Discussion

Study 1 found that expertness diversity among members was connected to team coordination when team membership was fluid. This implies that (high) membership fluidity works as a boundary condition for the coordination-enabling view of vertical differences (Anderson & Brown, 2010) to apply. That is, vertical differences help members to coordinate, especially when existing routines and practices within teams do not work well due to membership change.

Despite these findings, Study 1 has several limitations. First, both vertical differences and membership fluidity are subjective perceptions by workplace managers. Thus, the results of Study 1 may be due to their perceptual biases (Kraus et al., 2012). In addition, the survey included a mix of managers from various firms in terms of industry, job type, and firm culture, which may be connected to the workplace characteristics including expertness diversity, and fluidity of membership. t might be a bias in the results in Study 1. To overcome these limitations, Study 2 will conduct a detailed examination of the same companies, narrowing the job types as well.

Study 2

Method

Sample

We constructed a dataset for the study using internal data from a service company provided by its human resources department. We focused on teams with three or more employees in the Sales division. Included in the analysis were 287 teams (2713 employees) with a mean team size of 9.5 (median 8).

Measures

Expertness diversity. We objectively measured the teams' expertness diversity by utilizing the firm's HR dataset, operationalizing it as the standard deviation (SD) of job ranks in each team (Harrison & Klein, 2007; Martins et al., 2013). As members with higher job ranks were expected to have more expertise to contribute to team tasks, the teams' SD of the job ranks across all members refers to the vertical member difference in the level of expertise.

Membership fluidity. In accordance with Study 1, we calculated the percentage of new team members who joined within one year of the current team members as an indicator of the degree to which team members are replaced. One year is the primary time unit for personnel allocation in the target firm, according to the HR managers. Personnel transfer history data in the company was used for the calculation. Newly formed teams (i.e., all members joined within one year) were not included in the dataset. *Team coordination.* We constructed the outcome variable (i.e. team coordination) from the employee survey in which employees indicated their agreement levels for each item on a 5-point scale (1: do not agree at all to 5: very much agree) about their teams. The survey was designed for company management rather than research purposes, meaning that it included a wide variety of items. Thus, we initially conducted a factor analysis and found two factors, one of which is related to team coordination.

Results

Factor Analysis

We conducted an exploratory factor analysis on the scores of the employee survey's 17 items using the maximum likelihood method and promax rotation. The scree plot suggested a two-dimensional structure with the first two factors having Eigen values of 8.56, and 1.31, explaining 52.9% of the variance. The first factor consisted of 7 items (Table 3), mainly concerning team coordination (Anicich et al., 2015; Rico et al., 2008). Example included "In our team, we take advantage of different opinions and values of each other." and "In our team, we can utilize each other's strengths and complement each other's weaknesses." The factor analysis also revealed the second factor with 8 items and the other 2 items that did not belong to either of them, which are beyond the scope of this study.

Insert Table 3 about here

Effects on Team Coordination

We created a composite measure of team coordination by averaging the responses to the 6 items across members of each team (ICC = 12.6%), and used the team average as the outcome variable in the following team-level analyses. Table 4 shows the descriptive statistics.

Insert Table 4 about here

To test the hypothesis, we conducted a regression analysis for team coordination (Table 5). As in previous studies (Martins et al., 2013; Yu et al., 2019), we included team size and the team mean of job ranks as covariates. A significant interaction between expertness diversity and membership fluidity was found ($\beta = .18$, p = .002). A simple slope analysis revealed that expertness diversity was positively associated with team coordination in teams with high membership fluidity (b = .21, p < .001; Figure 2).

Insert Table 5 & Figure2 about here

Discussion

In Study 2, we utilized a large sample of organizational work teams as a research context, examining the hypothesis by comparing work teams within the same firm. Study 2 replicated the results of Study 1, both of which supported the hypothesis, indicating that expertness diversity among members facilitated team coordination for teams whose members changed frequently. These two studies are complement to each other and compensate for the limitations of each. The teams analyzed in Study 2 had the same organizational culture and were engaged in the same type of task (i.e., sales), whereas in Study 1, we recruited managers from various workplace contexts.

General Discussion

In this article, we examined the impact of vertical differences in the level of expertise (i.e., expertness diversity) among members, which is inevitable in teams, on team coordination. We hypothesized that the coordination-enabling role of vertical differences argued in previous studies would be more pronounced when membership is more fluid. We tested this hypothesis through a workplace survey of responsible managers (Study 1) and organizational data analysis of work teams within a firm (Study 2). The results of both studies were consistent and supported the hypotheses. The fact that the results were replicated across different study designs (online survey and HR data analysis) and measurement methods (subjective ratings and objective team characteristics) provides evidence of the robustness of the findings.

The results suggest that when membership fluidity increases, its potentially negative effects (increases in the difficulty of implicit coordination) can be offset by vertical differences among members. In theory, this implies that membership fluidity acts as a precondition for enhancing coordination by vertical difference. As to practical implications, teams with frequent member changes may improve team coordination by managing the member composition to be more vertically differentiated in the level of expertise. For future research, it will be necessary to directly examine how vertical diversity promotes coordination in teams. This study assumed that vertical diversity provides social cues to induce clear expectancies about the appropriate behaviors in interactions, which functioned to improve team coordination especially when existing coordination mechanisms (such as routines and mutual understanding) were hindered by membership changes. The assumed process was not directly tested (i.e., whether and how such a process actually occurs), although the predicted consequence (i.e., coordination facilitation) was found. Such emergent processes in teams with vertical differences and membership fluidity will need to be investigated.

To conclude, this study provides elaborated evidence on the interactive effect of vertical diversity in expertise levels and membership fluidity on team coordination, which fills the gap in the team diversity literature and contributes to the theoretical development of team dynamics derived from vertical differences among members.

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Table 1Descriptive Statistics (Study 1)

Ν	Variables	Mean	SD	1	2	3	4
413	1. Expertness diversity	3.46	0.68	-	ſ	r	
	2. Membership fluidity	88.04	19.91	.00	-		
	3. Team collaboration	3.46	0.87	00	.06	-	
	4. Age	57.39	9.80	.06	.08	.10*	

Note. *: significant at p < .05,

Table 2

Regression analysis of team coordination in Study 1

	в	р
Expertness diversity (centered)	21	<.001
Membership fluidity ($0 = Low, 1 = High$)	.00	.93
Expertness diversity x Membership fluidity	.30	<.001
Age	.10	.05
Adjusted R^2	.05	<.001
R^2	.06	

Table 3

Items and factor loadings for team coordination (factor I) in Study 2

	I
Our team has established a relationship where we can talk about our thoughts without anxiety.	.91
In our team, we take advantage of different opinions and values of each other.	.84
In our team, we can utilize each other's strengths and complement each other's weaknesses.	.77
In our team, we understand each other's personality, characteristics, strengths, and experiences.	.75
Our team is an environment in which we feel free to consult with each other.	.73
In our team, we give each other feedback, which is sometimes tough, for mutual growth.	.46
In our team, we have opportunities to collaborate with each other.	.43

Note.

This table shows 7 items and their factor loadings for team coordination only (Factor I). The remaining 10 items in the employee survey and factor loadings for the other factor are not displayed.

Table 4Descriptive Statistics (Study 2)

N	Variables	Mean	SD	1	2	3	4	5
287	1. Expertness diversity	1.89	0.47	-				
	2. Membership fluidity	0.62	0.19	10	-			
	3. Team size	9.45	6.04	18**	.28***	-		
	4. Team Mean of job ranks	6.20	1.11	08	03	55	-	
	5. Team collaboration	4.12	0.33	.06	.13*	.11	10	-

Note. *: significant at p < .05, **: significant at p < .01 (**), ***: significant at p < .001 (***).

Table 5

Regression analysis of team coordination in Study 2

	в	p
Expertness diversity (centered)	.10	.09
Membership fluidity	.09	.15
Expertness diversity x Membership fluidity	.18	.002
Team Mean of job ranks	02	.82
Team size	.12	.12
Adjusted R^2	.05	.002
R^2	.06	

Figure 1.

Interaction of membership fluidity with expertness diversity in predicting team coordination in Study 1



Figure 2.

Interaction of membership fluidity with expertness diversity in predicting team coordination in Study 2



Expertness diversity