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Look Before You Lead: Seeing Virtual Teams Through the Lens of Games

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ABSTRACT

This study investigated virtual teams playing *World of Warcraft* to better understand how traditional leadership theories applied to virtual worlds and to identify the most valuable leadership traits. Raid members completed surveys that assessed their leadership capability under the competing values framework. In keeping with previous scholarship, the findings indicate that successful virtual teams value roles from task-based leadership and a factor analysis revealed that the behavioral complexity leadership theory operates differently in virtual environments.

KEYWORDS

Competing values framework; games; leadership; virtual environments; virtual teams

Games provide a lens through which we can examine aggregate human experiences without some of the repercussions associated with conducting human experiments. They support millions of players, create opportunities for competition and collaboration, and create an environment ripe for discovery; but, like supercolliders, they allow researchers to engineer experiences at the micro- and macrolevel (Castronova, 2006). For example, Massively Multiplayer Online (MMO)s video games have structured environments that support and nurture the virtual teams that inhabit them (Bianchi & Bohunicky, 2014). However, in the real world virtual teams are missing these crucial underpinnings. Therefore, their plight is a confusing miasma of results some describing moderate success and others insurmountable difficulties, with the press issuing helpful advice to both sides (Purvanova, 2014). Leadership is a lynchpin to the successful performance of virtual teams (Caya, Mortensen, & Pinsonneault, 2009); however, little is understood about the real-world theories that apply in a virtual context. Therefore, I consider the question: Are leadership theories derived from face-to-face leadership situations applicable in virtual contexts such as in MMO games?

In the following study, I identify and analyze the leader roles used during teaming in a MMO to see if they align with results expected in traditional leadership theory. Although quantifying leadership roles in a particular setting is not new, researchers have yet to examine whether a specific theory operationalizes similarly in virtual environments. The first half of the article provides the theoretical framing for using MMOs to conduct a virtual team study as well as information about the study setup and data collection. The second half details the results with an integrated discussion. Finally, I conclude with a review of limitations and takeaways for the formation and successful deployment of virtual teams across various contexts.

Theoretical framing

Games reflect human experiences; they provide a lens through which we can examine ourselves and ourselves be examined (Turkle, 2011). Today's games provide an extraordinary opportunity to not just observe behavior but also "are ripe for analysis of the discourse/Discourse (language-in-use/'kinds of people') attending them" (Steinkuehler, 2006, p. 40) and can help us to understand how we

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view the world, work with others, and conceptualize space. However, most research has focused on how games influence or infect behavior (see Blackburn & Kwak, 2014; Gee, 2008) and provide motivational/educational avenues (see Custer, 2014; Sandford, Ulicsak, Facer, & Rudd, 2006). Researchers study games for their communication affordances, as in procedural rhetorics (Bogost, 2008), as generators of technical communication artifacts (deWinter, 2014, Mason, 2013), for their potential for job growth (Eyman, 2008), and as exemplars in activity systems (Sherlock, 2009). Even when researchers consider games as sandboxes, few examine their potential as "super colliders" to further insights into human behavior (Castronova, 2006, p. 12). Such an opportunity—to examine collaboration and leadership—is available in *World of Warcraft* (*WoW*).

Leadership in World of Warcraft

WoW, an MMO hosting millions of players, has play mechanics that include quests, arenas, dungeons, and raids. Some cooperative challenges are complex, requiring a team of 20, intense practice, and planning. Others are simpler, needing three people to eliminate recalcitrant targets. Depending on the challenge, collaborative teams can be formed ad hoc or through guilds. Ad hoc play is event driven; players form groups to attempt specific content like raids.

Guilds are a formalized team structure designed to help tackle more complex content (Lisk, 2012). They provide perks such as increased health pools, improved loot availability, and enhanced communication tools. Guilds support the methodical planning, practice, and execution required to complete raids. Although guilds are designed to facilitate long-term objectives, guilds are relatively fragile, suffering from churn due to incompatible expectations (Ducheneaut, Yee, Nickell, & Moore, 2007) and ethical conflicts (Williams et al., 2006).

However, ad hoc teams more closely mirror real-world virtual project teams (Zhu, 2012). *WoW*'s ad-hoc teams and real-world project teams are created as needed. Each use specialized software to collaborate and communicate. Once a *WoW* team is created, instant access is granted to *nerfed*, or easier content. However, both types of teams run for a predetermined duration, working on multiple projects simultaneously, and once the event is deemed complete, members disband.

Leadership and collaboration at work

Collaboration and teaming is of utmost importance in the working world; teams are the predominant business vehicle for productivity (Zhu, 2012). The need to be globally competitive, leverage important resources, and maximize profit has spurred a number of entities toward virtual teams. Virtual teams—groups of people working together from various locations on interdependent tasks having shared responsibility for the work—include organizations such as nonprofit environments, scientific or research teams, and competitive organizations (Zhu, 2012). The amount of virtualness teams experience occurs along a continuum, where members can be completely or partially virtual (de Guinea, Webster, & Staples, 2005, p. 1). Virtual teams—fueled by Information Communication Technologies (ICTs) and an unprecedented number of inexpensive collaboration tools (e.g., e-mail, video conferencing, smartphones)—do not always yield fruitful results. In fact, academia continues to report numerous financial losses and failures (Purvanova, 2014) citing root causes like poor trust (Avolio, Walumbwa, & Weber, 2009), "degree of virtualness," and effective technology use (de Guinea et al., 2005, p. 5). Paradoxically, businesses continue to employ more and varied types of virtual teams (Zhu, 2012). Clearly the successful implementation of virtual teams lies somewhere in the middle.

Regardless of the ambiguity around reporting, scholars and industry recognize the importance of leadership as a critical antecedent to virtual team success (Caya et al., 2009). The majority of virtual team studies are either through short-duration experiments with college students or at the other end of the spectrum through field studies with long-term, expert teams (Gilson, Maynard, Jones Young, Vartiainen, & Hakonen, 2014). This study adds needed depth to the literature, illustrating that *WoW*

can accommodate teams running any duration, with varied and substantial tasks, and most importantly is not sanitized of culture or context. Lastly, most studies approach leadership from an existing theory, with the assumption of transferability to a virtual environment (Eseryel, 2010). Therefore, I seek to explore the question: Do traditional leadership theories operationalize similarly in a virtual context?

One of the first steps in answering this question was to decide on a relatively robust leadership theory, one compatible with other theories. In this way, if the theory does not operationalize virtually, the findings will still help illuminate future directions for research.

Leadership theory

Most assessments of leadership utilize a behavior-based theoretical underpinning, stating that leadership is predicated on people's actions. Early research argued that leadership was composed of two actionable factors: task and socioemotional (Bass & Bass, 2008). Task-oriented behaviors are activities that keep a team on track, help assign or distribute work, and other people coordination functions. Relationship-oriented behaviors are socially based skills (e.g., conflict management, team motivation, mentorship) and are credited with maintaining team cohesiveness and mitigating issues. The task-based roles relied on actionable exchanges between the leaders and members, whereas the socioemotional roles altered the way people perceived the leader, the team, and/or the project goals (Bass & Bass, 2008).

Behavioral complexity leadership theory

Modern leadership scholars eschewed the simplicity of two-factor leadership (Reeves & Malone, 2007) and instead developed theory that more accommodated the inherent complexity of leadership. Among those was behavioral complexity (BC) leadership theory, which states that leaders must understand and respond to competing and paradoxical leadership requirements composed of social, cognitive, and behavioral facets (Hooijberg, Hunt, & Dodge, 1997). BC theory posits that leaders possess a repertoire of leader roles and leaders must select and apply the correct role(s) to the right circumstance. Quinn's competing values framework (CVF) operationalizes BC theory by identifying and dividing leader roles into four quadrants assessed through a survey instrument (Denison,

Table 1. Overview of 12 leader roles, quadrants, and the survey questions from the modified competing values framework.

Collaborate	Create
Facilitator: Encouraging participation	Visionary: Anticipating customer needs
Making it legitimate to contribute opinions	Identifying the changing needs of the
Maintaining an open climate for discussion	customer
Mentor: Developing people	Anticipating what the customer will want next
Seeing that everyone has an advancement/achievement plan	Innovator: Initiating significant change
Coaching people on (advancement/achievement) issues	Initiating bold projects
Empathizer: Acknowledging personal needs	Launching important new efforts
Being aware of when people are burning out	Motivator: Inspiriting people to exceed expectations
Encouraging people to have work/life balance	Inspiring (team members) to be creative
	Encouraging (team members) to try new things
Control	**Compete**
Regulator: Clarifying policies	Competitor: Focusing on competition
Seeing that (guild) procedures are understood	Emphasizing the need to compete
Making sure formal guidelines are clear to people	Developing a competitive focus
Monitor: Expecting accurate work	Producer: Modeling a hard work ethic
Emphasizing the need for accuracy in work efforts	Showing an appetite for hard work
Expecting people to get the details of their work right	Modeling an intense work effort
Coordinator: Controlling projects	Driver: Emphasizing speed
Providing tight project management	Getting work done quicker in the (guild)
Keeping projects under control	Providing fast responses to emerging issue

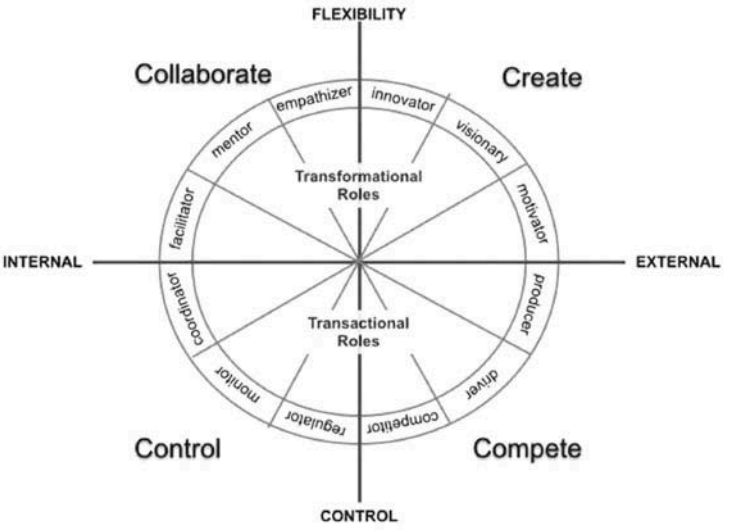

Figure 1. Circumplex depicting twelve leader roles grouped into four quadrants. Based on work from Denison et al. (1995).

Hooijberg, & Quinn, 1995); Lawrence, Lenk, and Quinn (2009) later refined the theory into 12 roles (see Table 1).

BC theory's four quadrants, depicted in a circumplex, illustrate the subtleties inherent in leadership; roles can be in complement or in tension, concurrently (Figure 1). Additionally, BC theory (with four factors) can be understood in terms of prior two-factor leadership theory; BC's Collaborate and Create are representative of socioemotional roles, whereas Control and Compete represent the task-related roles. According to Bass and Bass (2008), successful traditional leaders are thought to work effectively across all roles. However, some virtual leadership studies valued task-related roles over socioemotional roles, especially in short-term studies (Avolio et al., 2009).

Emergent leadership theory

Although the literature mentions a number of mechanisms through which leaders emerge, the method of assessing emergent leaders is either through direct observer assessment or via team member perception (Bass & Bass, 2008). Using member assessment, members vote for a leader and nominations are represented as an index; the Perceived Leader Index (PLI) is the number voters divided by the number team members. A PLI of 1.0 indicates that every member on the team voted for that leader. If fewer members vote a leader, the PLI becomes a fraction.

Recognizing success

Implicit in any leadership study is that only successful leaders warrant emulation. Success is predicated on two separate but intrinsically intertwined measures: output and outcome (Hambley, O'Neill, & Kline, 2007). Output is the quality of a team's performance as assessed via a deliverable (e.g., product launch, social media campaign, predefined service). Outcome is the team's viability, the team's emotional well-being (i.e., cohesiveness, trust, satisfaction).

In the following study, I found that BC theory behaved unexpectedly in a virtual context. Results resembled prior two-factor leadership theory, indicating that the affordances available in face-to-face settings may not be applicable in virtual environments. This important finding has some interesting implications for the workplace and academia included in the fifth section.

Method

The original study examined ad hoc team leadership using complex, interdependent, tasks in *WoW* (Cataclysm 4.3 in 2013). The perspectives of leaders and their members were captured via survey, as members attempted weekly raids in *WoW*. The study included two teams (Alpha and Beta), each attempting the same raid sequences across 5 weeks. Alpha had a randomly assigned leader; Beta had no assigned leader. Participants played in the same realm and faction (horde). Teams determined their play schedule, playing one raid a week with increasing challenge; the rising raid was revealed weekly.

This data was reexamined to evaluate the efficacy of BC theory in a virtual environment.[1]

Participants

The participant pool was sourced from gaming venues, forums, social media, and word-of-mouth. Eligible participants were screened by expertise, character class, ability, and willingness to adhere to a rigorous schedule. Incentives included a six-month subscription to *WoW*. Of the 147 applicants, 24 participants were selected. Players ranged between age 18 and 40+ years with 72% younger than age 30. The majority of participants were White (76%) and male (64%). Most were employed (52%). Approximately one fourth (28%) were in college. Pseudonyms were provided to protect players' privacy; participant gender was maintained.

Questionnaire and measures

Electronically administered surveys collected leadership perceptions using the BC leadership theory framework. Participants were asked to identify their team leaders and answer questions about the leader's traits and team outcome. Leader identification was done via secret member nominations. The survey asked members to rate (using a Likert-type scale) each identified leader through a series of questions (refer Table 1). Finally, members were asked to rate themselves using the same criteria. This dual-source feedback (self and leader) provided a snapshot of the identified leader(s) and the rater's leadership capacity. Leader roles were calculated from the surveys. The reliability of the instrument was evaluated using Cronbach's alpha (α). The subscales for the individual leader roles, four quadrant roles, two aggregate roles, and outcomes were above $\alpha = .85$.

Because members completed surveys about themselves and their leaders, there are leader role scores for members and leaders. The magnitude of a leader role score represents the extent to which a person fulfilled or used a specific trait (e.g., exhibited facilitator, displayed mentor traits). Collaborate, Create, Control, and Compete are the calculated means of specific roles. For example, Collaborate demonstrates how well a person worked with others and is the mean of facilitator, mentor, and empathizer roles. Lastly, behavioral repertoire (BR), a total leader ability indicator, is the grand mean of all individual leader roles. The higher the BR, the more adept one is with using/displaying multiple leader traits. Behavioral differentiation (BD), the grand variance, represents the ability to apply correct roles to appropriate situations. However, because variance is sensitive to the number of leader nominations, BD is not considered in this experiment.

Results and discussion

This section details the results of the study by revealing the emergent leaders, discussing their roles, and examining team performance. Lastly, the BC framework was examined using a factor analysis to determine appropriateness virtual contexts.

Identifying emergent leaders

Emergent leaders were identified through the member nomination process and defined by (PLI) (Table 4). The PLI column shows the average scores for each leader, whereas N is their total number of leader nominations. Alpha identified Irene (assigned leader) as the emergent leader with an average PLI greater than 0.50. Mary was the only other Alpha member indicated as a leader. Beta identified seven leaders, intermittently, across the 5 weeks.[2] The leaders with the highest average PLI were Lance, Bryan, and Lewis. However, the leaders with the highest number of nominations were Lance, Lewis, and David. Recognizing that multiple nominations is more indicative of leadership than a high PLI in a single week, the emergent leaders for Beta were Lance, Lewis, and David. Emergent leaders are identified by the superscript letter in Table 4. Based on the PLI, Alpha utilized centralized leadership (Misiolek & Heckman, 2005), whereas Beta had distributed leadership across three leaders. The team configuration may be important to team effectiveness (Wang, Waldman, & Zhang, 2014). Distributed leadership teams, due to their varied expertise and social aptitude, experience higher success than traditional teams (Scialdone, Howison, Crowston, & Heckman, 2008).

In examining Alpha's roles, Mary ranks higher than Irene (appointed leader) across the quadrants as well as in BR (Table 2); Mary performed better as a leader than Irene. However, it is important to note that Mary's score is predicated on only five nominations (Irene received 49). A question that arises is, Why did Mary receive only five votes and have such a high score? Perhaps the appointed leader mantle prevented members from considering or voting for another leader. Even though the membership seemed incapable of indicating (regularly) someone else as the leader, they were able to demonstrate overall dissatisfaction with leadership. This may be the result of mental models established by pro forma work roles, where speaking out against a superior (by selecting a different leader) is inappropriate.

In comparison, Billy (Beta) has the highest BR and quadrant scores (Table 2). Although Billy garnered four nominations, all four originated in a single week; thus his leadership is not indicative of sustained leadership throughout the study duration. Lance and Lewis had the next highest BR, and these two plus David repeatedly swap high scores among the other quadrants. Their high BR and quadrant leadership ratings are consistent with leadership across the study. Therefore, the trio identified by the superscripted letter is the emergent leadership (Table 2).

Calculating team performance

The complexity of *WoW* does not lend to easy assessment. Table 3 shows the data acquired during game play, including wipes, boss kills, and time to complete four raids.[3] Using these metrics, each team's average completion rate was calculated. Nationwide raid team performance was collected

Table 2. Composite leader roles for all identified leaders.

	PLI	N	COLL	CREA	CONT	COMP	BR
Alpha Team							
Irene[a]	0.83	49	2.94(2)	3.00(2)	3.48(2)	3.27(2)	3.17(2)
Mary	0.13	5	3.53(1)	3.30(1)	3.50(1)	3.37(1)	3.42(1)
Beta Team							
Paula	0.08	1	3.00	3.00	3.17	3.00	3.04
Billy	0.13	4	3.92(1)	3.67(1)	4.00(1)	3.83(1)	3.85(1)
Lewis[a]	0.22	14	3.54(3)	3.30(3)	3.81(3)	3.56(3)	3.55(3)
David[a]	0.13	5	2.83	2.00	3.83(2)	3.33	3.00
Bryan	0.25	3	3.11	3.11	3.11	3.28	3.15
Lance[a]	0.33	16	3.55(2)	3.37(2)	3.71	3.64 (2)	3.57(2)

Note. PLI = Perceived Leader Index; N = sample size; COLL = collaborate; CREA = create; CONT = control; COMP = compete; BR = behavioral repertoire.
[a]Emergent leaders.
The column rank, by team, is in parenthesis.

Table 3. Output results: Raid performance for Alpha and Beta with a calculated success score on scale of 1–5 (1 = *worst*, 3 = *mean*, 5 = *best*).

	Raids	Wipes	Kills	Minutes	Completion rate	Success score
Alpha	4	46	19	844	56.3%	3.25
Beta	4	28	25	507	80.4%	5.0

Table 4. Outcome results: Satisfaction, trust, and cohesiveness hypothesis testing. Means and standard deviations for the Likert-type scale 1–5, shown for each team in first two rows.

	Satisfaction	Trust	Cohesiveness
Alpha	2.86(1.34)	2.88(1.17)	3.31(0.84)
Beta	3.26(1.16)	3.15(1.08)	3.53(0.69)
z value	−3.62	−3.84	−3.621
p value	0.0003*	0.0001*	0.0003*

Note. Significance shown with *$p < .05$.

from a third-party site.[4] From this information, a success score (between 1 and 5, with 5 the best) was calculated to show how the teams' performance compared to the nationwide mean.

Outcome ratings measured through survey items were compared using hypothesis testing. The data was non-normal; thus, Wilcoxon nonparametric tests (yielding a z value) were used (Table 4). The resulting p values for satisfaction, trust, and cohesiveness were significant ($p < .05$), indicating that members perceived their teams very differently. Alpha scores show that they were significantly less satisfied, had less trust, and were less cohesive than Beta. Alpha's satisfaction and trust score was below the 3.0 average, further indicating a poorly functioning team.

In summary, performance results show that the teams experienced markedly different successes; Beta outperformed Alpha at play and in team support. Lack of leadership expertise is likely not the reason for Alpha's poor results because the majority of the identified leaders had years of ranked guild leadership in the United States. Alpha had a female leader and perhaps some issues were gender related. However, the differences in team leadership configurations (distributed vs. central) likely affected their performance. Because of the relatively short study duration, the inherent democratization of the Beta team (no appointed leader) may have given members a sense of participation and agency that was unavailable in the Alpha team.

Examining the model

The survey data was further used to ascertain the roles most important to virtual teams. However, even though a model is built on the underlying structure of survey data, it is predicated strongly on data from the teams. Mixing different leadership styles, success records, or team structures (central or distributed) would severely curtail the usefulness of the results. Therefore, the results from Alpha and Beta were considered separately.

Interpreting the factor analysis

To define the model, a factor analysis was used to pinpoint and identify the most influential leader roles. Principle-component factor (PCF) analysis can provide "insights into the nature of the latent variables underlying" a theory (DeVellis, 2012, p. 158). Specifically, PCF was used to identify prominent factors that contributed most to theory and to ascertain a description of how the roles were in use. To do so, PCF considers the variance in a system of numbers using eigenvalues (a characteristic value associated with a system), when summed these values represent 100% of the system variance. In this context, this analysis looks at the leader roles (factors) and how they relate to each other. Variables group together into patterns that reveal the story about how the variables manifest in a system. The amount a variable contributes explains local variations in a formula (existing theory).

Because BC theory groups roles into four quadrants, our results should yield four factors (eigenvalues) representing these quadrants. Using BC theory coupled with the importance of task-based roles in virtual environments, the more important factors would likely originate in the task-based quadrants: control or compete. Furthermore, since gameplay was cooperative, the control roles (regulator, monitor, coordinator) would likely be more advantageous over the compete behaviors.

Like many statistics, operability in a specific domain is required. A factorability correlation, to confirm reasonable PCF results, yielded an acceptable 10 of the 12 items correlated by at least 0.3. Additionally, a factor analysis is sensitive to the number of subjects (usually observations) and factors (questions) analyzed in the survey, referred to as the subject-to-item ratio. Because of the unique nature of this study's data collection—multiple nominations (observations) possible per leader per week—the subject-to-item ratio for the study was skewed; this study ranged from 4:1 (Alpha) to 2:1 (Beta). The recommended threshold of observations-to-item ratio was 20:1, which was not met. However, few exploratory studies using PCF meet this mark (Costello & Osborne, 2005). To assist in mitigating the poor subject-to-item ratio, z-scores using arithmetic weighting based on nomination frequency were calculated and used. Z-scores helped to normalize the observations by ensuring that leaders with few nominations (i.e., Billy had four nominations) are comparable with other leader scores that are built on many nominations (i.e., Irene with 49).

Revealing the structure

The PCF analysis for Alpha and Beta revealed only two eigenvalues. Alpha's first eigenvalue explained 72% of the variance with the second accounting for 8%. Beta's initial eigenvalue explained 55% of the variance and the second 16%. Using a Promax rotation to reveal role alignment under these two factors (Table 5) reveals that the roles from the quadrants Collaborate and Create loaded together in one factor with quadrants Control and Compete in the other. Relying on knowledge about BC theory to previous leadership theories (refer to Figure 1) and based on the alignment of the roles, the two factors are easily recognized and identified from two-factor leadership theory as task based and socioemotional. Notably, the factors were reversed in the two teams. Alpha's first eigenvalues represented socioemotional roles and Beta's represented task-based roles. The factor reversal and the percentage loading in the eigenvalues is likely accounted for in the difference in leadership style, performance, and team structure exhibited by the teams.

Limiting the remaining conversation to the successful Beta team, loadings indicate that task-based roles had stronger support (55% of the variance) in this environment, where according to the

Table 5. Factor loadings and commonalities based on a principle components analysis with Promax (oblique) rotation for leaders and their roles with loadings > 0.4.

		Alpha		Beta	
Leader roles		Socioemotional	Task based	Socioemotional	Task based
COLL	facilitator	0.9707	—	0.7896	—
	mentor	0.9627	—		0.8311
	empathizer	0.9602	—	0.9864	—
CREA	innovator	0.8734	—	0.3645	0.6458
	visionary	0.9119	—	0.7948	—
	motivator	0.9175	—	0.8641	—
CONT	coordinator	0.7443	—	—	0.7163
	monitor	—	0.9606	−0.4935	0.9559
	regulator	—	0.6751	—	0.7375
COMP	producer	0.7183	—	—	0.7045
	driver	0.7601	—	0.5021	0.5610
	competitor	—	0.5913	—	0.7111

Note. COLL = collaborate; CREA = create; CONT = control; COMP = compete.

equation, we expected 50% of the variance from two factors. Furthermore, the items with the highest loadings exemplify the factor (deVellis, 2012); therefore, empathizer (98.6%) exemplifies the socio-emotional roles and monitor (95.6%) is representative of task-based roles (Table 5). The roles of innovator, monitor, and driver cross-loaded both factors whereas mentor loaded unexpectedly in the task-based factor. These issues are likely accounted for by one of two reasons: a lack of clarity of the roles in this environment and/or the small study size. It is possible that some roles in the virtual environment, and particularly in a gaming environment, will have no equivalent. For example, creativity in an environment where programmers have designed the experience may simply not have an understandable corollary in the real world, where users/thinkers/doers have agency and carve their own paths. Or perhaps the ambiguity of the various factors is due to small sample size (Costello & Osborne, 2005).

The factor analysis in Beta further clarified that motivator and empathizer roles were important socioemotional roles from the six available (Table 5); roles loading > 0.80 are significant (Costello & Osborne, 2005). However, socioemotional support was not as important as evidenced by the 16% factor loading. One explanation for this finding might be that many of these socioemotional behaviors were handled outside of the purview of this study. Although this study witnessed most of the interaction between members (i.e., farming runs, collaborative quests), the majority of the members' interactivity was dedicated to raiding or preparing for them. In only a few instances (e.g., waiting for late players, fixing or buying equipment and consumables) did the team take time to discuss something other than relevant upcoming events. While typical "water cooler" talk (e.g., "how old is your dog?", "I'm having pizza for dinner") was captured, this type of discourse was not laden with leader roles. In other words, members during this study did not spend time mentoring, empathizing, motivating, and so on. This may be due to the study protocol—the majority of members did not know each other prior to play—or the result of the virtual environment.

Additionally, the mentor role loaded high (> 0.80) as a task-based role and not as a socioemotional role, perhaps indicating that the members did not identify this role as contributing to socioemotional support. This finding may seem an anomaly or instead may be a direct commentary on the situation or environment. Mentorship described as "developing people" may be seen as a necessary component to getting work done and thus a part of the task-based space in a virtual environment. For example, in discussions prior to the upcoming raid, Beta leaders simply provided members with links to information about the raid. They did not conduct training missions, or participate in group walkthroughs to assist or coach members. Instead, links were issued for members to partake in critical independent research. In other words, at this advanced level, the emergent leaders' mentorship was a task-focused endeavor; leaders simply pointed members towards authentic sources for important information. From this perspective, roles such as mentor are a crucial part of information sharing and directly related to successful raiding.

Finally, the roles of innovator, monitor, and driver cross-loaded both factors. This may be a product of the meaning making in a rigid, predictable gaming environment. For example, an innovator should be a leader who "initiates significant change"; however, this concept may not hold meaning or only resonate weakly in an environment where members are rewarded for adhering unerringly to previously established rules and methods. Cross-loading might also indicate concepts with similar meanings for members. For example, in the case of driver, perhaps this concept has overlapping meanings with producer.

In reviewing the PCF results, the most startling point in the analysis is the two-factor loading. The variables did not load into the four expected factors—Collaborate, Create, Control, and Compete—that mirror a traditional environment (Lawrence et al., 2009). Although it was expected that some roles would be less useful to leaders in this environment (e.g., Compete in a collaborative environment), it was not expected that roles would distill down to two-factor leadership theory. This is the clearest example that many of the affordances available in traditional face-to-

face leadership are not as evident or potentially not available in a virtual environment. Put another way, the high level of virtualness, detrimental to virtual teaming (de Guinea et al., 2005, may be accounted for in how we conceptualize leadership and leader roles and operate teams in this environment.

In summary, Beta's PCF analysis showed an unexpected two-factor loading with 55% in the task-related (task-based) roles, indicating that these roles were most evident in this environment. The remaining roles (task-based) loaded into a modest 16% further indicating that task-based roles were valued more. The most influential roles in this environment were monitor (task-based) and empathizer (socioemotional).

Study limitations

This study utilized few participants and observations and has limited generalizability. Similar to other small, exploratory studies, the factor analysis did not meet strict subject-to-item requirements. However, this study is a first step to ascertain the important leadership traits required in an ad hoc virtual teaming situation. Ultimately, the *WoW* milieu is an easily accessed, sophisticated lab environment, where teams completed "simulated" real-world projects. The tasks did not carry the import or responsibility of real-world work and consequences for nonperformance or noncompliance were lightweight or nonexistent. However, though the tasks were fantasy driven, where participants tilted at dragons instead of developing new apps, the tasks mimicked the interdependent teamwork common in project teams. The 5-week time frame is short of the average contact time for virtual teams of averaging 8 months (Chavaren, 2003).

Gender bias in leaders

Female leaders in game play are common. However, the assignment of an unknown female leader could certainly reduce player trust, a known difficulty in virtual teaming (Caya et al., 2009).

Players were not informed of each other's credentials or expertise; however, information was available about member expertise. Although Alpha never expressed any issues with females, the same could not be said for Beta. The trio of male leaders used misogynistic and toxic remarks that irritated their teammates.

Well-honed leader and follower teams

As an ad hoc team, these players had little shared experiences. Instead, they were seasoned players placed in a team and asked to perform. Although conflict may have been mitigated if well-honed teams were used, the opportunity to examine teams that are more reflective of real-world virtual project teams would have been lost. Instead, these results support a call for more diversity of result (Gilson et al., 2014).

Conclusions

This study supports previous scholarship (Caya et al., 2009) showing that leadership and success are intrinsically linked. The better leadership (according to membership perception) resulted in a more successful team. However, the study confirmed that behavioral complexity leadership theory operationalized differently in virtual environments. BC collapsed to earlier two-factor leadership theory leaving only two factors—socioemotional and task based. Importantly, the virtual teams of Alpha and Beta could not resolve the subtleties of leadership as prescribed by BC theory's twelve roles and four factors.

There are, at least, three possible explanations for this result:

(1) The virtual gaming environment is markedly different from nonvirtual leadership environments, such that traditional theories cannot describe this milieu.
(2) The environment is similar to the real world, but participants are markedly different from other real-world team members.
(3) The environments are similar, and the participants are similar, but something is preventing the expression, or understanding, of various leadership roles such that members are missing the subtleties afforded by real-world experiences.

Given previous scholarship (Yoo & Alavi, 2004), the latter is most likely the case. Even though players utilize rich synchronous communication channels, have embodiment through their avatars, and are immersed in a high-resolution game, these factors cumulatively cannot reproduce the experiences found in face-to-face teaming. Until this particular gap is bridged, virtual teams will struggle to match the successes and affordances available in face-to-face teams.

Notwithstanding, these findings have clear implications for business. Management might want to ensure that virtual team leaders have training around the leadership roles that are most important in virtual teams. This might mean concentrating on the roles that rank highly in task-based leadership such as monitor, coordinator, and regulator from the Control quadrant. Additionally, though there is concern of mappability of virtual context to real ones (Ahmad, Shen, Srivastava, & Contractor, 2014), there is clear opportunity for skill transfer from MMOs. Collaborative play in raids quickly conditions players to better understand leader and follower dynamics. Leadership skills, for example, are highly sought after in business, and MMOs might be used as training grounds for future and current leaders (Reeves & Malone, 2007). Management should consider adding targeted training around mentor roles and modeling activities specifically stressing information sharing (e.g., guided research, task preparation) as it seems these behaviors resonate with members.

Managers of virtual teams might also reconsider the ways in which they assign or talk about leadership; allowing teams to utilize emergent leadership might yield better performance. Management might only need to develop requirements, deadlines, and framework for project completion, permitting teams to handle the rest. However, this process is not without issues. Caution must be taken to ensure that everyone in the team is reasonably prepared to deal with conflict and resolve issues internally. Additionally, some amount of socialization (e.g., icebreakers, social media–based groups, buddy system tasks, virtual water coolers) should be built into projects and encouraged to facilitate emotionally healthy teams.

From a methodological perspective, using *WoW* as the study crucible is a novel approach. Teams that played in this venue used ready-made challenges and predesigned structures for teaming, removing the burden of task design, and metrics tracking. Studies such as this push the boundaries of social science research to include venues that are formulated for collaboration and afford a more accurate glimpse into human behavior than the lab. Ultimately, MMOs and similar virtual venues will prove invaluable for researchers examining human subjects and other emergent phenomena not easily studied in real world contexts.

Notes

1. UAH IRB (University of Alabama in Huntsville Institutional Review Board) approved in July 2015.
2. The exception is Betty; no survey was completed for her single nomination.
3. Raid 3 dropped for both teams.
4. WorldofLogs.com data collected September 5, 2012.

Notes on contributor

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