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INVESTIGATING THE PERCEIVED OF E-LEADERSHIP STYLE CHANGE AND ITS CONSEQUENCE IN VIRTUAL CONTEXT

Kai-Tang Fan, Lunghwa University of Science and Technology
Email: ktfan021@gmail.com

ABSTRACT

The main purpose of this study was to test the prescriptions for virtual leadership and leadership style change, based on the situational leadership theory. This study first manipulated virtual leadership by using email in accordance with transformational and transactional leadership theory. Then, this study investigated the possibility of changing leadership style and examined its effects on leadership effectiveness.

This research employed a 2x2x2 factorial experiment design to investigate the impacts of virtual leadership style (transformational vs. transactional), leadership style change (transformational to transactional/ transactional to transformational/ pure transformational/ pure transactional), and control mechanism (process-oriented vs. outcome-oriented) on leadership effectiveness. 130 undergraduate students served as virtual team members that were required to use a Web-based group decision support system to support their teamwork.

The results indicated that perception of transformational or transactional leadership style and leadership change was significantly stronger in accord with the assigned situation. Further evidence revealed that the interaction effect of leadership style change and control mechanism on leadership effectiveness were also significant. Corresponding to the situational leadership theory, the leadership matched with control mechanism led to higher leadership effectiveness relative to the mismatched condition. This research yield important inferences regarding the situational leadership in virtual context. The suggestions and contributions of this study as well as the managerial implications are also presented.

Keywords：Virtual leadership, Leadership style change, Situational leadership theory

INTRODUCTION

Virtual collaboration is a relatively new trend in knowledge-based society. It offers a wide range of potential benefits to organizations (Townsend, DeMarie, & Hendrickson, 1998; Powell et al., 2004). The increasing popularity of research has focus on examining many aspects in virtual context (Powell, Piccoli, & Ives, 2004). For instance, Microsoft often uses virtual teams to support major global corporate customer sales and post sales services (Jarvenpaa, Leidner, & Pearlson, 1995). How do people cooperate in virtual context? People who works in virtual context are most typically consisting of groups of geographically and/or temporally dispersed members who accomplish their work primarily via information and telecommunication

technologies (Ocker, 2005; DeSanctis & Poole, 1997; Jarvenpaa & Leidner, 1999; Lipnack & Stamps, 1997; Powell et al., 2004), such as computer-mediated communication (CMCS) and group decision support systems (GDSS) that may help facilitate the group problem solving processes and improve the decision quality.

Past research have identified that leadership is vital for team effectiveness in virtual context (Kayworth & Leidner, 2001/2002). Some theorists believed that leadership can be classified into transformational and transactional leadership (Burns, 1978), and the transformational leadership is vital for many behavioral outcomes (e.g., Avolio, Waldman, & Einstein, 1988; Avolio, Bass, & Jung, 1999; Bass, 1985; Yammarino & Bass, 1990; Bass, 1998; Shin & Zhou, 2003). For example, Sosik, Kahai, and Avolio (1998) conducted a laboratory study with one hundred fifty-nine undergraduate students to examine the effects of transformational leadership on creativity. The results showed that higher level of transformational leadership showed more creative performance, such as idea elaboration, flexibility in idea generation, and proposals of original solutions.

Traditionally, organizations or teams mostly rely on face-to-face (FtF) meetings in problem solving process (Ocker, 2005). Leaders can communicate with subordinates through multiple modes of face-to-face conversation, such as paraverbal (tone of voice, inflection, voice volume) and nonverbal (eye movement, facial expression, hand gestures, and other body language) cues (Warkentin, Sayeed, & Hightower, 1997). For that reason, leaders can also deliver important message or information to subordinates simultaneously. Unlike traditional teams, most virtual workers may have to communicate and work synchronously or asynchronously through computer-mediated communication systems (CMCS) or such technologies as telephones, e-mail, audio/video/data conferencing, electronic voting and collaborative writing (Coleman, 1997). Therefore, the implementation of virtual collaboration will pose significant challenges for organizations, especially leadership (Kayworth & Leidner, 2001/2002).

Avolio, Kahai, and Dodge (2000) argued that the nature of leadership is fundamentally the same, whether in FtF or virtual context. Amabile, Schatzel, Moneta, & Kramer (2004) noted that in FtF teams, leadership behavior does influence subordinates perceptions, in turn, influence creativity; however, in virtual context, several researchers (e.g., Mcgrath & Hollingshead, 1994; Nunamarker, Briggs, & Mathews, 1995; Sosik, Kahai & Avolio, 1998) indicated that the role of leadership in promoting subordinates' creative performance in GDSS groups has been largely ignored. For virtual teams, information and communication technology (ICT) often limits communication media and hence provides less effective support for the group problem solving processes. Lee (1994) considered e-mail to be a rich media and was capable of supporting managers' exercise. Leaders in virtual context can lead or give their subordinates feedback through emails, even though it is not conductive to immediate feedback (Lee, 1994). For this reason, e-mail may be an appropriate communication medium, since it can delay the feedback timing, let leaders to deliberate the message they want to deliver, and determine which style and timing to unroll their leadership or feedback. As a result, leadership behavior and the leading content would be separated by the nature of virtuality, and in turn, enrolled by e-mail.

Despite the benefit of virtuality and e-mail, the research that has identified or suggested the enrolling of e-leadership behavior and the e-leading content in virtual teams remains inconsistent (Avolio, et al., 2000). For example, Purvanova and Bono (2009) compared the effects of transformational leadership in both face-to-face and virtual context and revealed that the effects of transformational leadership on team performance were stronger in virtual context. On the contrary, Kahai, Sosik, and Avolio (2003) conducted a laboratory experiment to study the effects of leadership style, anonymity and rewards on creativity-relevant group process and outcomes in electronic meeting context and revealed that transactional leadership was associated with greater group efficacy and satisfaction with the task and higher solution originality than transformational leadership.

Researchers who believe in contingency perspective states that effective leaders may adopt or change their leadership style in accordance with the nature of task and environmental condition (Lee-Kelley, 2005). As Hersey and Blanchard (1982) originally proposed, situational leadership theory predicts an optimal combination between leadership style (relationship-focus and task-focus) and subordinate attribute. Thompson & Vecchio (2009) proposed that there will be a three-way interaction that represents the relationship between leader considerateness, leader structuring, and follower developmental level in account for the follower outcomes of job performance and attitudes. Although they could not find a robust evidence to support the above most widely-known Situational Leadership Theory (SLT); however, some major textbooks still noted several distinct strengths that SLT possesses (Northouse, 2007). By following the contingency perspective, this study tried to adapt the guidelines proposed by SLT to virtual context and explored the leadership effectiveness under match and mismatch scenarios.

Leadership research in virtual context

The virtualization of work environments is supported by emerging collaboration technologies and driven by a global workforce that is required to handle complex tasks. Therefore, communications among team members can easily get side tracked and people involved often lack clear understanding of why certain things happened and how decisions were made (Warkentin et al., 1997). In addition, information is not shared immediately and interpretation of information is often distorted (Kayworth & Leidner, 2001/2002). Many researchers have found that leadership plays a very important role in the effective functioning of virtual collaboration (Hiltz & Turoff, 1976, 1985; Hiltz, Dufner, Holmes, & Poole, 1991), especially in the creation and interpretation of advance information technology (Avolio, et al., 2000). On top of paying attention to work environments and organizational climate, leaders also need to coordinate project tasks and facilitate the group process to achieve teams' goals (Kayworth & Leidner, 2001/2002). In addition, they also believe that effective leaders in virtual context would exhibit higher levels of behavioral complexity than leaders of face-to-face condition (Kayworth & Leidner, 2001/2002).

In virtual context, leaders can use email or other means to convey the expectations and requirements to subordinates by specifying how their performance will be measured and rewarded (Bass & Avolio, 1990). If subordinates are found not contributing to the required works, warning messages will be sent to them hoping that their improper behaviors may be

corrected. Kayworth & Leidner (2001/2002) created 13 virtual teams, each composed of 5 to 7 members from 3 universities, they found that the most effective leaders were those who communicated regularly, answered team member questions, provided feedback, gave directions, and approached the members with a cordial yet assertive tone. Besides, they found that virtual team leaders were very effective when they acted in a mentoring role and exhibited a high degree of understanding (empathy) toward their team members. Thus, leaders in virtual context should be sensitive to work schedules, care for all subordinates, appreciate their subordinates' opinions and suggestions, and communicate to their subordinates. For example, Sosik, Kahai, and Avolio (1998) conducted an empirical study of the effect of transformational and transactional leadership on team creativity when an anonymous electronic brainstorming tool was used. In this study, 159 college students formed 36 groups. Results showed that there is a positive correlation between transformational leadership and creativity.

Kayworth & Leidner (2001/2002) proposed some guidelines for effective leaders. For instance, leaders have to exhibit a high degree of understanding (consideration) toward their team members, care for all members, and appreciate their team members' opinions and suggestions. They also have to monitor or lead their team members follow the initial guidelines. However, how leaders behave themselves in accordance with the above principles still under explored, especially in virtual context. According to information richness theory, communication media vary in the capacity to process rich information and face-to-face (FtF) is the richest one (Daft & Lengel, 1986). Nevertheless; in virtual context, workers are geographically dispersed and have to coordinate their tasks across different time zones. Consequently, they have no choice but to seek for other media instead of FtF meeting to support their daily work, and e-mail seems the most commonly used channel for communication among dispersed heterogeneous team members (DeSanctis, Wright, & Jung, 2001).

Although Daft & Lengel (1986) argued that e-mail is a lean medium because it lacks the capability for immediate feedback, uses only a single channel, tends to be impersonal, and incurs a reduction in language variety, Lee (1994) indicated that richness or leanness is not an inherent property of the e-mail medium but an emergent property of the interaction of the e-mail medium with its organizational context. Team leaders can actively lead their team members through delivering meaningful messages in e-mail (Lee, 1994). However, what leadership style should leaders express in accordance with the control mechanism through email in virtual context is worth of further investigation.

Leadership style and control mechanism in virtual context

Studies have found that leadership styles in fact have impacts to the creativity of individual, particularly transformational leadership has more positive impact to many crucial outcome variables (Avolio, Bass, & Jung, 1999). Transformational leadership may improve subordinates interactions and trust; moreover, it can also encourage subordinates to share ideas or knowledge with each other. Kayworth & Leidner (2001/2002) also indicate that the leaders who simply demand their team members to finish the task without providing encouragement and response may lead the team into an unstable process and mediocre performance. In addition, Sosik, Kahai & Avolio (1998) conducted an empirical study of the effect of transformational and transactional

leadership on team creativity when an anonymous electronic brainstorming tool was used. There were 159 college student subjects in 36 groups. The result showed that transformational leadership will encourage the followers to challenge status quote and antiquated methods when their leaders motivate them intellectually. They will discover new issues and problems to fulfill their curiosity and imagination.

In addition to the leadership style, the control mechanism in virtual context is also vital to the leaders (Piccoli & Ives, 2003; Piccoli, et al., 2004). Piccoli & Ives (2003) divided the control mechanism into process-oriented and outcome-oriented. The process-oriented focused on the designing and structuring of working process. The outcome-oriented; however, focused on how leaders controlled their subordinates performed in the end (Ouchi, 1977, 1979; Piccoli & Ives, 2003; Snell, 1992). Purvanova & Bono (2009) indicated that the contextual effects may not be the same for all leaders, in other words, leaders may alter their leadership style to match the context. According to the perspective of personal trait, leaders may not expect to behave different style across situations. Interestingly, some studies testing the above consistency-specificity behavior leads to confounding results. Some researches stated that leaders behave consistently across situations (e.g., Albright & Forziati, 1995; Zaccaro, Foti, & Kenny, 1991); however, others found that leaders behave vary by context (Barrow, 1976; James & White, 1983). Based on the above discuss, this study expected that leaders in virtual context will vary their style in accordance with the specific control mechanism. In this case, leaders in virtual context will alter their leadership style to adapt to the situation. However, there were no previous evidences had clearly illustrated the relationship between leadership style and control mechanism, especially in the virtual setting. Thus, the purpose of the present study is tried to address this issue by investigating the consequences of leadership styles (transactional vs. transformational) and control mechanism (process-oriented vs. outcome-oriented) in virtual context and further examining how the subordinates feel if leaders changed their leadership style, both in the match or mismatch conditions.

METHODS

Sample

Undergraduate students enrolled in management accounting courses (n = 70) and human resource management courses (n=61) at two private university, located in central and north Taiwan, participated in this experiment for 20% course credit, respectively. Participants were randomly assigned to 32 four-to-five-member virtual teams. These teams were assigned as (Kahai, et. al., 2003) which had no prior interaction or co-operation experience or any expectation of future interaction. In the case of some groups, there were some participants not showing up for the online discuss every day, from the first week till the sixth week. Thus, only 114.participants contained for the further analysis. The average team size was 3.56.

Task Assignment

Each team was assigned to serve as a consulting team and asked to solve the same consulting project. For the project assignment, team members had to read the assigned management case,

developed by Wu, Hsieh, and Wan (2008), collected by Taiwan Management case center (TMCC). In addition, the confederates (served as team leader) were asked to use transformational or transactional leadership style with process-oriented or outcome-oriented control mechanism to manage their team member in accordance with their discussion. Participants were asked to follow their leader's direction to participate 6 weeks online meeting and discuss about "How to revise the performance evaluation system based on the balance score card perspective," supported by a Web-based group decision support system to complete their teamwork (consulting project) during 6 weeks. After the experiment, they are required to submit a five-to ten-page report.

Research Design

This study used a 2 (transformational/transactional) x 2 (constant/change) x 2 (process-oriented/outcome-oriented) factorial repeated-measures design, with style change used as a within-groups factor. The experimental groups were randomly assigned across the leadership and control conditions while ensuring even distribution. There were 4 groups in every Leadership x Control cell. Each group discussed the same consulting project within two stages: on in the first fifteen days (before leadership change) and the other in the following nineteen days (after leadership change). The number of participants in this study did not permit perfectly counterbalancing across leadership and control conditions. The effects of each participants' effort and how they value this research were controlled statistically.

Research assistants (served as confederate leaders) set up all agendas in advance and ask all participants to receive a one week period creative support system training to ensure that they were all familiar with the Teamspirit system. After training, all participants were asked to participate in 5 related meetings during 6 weeks by using Teamspirit to support their teamwork, and requested to submit a 5-10-pages final report in the end.

The confederates led the task exhibiting transformational or transactional leadership style in accordance with process-oriented or outcome-oriented control. The instructions and descriptions email consisting of some behavioral comments representing transformational or transactional leadership styles were formed based on the literature regarding the transformational and transactional leadership theory (Avolio, et. al., 1999; Kahai, et. al., 2003). Before participants discussed online, the confederates typed their scripted comments into the leading email and delivered to each participants at assigned times, which were different across process-control or outcome-control conditions. For the manipulation on control mechanism, based on Piccoli & Ives (2003), to manipulate the process-oriented control condition, the confederates typed their comments in advance and email to the participants to inform or notify whether they perform will or not in the online discussion every day. As to the manipulation of outcome-oriented control condition, the confederates only informed the participants how to discuss online on Monday and notify the participants to finish their online discussion on Thursday.

According to previous virtual team leadership studies (e.g., Hambly, et. al., 2007; Kahai et., al., 2003), the transformational leader's instructions and comments emphasized understanding and appreciating each participants' needs and viewpoints within group, and stimulating each other's

efforts to be creative and constructive by proposing questions, sharing new ideas, and approaching old situations in new ways (Kahai et., al., 2003). The transactional leader's instructions and comments emphasized what the group was expected to do and the rewards or punishments (course credits) it would receive on when they finishing their discussion and achieving the expected performance (Kahai et., al., 2003). After the first fifteen days' discussion, some participants under leadership change conditions will received their confederates change their leadership style from transformational into transactional or from transactional into transformational, started from the sixteen days till end. In addition, no matter under what conditions, the control mechanism will keep constant. After the five weeks online discussion, participants were asked to submit a five-to-ten pages report.

TABLE 1 Experimental Design

			Control Mechanism	
			Process-oriented	Outcome-oriented
Leadership Style	Constant	TF to TA	EG 1 (4 groups)	EG 5 (4 groups)
		TA to TF	EG 2 (4 groups)	EG 6 (4 groups)
	Change	Transformational (TF)	EG 3 (4 groups)	EG 7 (4 groups)
		Transactional (TA)	EG 4 (4 groups)	EG 8 (4 groups)

Measures

Manipulation checks. Individual-level of questionnaire items were employed to check the leadership, the leadership style change, and control mechanism manipulations. The leadership manipulation was checked using 5-point scale items ranging from "5 = strongly agree" to "1 = strongly disagree" adapted from the revised MLQ-5X (Avolio, et al., 1999). Perception of transformational leadership was measured with a 13-item scale and the perception of transactional leadership was measured with a 5-item scale. Since one of the primary goal of this study was to investigate whether the subordinate will perceive the change on leadership style, this research conducted six times measures from the beginning to the sixth week, with 5-point "strongly agree" to "strongly disagree" response format. The coefficient alpha of transformational leadership style form the first measure to the sixth measure were ranged from .82~.91. The coefficient alpha of transactional leadership style form the first measure to the sixth measure were ranged from .83~.95. In addition, the leadership style change was checked by comparing the subordinates' 6-times perception on the transformational and transactional leadership style.

The manipulation check on the control mechanism was measured not only by asking the participants how many times did they receive the email from their leaders within a week but also asked what is the main concern of their leader, focus on process or focus outcome? *Where 1 = absolutely outcome, 2 = not sure, 3 = absolutely process*.

Leadership effectiveness. This research followed Conger, Kanungo, and Menon (2000), used reverence for the leader (REV), trust in the leader (TRU), and satisfaction with the leader (SAT) to assess the leadership effectiveness. The REV was measured by a three-item scale developed by Conger, et. al. (2000). The TRU was measured by a three-item scale and was taken from Bass (1985) and Bulter (1991). SAT was also measured by three items based on Bass (1985). Since our purpose was to investigate whether the subordinate will perceive the change on leadership style and examined the effects of leadership change on leadership effectiveness, this research conducted six times measures from the beginning to the sixth week, with 5-point "strongly agree" to "strongly disagree" response format. The coefficient alpha of REV form the first measure to the sixth measure were ranged from .78~.86. The coefficient alpha of TRU form the first measure to the sixth measure were ranged from .80~.89. The coefficient alpha of SAT form the first measure to the sixth measure were ranged from .87~.95.

Web-based group problem solving system: Teamspirit

The design and structuring of group decision processes have been shown to be an important element for teams, particularly distributed ones to succeed. We have designed and implemented a Web-based problem-solving system, i.e., a Web-based GDSS in this study, called TeamSpirit. It was specifically designed according to group problem solving processes (identify problems, create/design solutions, implement solutions or systems) and techniques and was intended to be used by members of virtual teams to support their creative problem solving processes over the Web (Chen, Liou, Wang, Fan, & Chi, 2007). Each problem solving process should follow the next three stages, idea generation, idea consolidation, and idea evaluation, besides, each stage was designed some implement tools to support divergent and convergent thinking in the creative problem solving process.

The teamspirit closely followed the Creativity Problem Solving (CPS) processes and tools commonly used in general problem solving and decision making developed over time. The CPS program was initially developed by Osborn (1963) and later modified by many other researchers (e.g., Torrance et al., 1978; Isaksen et al., 1994, 2000). It is a complete program based on such a tripartite model of creative process. The key concept of the CPS is to separate the idea generation stage from the idea evaluation stage so that bizarre, uncommon ideas may have a chance to enter into our attention before they are pruned out. Facilitators and participants only need to use Web browsers to manage meetings or participate in meetings. TeamSpirit is developed in ASP.NET using Visual Basic .NET as the implementation language. The TeamSpirit system can be deployed on a computer running Microsoft Windows 2003 Server with Internet Information Server (IIS) and Microsoft .NET Framework SDK installed.

RESULTS

Table 2 and 3 present scale means and standard deviations among each experimental condition for the measures of leadership style and leadership effectiveness.

Manipulation checks

Individual-level responses to the leadership, style change, and control mechanism items were analyzed with ANOVA. The results revealed that participants led by transformational leadership perceived significantly higher level of transformational leadership style, whether before style change ($M = 3.65$ vs. 3.04, $p < .001$) or after style change ($M = 3.48$ vs. 3.10, $p < .01$). On the contrary, participants led by transactional leadership perceived significantly lower level of transformational leadership style, whether before style change ($M = 2.97$ vs. 3.35, $p < .001$) or after style change ($M = 2.93$ vs. 3.39, $p < .001$).

Perceptions of receiving leaders' email during week 2 to week 6 were significantly more in the process-oriented control condition than in the outcome-oriented condition ($M = 1.98$~2.98 vs. $M = 1.71$~1.94, $p < .001$). In addition, the perceptions of the main concern of their leader during week 2 to week 6 were significantly higher in the process-oriented control condition than in the outcome-oriented condition ($M = 2.01$~2.52 vs. $M = 1.61$~2.14, $p < .05$).

TABLE 2 Cell means, standard deviations for leadership style

Leadership				Style change				Style constant			
				TF to TA		TA to TF		Transformational (TF)		Transactional (TA)	
Control mechanism				P	O	P	O	P	O	P	O
Experiment design				EG1	EG2	EG3	EG4	EG5	EG6	EG7	EG8
Transformational	before	1st	M	3.65	3.61	3.20	2.94	3.65	3.67	2.95	3.07
			SD	.48	.61	.52	.49	.46	.40	.61	.80
		2nd	M	3.56	3.23	3.07	3.06	3.51	3.26	3.18	2.95
			SD	.70	.56	.51	.52	.46	.81	.76	.67
		3rd	M	3.36	3.25	3.51	3.55	3.54	3.42	3.10	2.94
			SD	.37	.43	.76	.79	.44	.51	.59	.76
	after	4th	M	3.28	3.10	3.57	3.68	3.30	3.38	2.99	3.01
			SD	068	.72	.67	.48	.57	.69	.76	.69
		5th	M	3.37	3.19	3.39	3.62	3.29	3.37	3.08	3.26
			SD	.47	.72	.54	.54	.43	.96	.56	.62
		6th	M	3.36	3.35	3.44	3.49	3.48	3.41	3.08	3.19
			SD	.57	.60	.62	.51	.45	.51	.68	.62
Transactional	before	1st	M	3.28	2.91	3.37	3.13	2.73	2.91	3.51	3.41
			SD	.44	.52	.42	.48	.50	.62	.53	.48
		2nd	M	2.87	2.94	3.35	3.35	2.77	2.57	3.23	3.48
			SD	.55	.52	.52	.48	.38	.50	.55	.44
		3rd	M	3.11	3.13	3.39	3.57	2.70	3.07	3.31	3.42
			SD	.44	.51	.47	.54	.56	.32	.52	.63
	after	4th	M	3.29	3.53	3.22	3.17	2.62	2.72	3.46	3.29
			SD	.58	.39	.54	.62	.57	.58	.59	.63
		5th	M	3.30	3.35	3.13	3.35	2.91	2.63	3.30	3.30
			SD	.48	.47	.52	.63	.44	.82	.45	.54
		6th	M	3.14	3.41	3.14	3.28	2.84	2.85	3.39	3.30
			SD	.59	.33	.55	.61	.56	.52	.51	.55

TABLE 3 Cell means, standard deviations for leadership effectiveness

Leadership				Style change				Style constant			
				TF to TA		TA to TF		TF to TA		TA to TF	
Control mechanism				P	O	P	O	P	O	P	O
Experiment design				EG1	EG2	EG3	EG4	EG5	EG6	EG7	EG8
REV	before	1st	M	3.46	3.59	3.45	3.57	3.67	3.51	3.44	3.65
			SD	.37	.37	.65	.57	.53	.69	.38	.55
		2nd	M	3.21	3.29	2.90	3.41	3.18	3.05	3.16	3.27
			SD	.45	.40	.49	.68	.37	.83	.55	.37
		3rd	M	3.35	3.09	3.37	3.32	3.45	3.28	3.06	2.85
			SD	.66	.42	.50	.66	.59	.82	.29	.58
	after	4th	M	3.22	3.25	3.36	3.19	3.15	3.33	3.18	3.59
			SD	.42	.35	.62	.27	.54	.62	.29	.51
		5th	M	3.21	3.29	3.25	3.43	3.23	3.18	3.15	3.68
			SD	.56	.38	.51	.42	.57	.60	.40	.54
		6th	M	3.14	3.25	3.35	3.19	3.26	3.33	3.11	3.71
			SD	.53	.32	.71	.32	.51	.72	.52	.47
TRU	before	1st	M	3.32	3.19	3.21	3.46	3.64	3.35	3.28	3.42
			SD	.36	.45	.55	.42	.61	.40	.40	.38
		2nd	M	3.10	2.82	2.91	3.27	3.10	2.79	2.98	3.08
			SD	.33	.62	.33	.34	.55	.70	.62	.40
		3rd	M	3.10	2.83	2.78	2.81	3.42	2.74	.2.68	3.22
			SD	.55	.87	.34	.56	1.22	.85	.59	.64
	after	4th	M	3.22	3.31	3.55	3.31	3.15	3.21	3.08	3.26
			SD	.35	.44	.56	.76	.75	.74	.74	.80
		5th	M	3.03	3.24	3.30	3.16	3.04	3.10	2.89	3.31
			SD	.51	.39	.58	.76	.69	.92	.51	.75
		6th	M	2.77	3.17	2.97	2.70	2.95	3.20	2.89	3.22
			SD	.71	.46	.77	1.15	.73	1.05	.76	.69
SAT	before	1st	M	3.53	3.58	3.49	3.55	3.69	3.60	3.50	3.58
			SD	.42	.63	.38	.52	.48	.58	.44	.45
		2nd	M	3.02	3.20	3.04	3.34	3.04	2.88	2.80	3.06
			SD	.40	.59	.29	.48	.54	1.15	.61	.47
		3rd	M	3.21	2.90	2.93	2.78	3.04	3.21	2.97	2.93
			SD	.56	.72	.58	.59	.51	.91	.62	.62
	after	4th	M	3.16	3.36	3.40	3.07	3.31	3.30	3.00	2.92
			SD	.58	.44	.52	.35	.69	.59	.62	.62
		5th	M	2.96	3.36	3.29	3.23	3.34	3.37	2.91	3.36
			SD	.63	.51	.50	.58	.57	.59	.79	.74
		6th	M	2.69	3.31	3.43	3.04	3.30	3.40	2.86	3.36
			SD	.70	.36	.77	1.14	.36	.47	.70	.83

The impact of leadership style, style change, and control mechanism on leadership effectiveness

Table 4 shows descriptive statistics for the leadership effectiveness in each of the cells in the study's design. MANCOVA was employed to examine the impact of leadership style, style change, and control mechanism on leadership effectiveness. The leadership (B), control mechanism (C), and style change (D), B x C, A x D, B x D, C x D, and B x C x D, were served as independent variable and the relationship between effort and course credit (A) was served as covariate and were entered simultaneously. Table 5 shows summary MANCOVA results on the reverence for the leader (REV), trust in the leader (TRU), and satisfaction with the leader (SAT).

The results showed that leadership style did moderate the effect of control mechanism on the reverence for the leader [$F(3,114) = 4.73$, $p < .01$], trust in the leader [$F(3,114) = 6.84$, $p < .001$], and satisfaction with the leader [$F(3,114) = 5.03$, $p < .01$]. Further, the MANOVA indicated a significant three-way interaction of leadership, style change, and control mechanism on the reverence for the leader [$F(3,114) = 3.51$, $p < .05$], trust in the leader [$F(3,114) = 3.03$, $p < .05$], and satisfaction with the leader [$F(3,114) = 5.47$, $p < .01$]. Figure 1 was graphic representation of the above two-way and three-way interaction. As shown in the figure, the strongest interaction relationship between leadership, style change, and control mechanism were observed. To sum up, leadership did moderate the effect of control mechanism on the reverence for the leader, trust in the leader, and satisfaction with the leader. Analysis of simple effects indicated that in the process-oriented condition, transformational leadership leads higher level of leadership effectiveness than transactional leadership. In the outcome-oriented condition, transactional leadership leads higher level of leadership effectiveness than transformational leadership. Further, if the transformational leadership in accordance with process-oriented control and the transactional leadership in accordance with outcome-oriented control are the matched conditions and the others were mismatched conditions. In this case, leaders who change their style from match to mismatch conditions did decrease the level of leadership effectiveness, and leads that changes their style from mismatch to match conditions did increase the level of leadership effectiveness. Thus, the results supported the expected relationship, that is, leaders in virtual context will vary their style in accordance with the specific control mechanism.

TABLE 4 Cell means, standard deviations for leadership effectiveness

Variable	Experiment Scenario	Process-Oriented Control					Outcome-Oriented Control				
		Before change		After change			Before change		After change		
		M	SD	M	SD	N	M	SD	M	SD	N
REV	TF to TA	3.36	.29	3.14	.45	19	3.29	.27	3.40	.39	15
	TF	3.46	.26	3.34	.59	14	3.25	.64	2.92	.83	14
	TA to TF	3.24	.34	3.31	.56	16	3.38	.53	3.21	.21	16
	TA	3.15	.33	3.06	.38	14	3.39	.36	3.81	.50	15
TRU	TF to TA	3.18	.23	2.96	.38	19	2.93	.43	3.39	.43	15
	TF	3.44	.48	3.21	.77	14	2.96	.41	2.88	.88	14
	TA to TF	2.90	.13	3.26	.58	16	3.15	.19	3.08	.73	16
	TA	2.91	.35	2.79	.57	14	3.20	.23	3.40	.73	15
SAT	TF to TA	3.28	.30	2.91	.53	19	3.21	.13	3.45	.40	15
	TF	3.34	.37	3.44	.57	14	3.25	.70	3.04	.73	14
	TA to TF	3.12	.28	3.36	.51	16	3.21	.29	3.10	.34	16
	TA	3.02	.40	2.73	.59	14	3.25	.16	3.47	.74	15

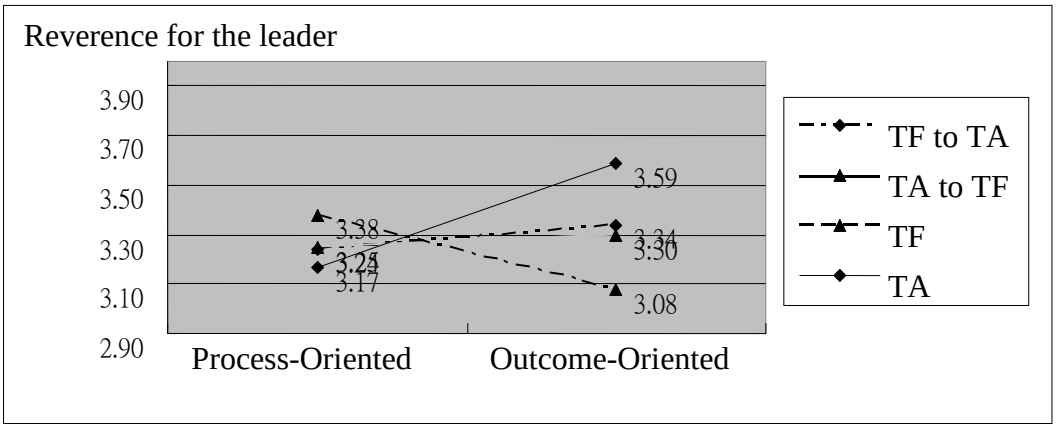
TABLE 5 MANCOVA results on leadership effectiveness

Variables	Interaction effects							
	B x C		B x D		C x D		B x C x D	
	F	*df*	*F*	*df*	*F*	*df*	*F*	*df*
Reverence for the leader	4.73**	3,114	2.89*	3,114	0.95	1,114	3.51*	3,114
Trust in the leader	6.84**	3,114	1.04	3,114	1.38	1,114	3.03*	3,114
Satisfaction with the leader	5.03**	3,114	0.31	3,114	1.09	1,114	5.47**	3,114

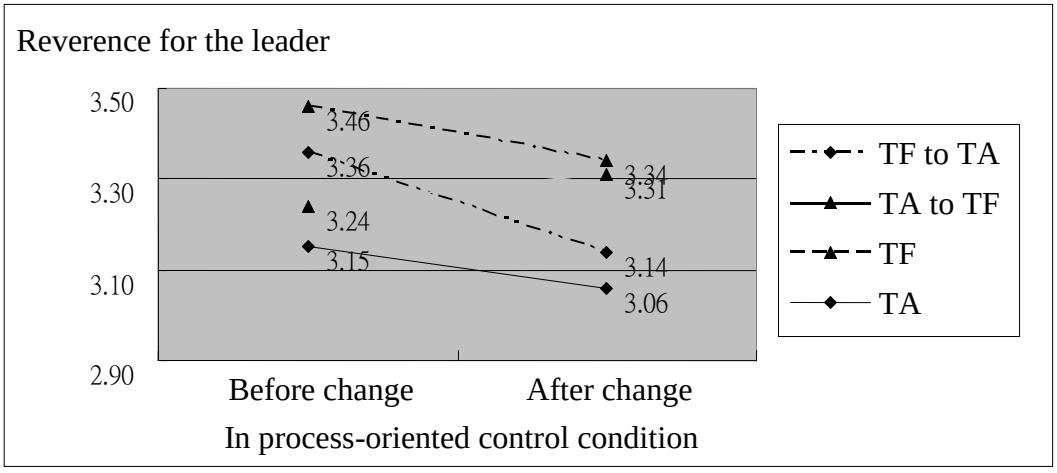
Note: (B) means leadership style; (C) means control mechanism; (D) means style change
* $p < .05$
**$p < .01$

FIGURE 1
Plots of cell means for leadership effectiveness variables

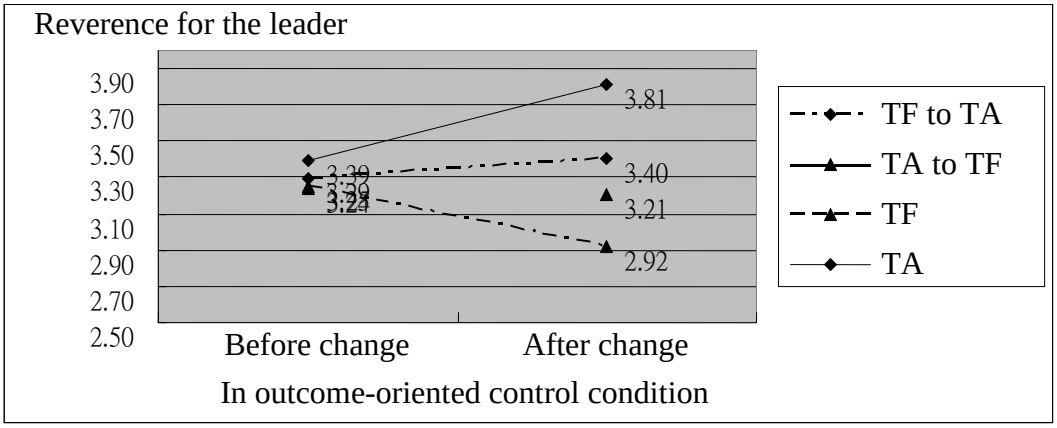
(a)



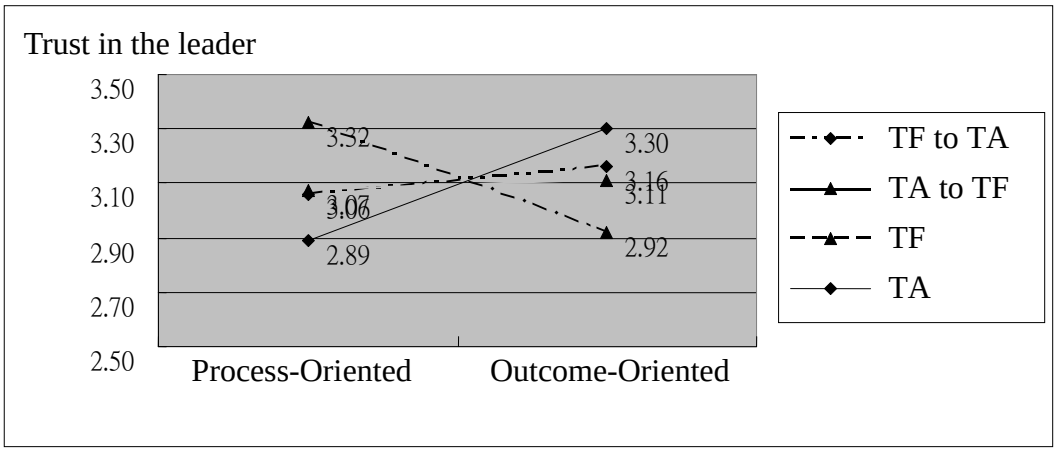
(b)



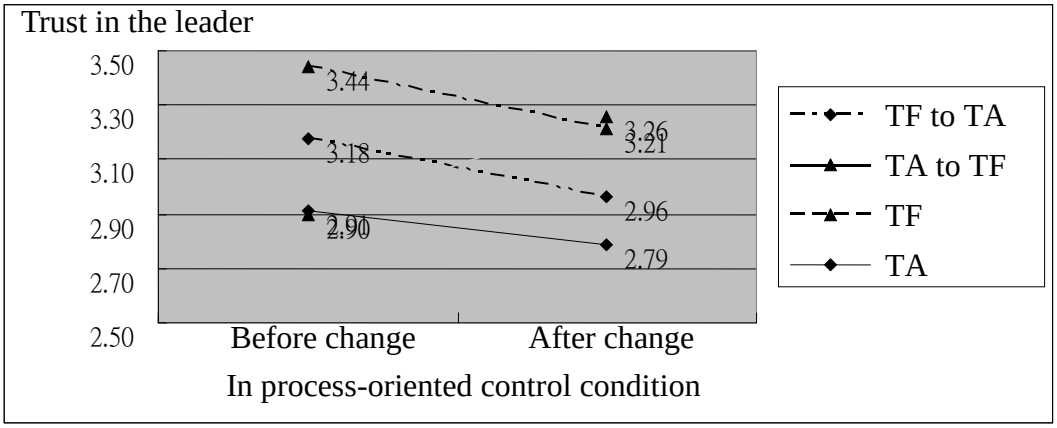
(c)



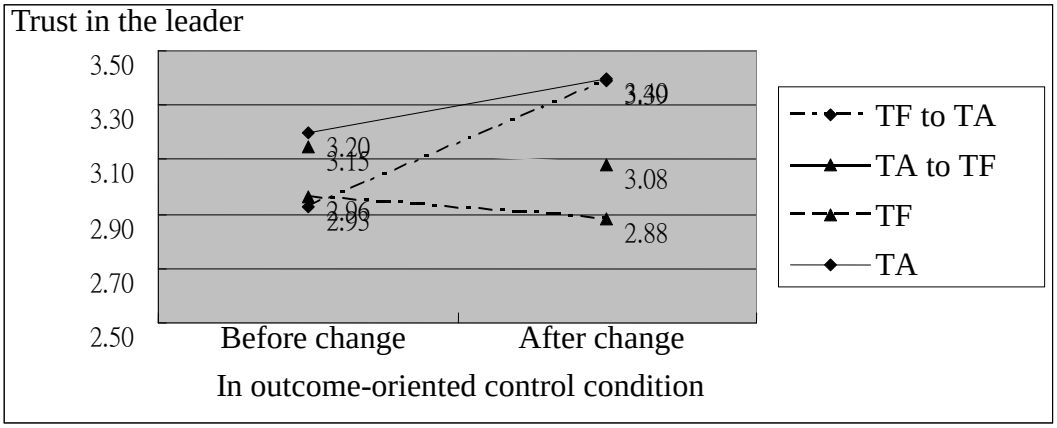
(d)


Trust in the leader
3.50
3.30
3.10
2.90
2.70
2.50
3.32
3.07
3.06
2.89
3.30
3.16
3.11
2.92
Process-Oriented
Outcome-Oriented
TF to TA
TA to TF
TF
TA

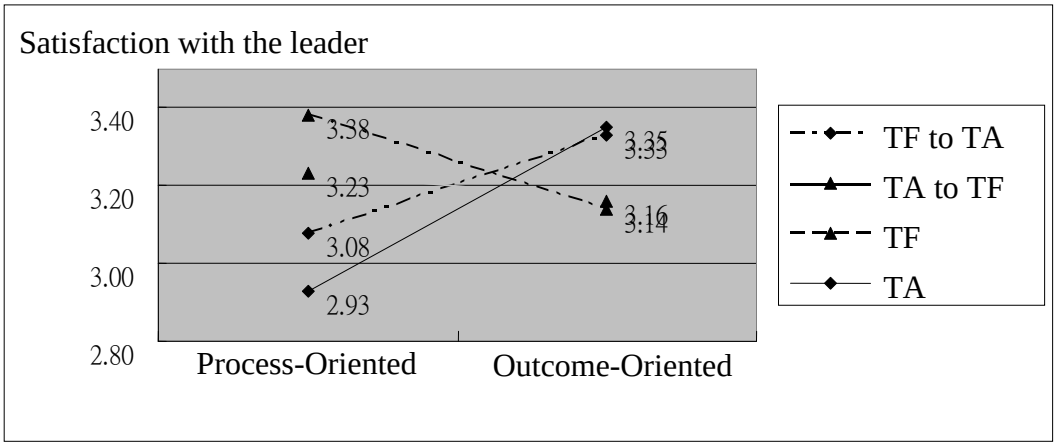
(e)


Trust in the leader
3.50
3.30
3.10
2.90
2.70
2.50
3.44
3.18
2.90
3.26
3.21
2.96
2.79
Before change
After change
In process-oriented control condition
TF to TA
TA to TF
TF
TA

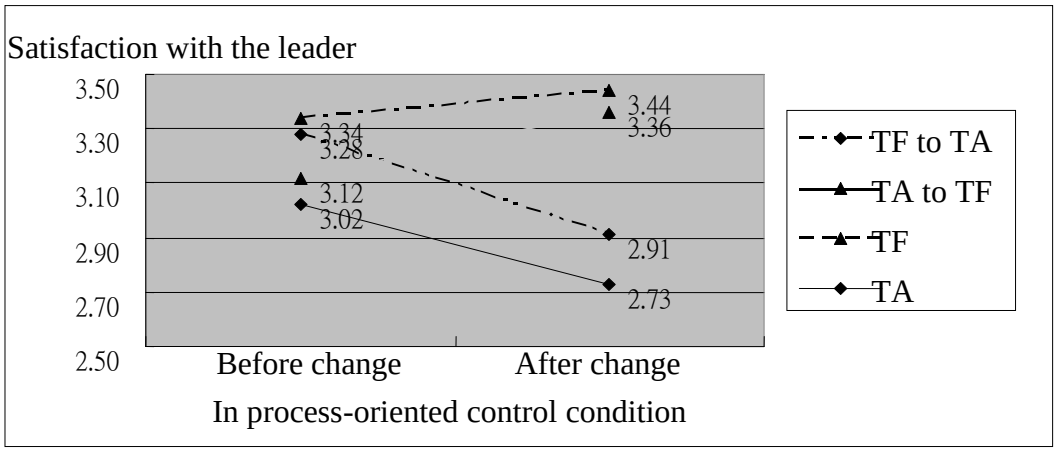
(f)


Trust in the leader
3.50
3.30
3.10
2.90
2.70
2.50
3.20
3.15
3.06
2.93
3.40
3.08
2.88
Before change
After change
In outcome-oriented control condition
TF to TA
TA to TF
TF
TA

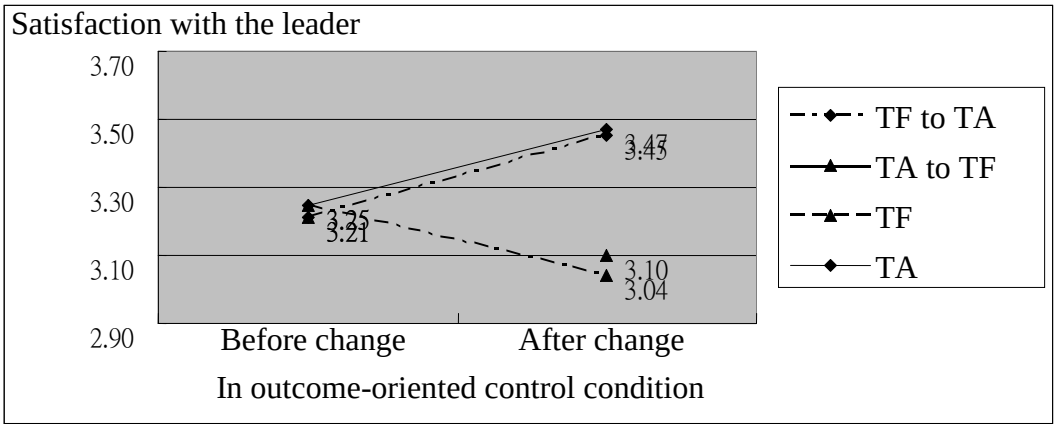
(g)


Satisfaction with the leader
3.40
3.20
3.00
2.80
3.38
3.23
3.08
2.93
3.35
3.33
3.16
3.14
Process-Oriented
Outcome-Oriented
TF to TA
TA to TF
TF
TA

(h)


Satisfaction with the leader
3.50
3.30
3.10
2.90
2.70
2.50
3.34
3.28
3.12
3.02
3.44
3.36
2.91
2.73
Before change
After change
In process-oriented control condition
TF to TA
TA to TF
TF
TA

(i)


Satisfaction with the leader
3.70
3.50
3.30
3.10
2.90
3.25
3.21
3.47
3.45
3.10
3.04
Before change
After change
In outcome-oriented control condition
TF to TA
TA to TF
TF
TA

DISCUSSIONS

The purpose of the present study tries to investigate the match and mismatch conditions between leadership styles (transactional vs. transformational) and control mechanism (process-oriented vs. outcome-oriented) in virtual context and further examining how the subordinates feel if leaders changed their leadership style, from match to mismatch conditions, and vice versa. The results show that leaders in virtual context will vary their style in accordance with the specific control mechanism. From the results, leadership style and control mechanism have impacts on leadership effectiveness. We speculate that the contingency-specific perspective and the nature of virtual context may be the major factors contributing to such findings.

Contingency-specific perspective

Early behavioral approaches to leadership suggest that effective leaders are those who engage in two basic activities: initiating structure and consideration (Bass, 1990; Rambo, 1982). Initiating structure refers to task-related activities, whereas consideration relates to the extent of care and concern for subordinates (Scott & Walker, 1995). Transformational leaders emphasize the vision and human relations aspect (consideration) of team function. They expressed great care, concern, and understanding toward members. When virtual workers perceived being understood and cared by their leaders, they felt free to express their ideas. Therefore, leaders adopt process-oriented control with transformational leadership style might lead subordinates feel that they are in a safer and more considerate environment, thus, enhance leadership effectiveness. In contrast, leaders with transactional leadership style in process-oriented condition might lead their subordinates feel pressure and uncomfortable thus decreases leadership effectiveness. In brief, this study revealed that leaders could have the flexibility in managing their subordinates in virtual context. The findings were more consistent with the previous literature on cross-situational consistency and specificity, which indicated that leaders should adapt their leadership style in response to situational demands (e.g., Hill & Hughes, 1974; James & White, 1983; Purvanova & Bono, 2009).

Nature of virtual context

Whereas virtual context undoubtedly face similar as traditional working environment, we argue that these dispersed work groups may also face unique issues. This stems from the belief that the CMCS (such as, group support systems, e-mail, internets, and intranets) used to link virtual workers across time, space, and organizational boundaries represent fundamentally new types of mediums “with their own advantages, disadvantages, social dynamics, problems, and opportunities” (Hiltz & Turoff, 1985). That virtual collaboration lack of a social context may alter or hinder the process through which virtual workers develop trust (Jarvenpaa, Knoll, & Leidner, 1998). As a result, virtual communication through CMCS may appear out of context and without focus (Warkentin, Sayeed, & Hightower, 1997), resulting in lost meanings, distortion, and misinterpretation. Workers are in such environments, they need their leaders to give them feedback, telling them what to do and telling them what have not done. Leaders through communication exhibited strong authority to achieve team goals, yet, at the same time, members were able to catch the team goal. Moreover, leaders gave the pressure to those who had not

participated or who did not perform well might push them to spend more effort to do the work. This might be the reason why transactional style in accordance with outcome-oriented control could increase subordinates show more reverence, trust, and satisfaction with the leader.

Implications

In light of the interest findings from this study, three crucial contributions were drawn. First, this study moves the current virtual leadership researches form face to face working environment to virtual context. Second, this study further specifies the discussion regarding leadership style and control mechanism. Third, this study advances the emerging study of virtual leadership by exploring the effects and the possible consequences of leadership change on the relevant outcome.

Some valuable findings have emerged from this research. First, leaders in virtual context should give some guidance or directions to their members with more concerned, understanding, and empathy wordings during the whole working process would not only increase members' willing to propose their ideas but also earn their respect, trust and satisfaction. Abundant of previous theories and empirical studies have verified that leadership styles indeed can increase leadership effectiveness whether in traditional team settings (Avolio, et al., 1999) or virtual context (Kayworth & Leidner, 2001/2002). Moreover, Jarvenpaa and Leidner (1999) have indicated that transformational leaders can build relationships among team members and to increase mutual trusts via written communications, which, in turn, is critical to team performance. However, there is little empirical study that exactly illustrates how leaders behave and motivate their members in virtual context. This research might give some hints for leaders to choose their leadership style and control oriented in virtual context.

Limitations and Suggestions

Our study has several limitations. First, since our findings are based on a limited sample, and all the subjects are all students, this may restrict our ability to generalize these results to other settings. Second, these findings may only be applicable to cultures similar to those represented by the subjects of this study, and the results may be different from global virtual teams that have members coming from many countries. Future studies should seek to identify how the characteristics of virtual leadership may vary across a variety of cultures. Third, we employed a simple assignment, whereas, in business environment, employees have to use their domain knowledge to solve more difficult problems than the assignment used in our experiment. Fourth, because our teams were comprised of different classes from the undergraduate students, subgroup formations occurred privately was possible. Such subgroup interaction might have had beneficial or negative consequences for the virtual works. We did not study the formation of subgroups, but this is another interesting area for future research.

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