

Are You Satisfied Yet? Shared Leadership, Individual Trust, Autonomy, and Satisfaction in Virtual Teams

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Despite the benefits associated with virtual teams, many people on these teams are unsatisfied with their experience. The goal of this study was to determine how to better facilitate satisfaction through shared leadership, individual trust, and autonomy. Specifically, in this study we sought a better understanding of the effects of shared leadership, team members' trust, and autonomy on satisfaction. We conducted a study with 163 individuals in 44 virtual teams. The results indicate that shared leadership facilitates satisfaction in virtual teams both directly and indirectly through the promotion of trust. Shared leadership moderated the relationships of individual trust and individual autonomy with satisfaction. Team-level satisfaction was a strong predictor of virtual team performance. We discuss these findings and the implications for theory and design.

Introduction

Despite the many opportunities provided by virtual teams, research has shown that working at a distance and relying primarily on information and communication technologies (ICTs) can at times be an unsatisfying experience (Baltes, Dickson, Sherman, Bauer, & LaGanke, 2002; Ortiz de Guinea, Webster, & Staples, 2012). However, satisfaction—positive affect or valence associated with being a member of a team—is associated with many positive outcomes (Peeters, 2006). The more team members are satisfied, the more likely they are to perform better and want to remain a part of a team (José, Ferrón-Vílchez, & Ortiz-de-Mandojana, 2014; Reinig, 2003). Therefore, finding ways to

facilitate satisfaction in virtual teams is an important topic (Briggs, de Vreede, & Reinig, 2003; Mejias, 2007; Peeters, 2006; Reinig, 2003).

Shared leadership is a strong predictor of individual and team satisfaction (Koccolowski, 2010). Shared leadership involves team members leading one another by engaging in the roles and responsibilities of leadership (Carson, Tesluk, & Marrone, 2007; Pearce & Conger, 2003; Robert, 2013b). Shared leadership represents the degree to which the typical team member engages in leadership roles and responsibilities on behalf of the team. Shared leadership ranges from high when all team members participate in leadership to low when only one member does so (Robert, 2013a). Shared leadership has been associated with a collaborative team climate (Drescher, Korsgaard, Welpé, Picot, & Wigand, 2014; Hoch & Dulebohn, 2013).

Team climate is the shared perception of the team's atmosphere, interpersonal relationships, and generally accepted practices and procedures of working together (Anderson & West, 1998; Edmondson, Kramer, & Cook, 2004). Teams that engage in high shared leadership can have a collaborative climate where team members respect, value, and encourage the participation of one another (Drescher et al., 2014; Hoch & Dulebohn, 2013). Despite the strong link between shared leadership and satisfaction, it is not always probable or possible to employ shared leadership (Robert, 2013a). For example, in some cases formal team leaders are employed and in other cases informal leaders emerge (Hoch & Kozlowski, 2014).

Trust and autonomy are two factors that also facilitate satisfaction. Trust in one's team, or the willingness to be vulnerable to the actions of one's teammates, and individual autonomy, or the degree of freedom and discretion an individual has in carrying out tasks, are both positively associated with satisfaction (Golden, 2007; Jarvenpaa, Shaw, &

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Staples, 2004; Langfred, 2004; Mayer, Davis, & Schoorman, 1995). Although it is possible to develop trust in virtual teams, it is certainly not guaranteed (Dennis, Robert, Curtis, Kowalczyk, & Hasty, 2012; Piccoli & Ives, 2003). Likewise, the degree of autonomy often depends on the amount of control teams want over the actions of their members, and that can vary (Langfred, 2005, 2007). In sum, it might not be possible to ensure that virtual teams engage in shared leadership or develop trust, or that team members have a high degree of autonomy.

Therefore, to better facilitate satisfaction and ultimately performance in virtual teams it is vital that we understand the effects of shared leadership, individual trust, and autonomy on satisfaction. For example, shared leadership might need to be in place to facilitate trust and autonomy. If this were true, a shared leadership structure would need to be in place before we could expect either trust or autonomy to help increase satisfaction. However, trust and autonomy might have independent effects on satisfaction separate from shared leadership. If this were true, shared leadership would be necessary. Either way, understanding the effects of shared leadership, trust, and autonomy on satisfaction offers potential insights into how to increase satisfaction, and ultimately performance in virtual teams. Unfortunately, we know very little about the effects of shared leadership, individual trust, and autonomy on satisfaction in virtual teams.

To address this shortcoming, we empirically tested a multilevel research model examining the satisfaction of 163 team members in 44 virtual teams. A multilevel approach allowed us to examine relationships between constructs at different levels. Applying a multilevel approach acknowledges that individuals are nested within teams and that team-level phenomena can emerge from individuals within the team (Kozlowski & Klein, 2000). The multilevel approach also asserts that phenomena at the team level can influence constructs and relationships at the lower or individual levels (Kozlowski & Klein, 2000).

Based on the multilevel approach, we assert in our research model that shared leadership facilitates team members' satisfaction in virtual teams directly and indirectly through the promotion of team members' trust and autonomy. In this model, we also assert that shared leadership moderates the impact of team members' trust and autonomy on satisfaction, such that when shared leadership is high, the impact of trust and autonomy on satisfaction should weaken; however, when shared leadership is low, trust and autonomy should be strong predictors of satisfaction. In addition, team-level satisfaction should be a strong predictor of virtual team performance (see Figure 1). The results of our study generally support our research model.

Overall, this paper offers three contributions to the literature. One, our study demonstrates that shared leadership helps to determine whether trust translates into more satisfaction. In doing so, this study helps to identify the conditions that limit or facilitate the effects of trust (Sarker, Ahuja, Sarker, & Kirkeby, 2011). Two, our findings show that shared leadership, unlike trust, is not related to

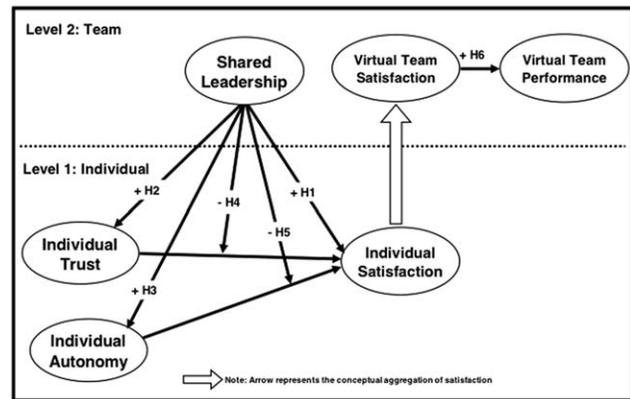


FIG. 1. Theoretical model.

autonomy, but, similar to trust, autonomy is positively related to satisfaction when shared leadership is low. This implies that autonomy is positively associated with satisfaction in virtual teams in the absence of shared leadership. Three, this study identifies the theoretical linkage between shared leadership and the performance of virtual teams. Many virtual teams rely on shared leadership; therefore, it becomes increasingly important to understand its impact on their performance (Hoch & Kozlowski, 2014).

Background and Theoretical Model

In the following section, we present our theoretical model, which asserts that shared leadership can facilitate a collaborative climate. This is consistent with prior literature (Bergman, Rentsch, Small, Davenport, & Bergman, 2012; Pearce, 2004). These researchers have found that shared leadership can influence team members through the climate or collective mood of the team (Kozlowski & Bell, 2003).

Shared Leadership and Social Exchange Theory

In this paper, we employ Blau's (1964) Social Exchange Theory (SET) to explain the effects of shared leadership. SET states that when people receive a service or favor they feel an obligation to repay it in kind. According to SET, the person who originally performed the service or favor also expects a future repayment on the part of the receiver. When this expectation is returned, individuals can develop cohesive and supportive relationships (Wayne, Shore, & Liden, 1997). In the case of shared leadership, team members engage in social exchanges by performing leadership roles and responsibilities on behalf of their team (Seibert, Sparrowe, & Liden, 2002). Carrying out of roles and responsibilities by one member often requires the assistance of other members (Robert, 2013a). These social exchanges coupled with assistance from one's teammates have been shown to be associated with perceptions of a strong supportive team climate (Drescher et al., 2014; Hoch & Dulebohn, 2013).

Perceived team support (PTS) is used to explain the effects of shared leadership resulting from social exchanges (Hoch & Dulebohn, 2013; Hoch & Wegge, 2014; Pearce &

Conger, 2003; Pearce & Herbig, 2004). PTS represents the belief team members have regarding how much their team respects and values them and their contribution (Bishop, Scott, & Burroughs, 2000). Teams high in PTS are said to have a climate characterized by mutual respect and support among its members (Wayne et al., 1997). Increases in shared leadership directly correspond with the social exchanges needed to facilitate a climate characterized by high levels of PTS (Hoch & Dulebohn, 2013). Next, we draw from these arguments to support our research model.

Shared Leadership and Individual Satisfaction

Shared leadership in virtual teams should be positively related to a team member's satisfaction by promoting a climate of PTS (Hoch & Dulebohn, 2013). Satisfaction in teams is largely driven by team members' experiences with their teammates (Reinig, 2003). Research on PTS has found strong links with satisfaction. Generally, team members are more satisfied with their team experience when they believe their team respects and values them and their contribution to the team (Eisenberger, Cummings, Aemeli, & Lynch, 1997; Winton & Kane, 2016). Specifically, mutual respect should be positively associated with cooperation and communication, both of which are strong predictors of satisfaction within teams (Bergman et al., 2012; Sheng, Tian, & Chen, 2010; Wayne et al., 1997). Work meaningfulness is another concept used to explain the relationship between PTS and satisfaction. Work meaningfulness is defined as "individuals' perception that their actions are valuable" (Barrick, Mount, & Li, 2013, p. 137). When team members believe their teammates value their work, their work has more meaning and they are more satisfied (Liden, Wayne, & Sparrowe, 2000). In sum, shared leadership directly corresponds to PTS, which is associated with cooperation, communication, work meaningfulness, and ultimately team members' satisfaction.

H1. Shared leadership is positively related to team members' satisfaction in virtual teams.

Shared Leadership and Individual Trust

Shared leadership should be directly related to team members' trust in their virtual team for several reasons. The more a team relies on shared leadership, the more likely its team members have followed through on their leadership commitments (Hoch & Dulebohn, 2013). Virtual teams that rely on shared leadership should have members who have demonstrated their trustworthiness by fulfilling their leadership roles and responsibilities or assisting others in fulfilling their roles. Team members build trust by observing whether their teammates have followed through on their commitments (Robert, Denis, & Hung, 2009). Therefore, the degree to which teams rely on shared leadership should be positively related to whether its members have followed through on their leadership commitments. On the contrary, shared

leadership should be lower in teams with members who have not followed through on their leadership commitments. Virtual teams rely less on shared leadership when their members are not fulfilling their leadership roles and responsibilities (Drescher et al., 2014). This is consistent with Bergman et al. (2012), who suggested that teams with high levels of shared leadership represent situations where members have demonstrated both their trustworthiness to their teammates and their willingness to trust their teammates. Therefore:

H2. Shared team leadership is positively related to team members' trust in their virtual team.

Shared Leadership and Individual Autonomy

Autonomy is the degree to which individuals have freedom, independence, and discretion in carrying out their work (Chiniara & Bentein, 2016). PTS has been found to be positively associated with individual autonomy for several reasons. First, the more support individuals receive from their team, the more likely they are to feel empowered to carry out their tasks in a way they see fit (Aubé, Rousseau, & Morin, 2007; Janz, Colquitt, & Noe, 1997; Van Mierlo, Rutte, Vermunt, Kompier, & Doorewaard, 2006). Second, supportive teams are more comfortable with allowing their members greater autonomy (Griffin, Patterson, & West, 2001). These arguments are consistent with research linking the degree of autonomy given to individuals with the level of confidence others have in them (Wat & Shaffer, 2005).

H3. Shared team leadership is positively related to team members' autonomy in virtual teams.

Shared Leadership, Individual Trust, Autonomy, and Satisfaction

In our research model, we propose that shared leadership should moderate the relationship of trust and autonomy with satisfaction. We suggest that shared leadership provides the same mechanisms that underlie the effect of trust and autonomy on satisfaction. Consequently, trust and autonomy are not likely to provide anything new to increase satisfaction in virtual teams relying on shared leadership. As such, the positive relationship of trust and autonomy with satisfaction should weaken based on the degree of shared leadership employed.

Shared leadership should moderate the relationship between trust and satisfaction. Trust leads to more satisfaction by facilitating cooperation and mutual respect among team members (Jarvenpaa et al., 2004). This occurs because trust decreases the fear that someone might take advantage of you while also promoting feelings of safety and benevolence (Robert et al., 2009). When shared leadership is low, we expect trust to have a stronger positive relationship with satisfaction. However, shared leadership increases

satisfaction by promoting team members' belief that their teammates respect and value them (Bishop et al., 2000), and shared leadership also facilitates cooperation among members (Sheng et al., 2010; Wayne et al., 1997). This mirrors the mechanisms used to explain why trust leads to satisfaction. Therefore, the more shared leadership a team employs, the more likely its members are to be deriving satisfaction from their cooperation and mutual respect. When this occurs, increases in trust are less likely to correspond directly with increases in satisfaction. Consequently, the relationship between trust and satisfaction weakens the more a virtual team relies on shared leadership.

H4. Shared leadership moderates the relationship between trust and satisfaction such that high levels of shared leadership weaken the relationship between trust and satisfaction.

Similarly, shared leadership should also moderate the relationship between autonomy and satisfaction, but for a different reason. The literature links autonomy to satisfaction through work meaningfulness. The more freedom, independence, and discretion people have in carrying out their work, the more important and valuable (i.e., meaningful) that work becomes to them (for meta-review, see Humphrey, Nahrgang, & Morgeson, 2007; see also Wu, Griffin, & Parker, 2015). When shared leadership is low, autonomy should have a strong positive relationship with satisfaction.

However, we expect the relationship between autonomy and satisfaction to weaken because of shared leadership. As stated earlier, work meaningfulness is the primary driver of the relationship between autonomy and satisfaction. Shared leadership through PTS facilitates the belief that individuals' teammates value their contribution, which is also associated with work meaningfulness (Bishop et al., 2000; Liden et al., 2000). Therefore, the more shared leadership a team employs, the more likely its members are to derive satisfaction from work meaningfulness. When this occurs, increases in autonomy are less likely to correspond directly with increases in satisfaction. Consequently, the relationship between autonomy and satisfaction weakens the more a virtual team relies on shared leadership.

H5. Shared leadership moderates the relationship between a team member's autonomy and satisfaction such that high levels of shared leadership weaken the positive relationship between autonomy and satisfaction.

Virtual Team Satisfaction and Virtual Team Performance

Finally, our model posits that team satisfaction is positively associated with virtual team performance. Team satisfaction directly corresponds with the satisfaction of its members (Robert, 2013a). Increases in individual satisfaction directly correspond with increases in overall team satisfaction (Bergman et al., 2012; Robert, 2013a). When individuals are satisfied with their team experience they are

often more committed to their team's objectives (Judge, Thoresen, Bono, & Patton, 2001) and more motivated to contribute to their team's success (Geister, Konradt, & Hertel, 2006). This, in turn, leads team members to put forth more effort on behalf of their team (Judge et al., 2001). At the team level, more commitment and motivation derived from satisfaction should lead to better performance. Research has confirmed the positive relationship between team satisfaction and team performance (e.g., Hertel, Geister, & Konradt, 2005). Therefore, we suggest:

H6. Team satisfaction is positively related to virtual team performance.

Methods

For this study, we employed a survey approach, collecting data to represent constructs in the research model. We chose this approach for two reasons: i) it allowed us to examine our model across many different teams and individuals, and ii) it allowed us to directly compare our results with those of previous studies that employed a survey approach (see Carson et al., 2007). However, we do not claim that this approach is superior to other approaches. Instead, we advocate the use of multiple approaches across multiple studies.

Participants

The participants were graduate students enrolled in an online distance education program at a national public university. The program was designed to accommodate working professionals. All course content and class interactions were online and no classes took place in a face-to-face classroom. Therefore, we believe these teams were great examples of virtual teams.

The participants' ages ranged from 28–52, with a mean of 39. Seventy percent of the participants were men and 90% worked full time. Eighty-two percent had at least 2 years of full-time work experience. In total, 163 individuals in 44 teams across two classes participated in the study. The size of the teams ranged from 3–5 people. The average team project lasted about 48 days.

Team Project

The team project was a needs analysis of a resource-management system. Teams were required to assess an organization's resource system. This evaluation included determining whether the system supported the organization's hiring, training, evaluating, and promotion processes. The teams were required to use the methods and techniques learned in their course to assess the usability and comprehensiveness of the systems. Each team submitted one project to the course instructor.

TABLE 1. Factor loading.

Item	Construct	Factor Loading				
1	I was satisfied with how we completed the team project.	Individual Satisfaction	0.895	0.181	0.145	0.123
2	Overall this team project was a good experience.		0.911	0.075	0.233	0.101
3	I was satisfied with the overall "team experience" during this project.		0.908	0.064	0.235	0.172
4	Looking back I was pleased with how we completed the team project.		0.87	0.018	0.225	0.099
5	I enjoyed the process we used to complete the team project.		0.88	0.001	0.217	0.142
1	In the team, I decide how to do my own work.	Individual Autonomy	0.047	0.914	0.023	0.015
2	I have a lot of freedom to decide how I perform assigned tasks.		0.05	0.872	0.04	0.124
3	I set my own schedule for completing assigned tasks.		0.105	0.887	0.129	0.111
4	Once the team decides what to do, I decide how to do my part.		0.078	0.879	0.084	0.006
1	If I had my way, I wouldn't let the other team members have any influence over issues that are important to the project. (Reserved Scored)	Individual Trust	0.234	0.05	0.894	0.014
2	I would be comfortable giving the other team members complete responsibility for the completion of this project.		0.201	0.022	0.844	0.123
3	I really wish I had a good way to oversee the work of the other team members on the project. (Reserved Scored)		0.118	0.081	0.82	0.073
4	I would be comfortable giving the other team members a task or problem which was critical to the project, even if I could not monitor them.		0.241	0.02	0.83	0.212
1	"Team Member A" engaged in leadership positions on behalf of the team.	Shared Leadership	0.244	0.03	0.112	0.88
2	We relied on "Team Member A" for leadership.		0.192	0.026	0.124	0.893

Notes: Extraction Method: Principal Component Analysis. Rotation Method: Oblimin with Kaiser Normalization.

Data Collection

We collected data via two online surveys. All responses were confidential. Both surveys employed well-established multi-item 7-point Likert scales. We used the first survey to collect information measuring shared leadership, individual team trust, and individual autonomy; we used the second survey to measure individual satisfaction. We e-mailed the first survey to students 7 days before their team project was due. We e-mailed the second survey after students submitted their team project. Note that the authors did not teach any of the classes in the study.

Measurement

All scales used in this study were developed and validated by other researchers and are summarized in Table 1. All team members had access to a collaborative system via software provided by the university. The system afforded teams the ability to communicate through e-mail, electronic chat, voice-only, or video. However, students were not limited to that software. Teams used a variety of electronic communications, on average across all teams the breakdown was as follows: e-mail (50%), chat (30%), voice-only (10%), and video (10%). Percentages are a breakdown of total team communication.

Independent Variables

Team Satisfaction. We measured team satisfaction by aggregating the items used to measure individual satisfaction to the team. This approach to measuring team satisfaction is consistent with previous studies examining shared leadership and team satisfaction (see Bergman et al., 2012; Robert, 2013a).

Shared Leadership. The items measuring shared leadership were taken from Carson et al. (2007). Team members were asked to rate to what degree each team member displayed shared leadership. As suggested by Carson et al., we calculated a density score for shared leadership. Density represents the degree to which all members were engaging in shared leadership. We calculated the density score by dividing the average perceived leadership by 7, the total possible number for leadership. For example, if the average team member rated each team member as a 4 of 7 on shared leadership, the team would receive a score of 50% (e.g., $(n-1)/6 = (4-1)/6 = 3/6$) for shared leadership. Higher scores represented more shared leadership, while lower scores represented lower shared leadership. Team members did not rate themselves.

Dependent Variables

Individual Autonomy. To measure individual autonomy, we used Likert scale items adapted from Ahuja, Chudoba, Kacmar, McKnight, and George (2007). Items presented participants with statements regarding the degree of freedom they had in carrying out tasks (see Table 1). Participants then rated their agreement with the statement ranging from 1 (*strongly disagree*) to 7 (*strongly agree*).

Individual Trust. We used Likert-scale items to measure individual trust toward one's team. These items were from Jarvenpaa, Knoll, and Leidner (1998) and adapted from Schoorman, Mayer, and Davis (1996). The items included statements regarding the degree that participants trusted or did not trust (reverse-coded) their teammates (see Table 1). We asked participants to rate their agreement with each statement from 1 (*strongly disagree*) to 7 (*strongly agree*).

TABLE 2. Means, standard deviations, reliabilities, and correlations.

Variable	Mean	Std. Dev.	Reliability	1	2	3	4	5	6	7	8	9
Individual Autonomy	4.80	1.50	0.88	(0.81)								
Individual Satisfaction	5.80	1.20	0.95	0.16	(0.83)							
Individual Trust	5.40	1.20	0.92	0.16	0.52	(0.72)						
Shared Leadership	0.72	0.12	N/A	0.09	0.53	0.29	N/A					
Team Gender Diversity	0.30	0.21	N/A	-0.26	-0.20	0	-0.06	N/A				
Team Race Diversity	0.22	0.22	N/A	-0.18	0.02	-0.09	0.08	0.14	N/A			
Team Size	3.71	0.75	N/A	-0.25	0.04	-0.07	-0.12	0.01	0.22	N/A		
Team Tenure	48.00	7.50	N/A	-0.12	-0.07	-0.03	-0.1	0.17	0.06	0.16	N/A	
Virtual Team Performance	79	18.00	N/A	0	0.54	0.54	0.35	-0.11	0.09	-0.22	-0.06	N/A

Notes: 1. Square root of the Average Variance Extracted (AVE) in on the diagonal. 2. Significance of correlations: correlations above a 0.22 are significant at the 0.05 level and above 0.28 significant at the 0.01 level. 3. N = 163.

Individual Satisfaction. We measured individual satisfaction by adapting Likert-scale items from Jarvenpaa et al. (2004). Items presented participants with statements regarding their level of satisfaction with their virtual team experience. Participants rated how much they agreed with the statement ranging from 1 (*strongly disagree*) to 7 (*strongly agree*).

Team Performance. We measured team performance as the score the team received on its project. Both classes performed the same team project, graded with the same criteria.

Control Variables

We used several control variables to reduce the possibility of alternative explanations. We controlled for instructor, team tenure, team size, and racial and gender diversity. We also included measures of technology use as control variables but none were statistically significant, so they were removed.

Instructors. There was one instructor for each class, so we used a dummy variable of 0 or 1.

Gender and Racial Diversity. We calculated gender and racial diversity using Blau's index (Blau, 1977). Blau's index is defined as $H = 1 - \sum p_i^2$. H represents the heterogeneity score of the team, p the proportion of team members who fall into a particular category, and i the number of categories represented in the team.

Team Tenure. We measured team tenure by the number of days the team existed.

Team Size

Team size was a measure of how many people were on the team.

Results

First, we assessed the psychometric properties of the scales. All multi-item measurement scales showed high reliability, with Cronbach's alpha scores equal to or greater

than 0.87 (see Table 2). Convergent and discriminant validity were assessed using factor analysis. All loadings were greater than 0.80 and cross-loadings were less than 0.25 (see Table 1, thus suggesting convergent validity within scales and discriminant validity across scales; Fornell & Larcker, 1981). Discriminant and convergent validity were also assessed by examining the square root of the average variance shared (AVE). The correlation matrix is shown in Table 2. The square root of the average variance shared (AVE) is shown along the diagonals. Values of 0.5 or higher indicate an acceptable level of convergent validity, while discriminant validity is indicated when the items of a construct share more variance internally than with other constructs in the model (Fornell & Larcker, 1981). In Table 2, the square root of the AVE of each construct is larger than its corresponding row and column correlations, indicating adequate discriminant validity.

We used two analytic procedures to empirically test the research model. First, all hypotheses examining individual satisfaction (H1–H5) were done using a multilevel approach that asserts that higher-level constructs can influence the lower-level constructs (Kozlowski & Klein, 2000). This was because all individuals were nested into teams. Therefore, it was necessary to use an analytic technique that recognizes that each case is not independent (Bliese, 2000). We used SPSS v. 22 (IBM Armonk, NY) mixed-model package to perform hierarchical linear modeling (HLM) to account for the nested nature of the data. Based on the HLM technique, we tested the research model by entering variables stepwise: model 1 included only control variables, model 2 included the main effects of independent variables and the control variables in model 1, and model 3 included the interaction effects along with the variables from models 1 and 2.

None of the independent variables had correlations between them greater than 0.70, suggesting that there was little multicollinearity (Aiken & West, 1991). Nonetheless, we standardized all continuous variables, as suggested by Aiken and West (1991), to reduce any amount of multicollinearity. To justify the aggregation of shared leadership, we assessed the intraclass correlation coefficient (ICC1) and the r_{wg} associated with satisfaction. The ICC1 was 0.28 and r_{wg} was 0.87, both justifying the aggregation of the construct (Bliese, 2000).

TABLE 3. Results of multilevel analysis on trust and autonomy.

Independent Variables	Trust		Autonomy		Satisfaction	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
Control Variables						
Team Size	-0.18	-0.11	-0.13	-0.12	0.07	0.15
Team Tenure	-0.06	-0.03	-0.25	-0.25	-0.05	-0.01
Racial Diversity	0.36*	0.31*	-0.35*	-0.34*	0.11	0.01
Gender Diversity	-0.04	-0.19	-0.36*	-0.34	-0.09	-0.13
Instructor	-0.76	-0.54	-1.07*	-1.01	-0.28	-0.18
Main Effects (Level 2)						
Shared Leadership		0.40**		0.09		.54**
-2 Restricted Log Likelihood	261	258	261	262	213	204
Deviance Difference		3*		1		9*
df		1		1		1
R ²	14%	22%	1.1%*	2.50%	6.10%	72%
Change in R		8%*		1.40%		66%

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

TABLE 4. Results of multilevel analysis on individual satisfaction.

Individual Satisfaction			
Independent Variables	Model 1	Model 2	Model 3
Control Variables			
Team Size	0.03	0.13	0.1
Team Tenure	-0.05	0.01	-0.02
Racial Diversity	0.14	0.06	0.02
Gender Diversity	-0.16	-0.25	-0.27**
Instructor	-0.15	-0.19	-0.22
Main Effects (Level 1)			
Individual Autonomy		0.13	0.12
Individual Trust		0.49***	0.58***
Main Effect (Level 2)			
Shared Leadership		0.51**	0.42**
Two-Way Cross-Level Interactions			
Shared Leadership X Indi v. Trust			-0.27*
Shared Leadership X Individ. Autonomy			-0.21*
-2 Restricted Log Likelihood	476	397	167
Deviance Difference		79	12
df		3	2
R ²	0	41%	56%*
Change in R		41%	15%***

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

Shared leadership was positively related to (H1) individual satisfaction ($\beta = 0.54$; $p < .01$) and (H2) individual trust ($\beta = 0.40$; $p < .001$), but not (H3) individual autonomy ($\beta = 0.09$; $p > .05$). Table 3 shows the effects of shared leadership on individual trust and autonomy. Model 1 includes only control variables. Racial diversity was positively associated with individual trust ($\beta = 0.36$; $p < .05$) but negatively associated with individual autonomy ($\beta = -0.35$; $p < .05$). Gender diversity showed a negative relationship with individual autonomy ($\beta = -0.36$; $p < .05$). Model 2 in Table 3 tested the main effects of shared leadership and explained 22% and 2.5% of the variance for individual trust and autonomy, respectively. The variance of individual trust increased significantly by 8% ($p < .05$). Comparison of

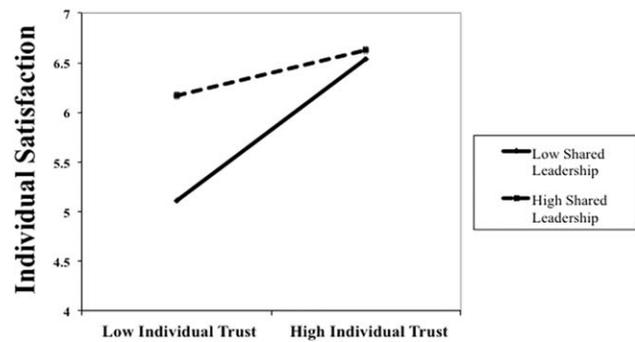


FIG. 2. Two-way interaction effects for shared leadership and individual trust.

deviance difference between models 1 and 2 on individual trust indicated that model 2 with shared leadership has a better model fit than model 1 ($p < .05$).

Table 4 shows the results of multilevel analysis on individual satisfaction. Model 1 in Table 4 shows the effects of the control variables on individual satisfaction. Model 2 shows the direct effects of individual autonomy, individual trust, and shared leadership on individual satisfaction. Model 3, which included the interaction effects, explained 56% of the variance. The addition of the interaction effects increased the variance explained by 15% ($F = 13.36$, $p < .001$). In addition, when we compared the deviance difference between model 3, with the interaction terms, and model 2, without any interaction terms, using a chi-squared test, we found that model 3 fit the data better than model 2 ($p < .001$). The better model fit along with the significant increase in variance explained suggests that the interactions are warranted.

Shared leadership moderated the relationship between (H4) trust and satisfaction ($\beta = -0.27$; $p < .05$), as shown in Figure 2. Shared leadership also moderated the relationship between (H5) autonomy and satisfaction ($\beta = -0.21$; $p < .05$), as shown in Figure 3. A team member's autonomy

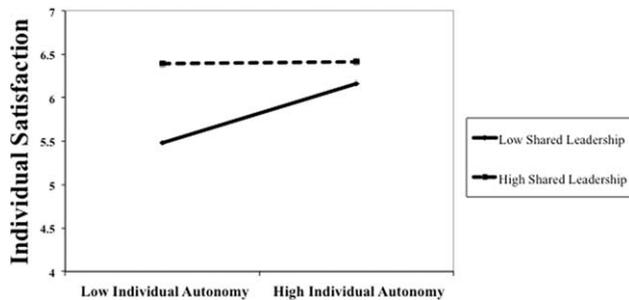


FIG. 3. Two-way interaction effects for shared leadership and individual autonomy.

TABLE 5. Results of OLS team analysis.

Independent Variables	Virtual Team Performance	
	Model 1	Model 2
Control Variables		
Team Size	-0.25	-0.25
Team Tenure	-0.45	-0.46
Instructor	0.65	0.02
Main Effect		
Team Satisfaction		0.50**
Adjusted R ²	20%	43%
Change R		23%
F	2.5*	4.6**

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

was positively related to satisfaction when shared leadership was low but not when it was high.

Next, we tested Hypothesis 6 using ordinary least squares (OLS) regression. This is because all variables were at the team level of analysis. To justify the aggregation of individual satisfaction to a team-level construct, we assessed the ICC1 and the r_{wg} associated with satisfaction. The ICC1 was 0.25 and r_{wg} was 0.85, both justifying the aggregation of the construct (Bliese, 2000). The full model, which included team satisfaction, explained 43% of the adjusted R²; the increase in the variance explained from model 1 to model 2 was significant.

Finally, team satisfaction was positively related to (H6), virtual team performance ($\beta = 0.50$; $p < .05$). The results indicate that shared leadership determines when individual trust and autonomy lead to higher individual satisfaction. An increase in satisfaction at the team level was positively associated with team performance (see Table 5).

To verify the link between shared leadership and team satisfaction, we ran an additional analysis at the team level (see Table 6). Shared leadership was a significant predictor of team satisfaction ($\beta = 0.48$; $p < .01$). We discuss the results in the next section.

Discussion

In this research, we sought to understand: i) whether shared leadership is needed to increase trust and autonomy;

TABLE 6. Results of OLS team analysis.

Control Variables		
Team Size	-0.25	-0.14
Team Tenure	-0.15	-0.1
Instructor	0.05	0.03
Main Effect		
Shared Leadership		0.48**
Adjusted R ²	3%	24%
Change R		21%
F	1.6	5.5**

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

ii) whether shared leadership helps to determine whether trust and autonomy translate into more satisfaction; and iii) whether the promotion of satisfaction through shared leadership is associated with better virtual team performance. To this end, the results of our study provide three overarching findings. First, shared leadership was associated with increases in satisfaction and trust but not autonomy. This implies that shared leadership is not needed to help facilitate autonomy. Second, shared leadership moderated the effects of trust and autonomy on satisfaction. This indicates that in the presence of shared leadership, trust and autonomy are relatively weak predictors of satisfaction in virtual teams. Finally, shared leadership was associated with better team performance by helping to facilitate satisfaction. This study extends our existing knowledge by highlighting and theoretically explaining the role of shared leadership in the satisfaction and performance of virtual teams. Next, we present the study's contributions and implications for research.

Contributions

First, this study contributes to the literature on trust in virtual teams. Shared leadership both facilitates an individual's trust in the team and undermines its effect on satisfaction. The social exchanges that take place during the course of sharing leadership facilitate trust but also create a climate of mutual respect and cooperation, both of which normally derive from trust to facilitate satisfaction. As a result, this study sheds new light on the conditions in which trust has little relationship with satisfaction in virtual teams. In doing so, it answers the call to identify the boundary conditions of the effects of trust on outcomes (Dirks & Ferrin, 2002; Jarvenpaa et al., 2004; Sarker et al., 2011).

Second, this study contributes to the literature by identifying autonomy as an alternative to shared leadership when promoting satisfaction in virtual teams. One: Shared leadership was not related to team members' autonomy. One explanation is that shared leadership might require team members to compromise with other members on how they go about accomplishing their work. This might be needed to better coordinate work across members to employ shared leadership (Carson et al., 2007; Robert, 2013a). Two: Autonomy was not positively related to satisfaction in virtual teams when teams engaged in high levels of shared leadership. Based on previous literature, we would expect a strong

link between autonomy and satisfaction (Chung-Yan, 2010). Taken together, these findings indicate that autonomy can help facilitate satisfaction without the need of shared leadership.

Finally, this study contributes to the literature on shared leadership in virtual teams. This study demonstrated that shared leadership facilitates improved virtual team performance through satisfaction. This extends research in an emerging and understudied area—the role of shared leadership in virtual teams (Hoch & Kozlowski, 2014; Hoch, Pearce, & Welzel, 2010). In doing so, this study addresses an important topic—the promotion of satisfaction in virtual teams (José et al., 2014; Reinig, 2003).

Limitations

Before discussing the implications of our study, it is important to acknowledge several limitations. First, all data were collected from one context. Additional research is necessary to determine whether our findings generalize to other settings. Second, our nonexperimental method does not allow us to draw conclusions regarding causation. For example, teams might have been more satisfied because they were performing well. Third, many of the measures were gathered through self-reports. To mitigate the effects of common method variance, we used two different surveys at two different times and we conducted a Harman single-factor test. The results indicate that common method variance was not a major issue. Finally, we employed team climate to help explain the impact of shared leadership. However, we did not measure team climate in this study. Future studies could include a measure of team climate to verify many of our assumptions.

Implications for Theory and Research

This study has several theoretical implications for research on virtual teams.

According to the results of this study, shared leadership both helps to facilitate trust and undermines the need for trust. It facilitates trust by leading to more trust (i.e., H2), but in the presence of shared leadership trust does not have much of a relationship with satisfaction (i.e., H4). In a recent meta-analysis on shared leadership, the development of trust was cited as one of the major reasons behind why shared leadership is associated with better team outcomes (i.e., performance and social and emotional outcomes; see Wang, Waldman, & Zhang, 2014). These findings suggest that the benefits of shared leadership might not be a result of the development of trust. When teams engage in high levels of shared leadership, the effects of trust greatly diminish with regard to satisfaction. Therefore, increases in trust due to shared leadership may not actually materialize into meaningful impacts when shared leadership is high. In fact, trust could simply be a byproduct of shared leadership. Shared leadership is associated with increases in cooperation, communication, and mutual respect from which trust emerges. However, the effects of shared leadership might not actually

occur through the development of trust. Although more studies are necessary to reach this conclusion, this calls into question the central role that trust plays in some of the effects of shared leadership.

Autonomy is often lauded because it leads to higher levels of satisfaction and greater work engagement. However, the effects of autonomy on satisfaction greatly diminished in the presence of shared leadership. It would be important to know whether shared leadership could provide the same level of work engagement as individual autonomy. This might be particularly important because individual autonomy might offer a level of engagement that is significantly higher than when teams rely on a shared leadership structure. Future studies should investigate whether shared leadership moderates the relationship between individual autonomy and work engagement.

This study, like others, found that shared leadership has positive benefits when it comes to facilitating better team relationships. And although satisfaction was related to virtual team performance in this study, shared leadership is not always related to performance (Balthazard, Waldman, Howell, & Atwater, 2004). In fact, in at least one case shared leadership was negatively related to the performance of virtual teams (Robert, 2013a). It would be interesting to know whether shared leadership leads to high levels of individual satisfaction because it often leads to compromises associated with team performance. If so, this would imply that some level of satisfaction could be associated with decreases in team performance. Therefore, future studies should investigate what levels of shared leadership and satisfaction are good for virtual team performance and what levels are bad.

Conclusion

This paper extends our understanding of the impact of shared leadership, trust, and autonomy on satisfaction and performance in virtual teams. The results of this study indicate that shared leadership, individual trust, and autonomy each play an important role in facilitating individual satisfaction in virtual teams. In addition, team satisfaction was positively associated with the performance of virtual teams.

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