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The Effects of Leader-Member Exchange on Member Performance in Virtual World Teams

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Abstract

Understanding the role of leadership in virtual world teams may help shed light on how to manage synchronous and highly interdependent work activities. Based upon leader-member exchange (LMX) theory, we propose that the relationship between a leader and a team member (LMX) influences 1) the degree to which a team member is allocated resources by the leader (empowerment and group assignments), 2) the degree to which a team member develops relational resources with the team (trust, obligation, norms, and identification), and 3) the extent to which a team member receives or develops resources results in higher levels of individual performance. Our findings from a longitudinal field study of one large virtual world team in the massively multiplayer online game (MMOG) EverQuest suggest that the leader member relationship does impact members' allocation and development of resources, and that it's not just the quantity of members' resources, but also the type of member resources, that has a direct influence on performance. Our findings also indicate that the influence of the leader-member relationship on member performance is fully mediated by the allocation and development of resources. Surprisingly, there was no relationship between LMX, trust, and performance, which suggests that trust may not be as vital in virtual teams where everyone's actions are visible. Lastly, the findings suggest that building relational capital to facilitate the transformation from self to collective interest may be an effective leadership tactic when managing large virtual teams or social collectives.

Keywords: *Leader-Member Exchange (LMX), Virtual World Team, Resources, Relational Capital, Performance, Social Collective, MMOGs, Virtual Team, Collective Interest.*

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1. Introduction

Virtual worlds are three-dimensional (3D), computer-simulated environments where users are represented by avatars through which they interact in real time with other avatars, objects, and the simulated environment. One particularily prominent form of virtual worlds are massively multiplayer online games (MMOGs). Virtual worlds (and MMOGS more specifically) offer new opportunities for globally dispersed users to connect and collaborate with others by, among other means, organizing themselves into virtual world teams (VWTs), of which there are many successful examples. In VWTs, users come together and coordinate actions in order to achieve common goals. The team sizes in MMOGs can vary from small groups to large raids (a raid is a large-scale event that requires substantial numbers of simultaneous participants to complete it). For example, the MMOG EverQuest supports up to 54 participants in one VWT. Naturally, larger VWTs require a non-linear increase in coordination efforts, leadership duties, and requirements (Steinkuelher, 2004).

While the virtual-team literature has extensively studied team collaboration via computer-mediated communication (CMC) technologies, collaboration through VWTs offers an intriguing twist. VWTs are similar to virtual teams because, in both, communication occurs through CMC, and the individuals behind the avatars are not typically physically collocated. However, VWTs also have much in common with face-to-face teams in that work is accomplished through collocated avatars in real time and in the same meta-place. This combination of characteristics, synchronous work and CMC, suggests that managing work in VWTs may not be easy. For example, Kayworth and Leidner (2000) have noted that "virtual teams are beset with a range of challenges inherent to their dispersed and often impersonal nature" (p. 183).

Despite MMOGs' focus on collaborative gaming, their "play" activities mirror many of the attributes of real-life work in that the VWT's success hinges on the effective coordination of individual efforts of team members (Castronova, 2005; Williams, Yee, & Caplan, 2008; Yee, 2006d). Just like leaders in real life, leaders in MMOGS are essential to the success of the VWTs they lead (DeMarco, Lesser, & O'Driscoll, 2007; IBM, 2007; Kahai, Carroll, & Jestice, 2007; Nardi & Harris, 2006; Williams et al., 2006; Yee, 2006c). Exploring leadership in VWTs may further our understanding of leadership phenomena in practical and relevant ways because MMOGs provide a platform to practice and experiment with leadership skills.

IBM, for example, has begun identifying employees who lead guilds in MMOGs to explore the applicability of what these employees have learned from their virtual experiences to management practice (IBM, 2007, 2008). In all, 75 percent of the employees interviewed indicated that the leadership skills they learned in MMOGs have helped them in their real-world settings (Reeves et al., 2007). This is because, unlike real life where leaders are generally more risk adverse, leaders in MMOGs are encouraged, if not outright expected, to experiment with risky and novel strategies and leadership styles to assure virtual team success. Furthermore, studying leadership in MMOGs provides a unique opportunity to observe leadership in action. While there are informal communication mechanisms used in MMOGS, the vast majority of VWT interactions are codified and recorded in computer logs, which makes the leadership behaviors and coordination activities of guilds visible. This type of large-scale, objective observation of leadership in action has been impossible in real-world organizational settings.

This paper explores how leadership in VWTs impacts the performance of individual team members. Our research position is that the effectiveness of a VWT is predicated on the efforts of virtual team members and their individual performance, over which leaders have a great deal of influence. In essence, VWTs require effective leaders who can influence team members to perform their job duties well, and who can coordinate the efforts to ensure overall team success. Therefore, the research question motivating this study is: How do leaders influence the performance of individual team members in virtual world teams?

2. Literature Review and Research Model

One consistent theme that has emerged from research into MMOGs thus far has been the need for leadership to manage the collaborations among team members in order to achieve desired outcomes (Dannecker et al., 2008; Nardi & Harris, 2006). Collaboration begins when users realize that they have to cooperate rather than compete with other users while playing in order to advance their avatars. This is necessary because collecting rare and powerful items or amassing vast amounts of virtual currency, which are strong motivators for individuals, cannot typically be accomplished by individual efforts alone (Yee, 2006a). During the avatar-creation process, users choose a class for their avatar. A class represents the job that one's avatar will perform and each class has its own distinct advantages and disadvantages. An avatar of the warrior class is specialized in combat, whereas an avatar of the cleric class is specialized in healing. Together, the two are much more effective working cooperatively rather alone. This translates well to real-world settings where specialization of labor entails individuals from a variety of functional areas working together in organizations. In both virtual and real life cases, there are clear benefits to cooperating and organizing with others. However, with large numbers of participants, ensuring successful collaboration is no small feat. Consider the following example:

> *Sir Lancelot wishes to slay the foul dragon guarding the princess who will reward him handsomely for rescuing her. However, Lancelot realizes that attempting this by himself will simply result in his own charred body. He therefore has to recruit a valiant band of companions in order to battle this dragon. Naturally, not just anybody will do. Not only does he have to recruit a sufficient number of people to overpower the foul beast, he has to recruit the right people with the right skills for the situation at hand. The dastardly dragon is holed up in a castle with high walls and surrounded by a moat. Sir Lancelot needs engineers to build a bridge to cross the moat and to build siege weapons to scale the walls. He needs archers to keep the dragon at bay while the engineers are doing their jobs. He also needs mighty warriors who will scale the walls and actually fight the dragon. Healers to tend to the wounded and wizards to smite the dragon from afar are also needed. After an epic struggle, the dragon is slain, Sir Lancelot rescues the princess, and all is well.*

If only things were so simple. Who decides on how many people or which classes to recruit? Who decides on what strategies to pursue in order to slay the dragon? Who monitors everyone to make sure that they are performing their assigned tasks in an effective manner? What happens if all that the princess has to offer as a reward is a single kiss – who decides how the honor, or spoils if any, should be divided among all the other people who helped? Who organizes the next dragon-slaying raid? If one were to substitute "slay the dragon" with "design a new product for sale" and "wizards and warriors" for "product engineers and project managers", similar questions arise daily in today's organizations.

As with real-world organizations, success in MMOGs is contingent upon leadership skills, such as conflict resolution, discipline, motivation, coordination, nurturing and providing emotional support, delegation, training, retention, recruitment, scheduling, and politicking (Castronova, 2005; Ducheneaut, Yee, Nickell, & Moore, 2006; Ducheneaut, Yee, Nickell, & Moore, 2007; IBM, 2007, 2008; Reeves et al., 2007; Williams et al., 2006; Yee, 2006c). Using the Sloan leadership model, Reeves et al. (2007) found that leaders in MMOGs exhibited essential skills such as sensemaking, visioning, relating, and inventing. These findings are in line with leader-member exchange (LMX) theory, which has recently become a dominant theory in the evolution of organizational theories of leadership (Bass & Bass, 2008). At its core, LMX theory is about relationships; specifically relationships between leaders and their followers (Dansereau, Graen, & Haga, 1975; Graen & Cashman, 1975; Graen & Scandura, 1987). LMX theory has roots in social exchange theory, role theory, and vertical dyad linkage (Dansereau et al., 1975; Dienesch & Liden, 1986; Graen & Uhl-Bien, 1995). LMX theory holds that, instead of behaving in the same manner towards all of their followers, leaders behave towards and allocate resources differently to members of their workgroup based upon unique dyadic leader-member relationships (Bass & Bass, 2008; Dansereau et al., 1975; Uhl-Bien, Graen, & Scandura, 2000).

Early studies of LMX revealed persuasive evidence to suggest that due to time, resource, or cognitive pressures, leaders sometimes only form close relationships with a few key team members (Dienesch & Liden, 1986; Graen, 1976). For example, leaders develop high-quality relationships with members with whom they have had successful interactions (based on continuing work, social interactions, or exchanges) in the past. These members are considered part of the "in-group" and enjoy higher levels of trust, support, and formal and informal rewards (Dienesch & Liden, 1986; Graen & Scandura, 1987). As a result, these members are offered opportunities not available to others, such as more important organizational roles (Harris, 2004). In order to maintain a balanced exchange relationship, employees reciprocate by adopting attitudes and behaviors that reflect the support derived from the leader-member relationship. Therefore, increased levels of supervisorial support have a positive impact on members' performance because the norms of reciprocity influence members to perform beyond normal job expectations (Wayne, Shore, & Liden, 1997).

LMX has been shown to be positively related to objective and subjective performance, satisfaction with supervision, overall satisfaction, job satisfaction, organizational commitment, role clarity, member competence, intentions to stay, innovation, career progress, employee empowerment, and procedural and distributive justice perceptions (Gerstner & Day, 1997). LMX may also mitigate certain undesirable outcomes such as turnover intentions, role conflict and ambiguity, and job problems (Bass & Bass, 2008; Gerstner & Day, 1997; for detailed citations see Graen & Uhl-Bien, 1995; Van Breukelen, Schyns, & Le Blanc, 2006). However, what is not entirely clear from this body of literature is the exact causal mechanisms by which LMX influences these member outcomes. While there are over 100 articles in the review pieces cited above, the majority have been "LMX plus" studies that seek to relate LMX to organizational variables by using research designs that employ correlational analyses, which fail to properly explain the theoretical underpinnings underlying the leader-member relationship or the choice of outcome variables (Bass & Bass, 2008; Schriesheim, Castro, & Cogliser, 1999).

In order to address this gap, this study explores the more proximal mediators of the leader-member relationship in order to address how the leader-member relationship affects a team member's performance. Based upon LMX theory, the causal model examined in this research predicts that the leader-member relationship does not directly impact team member performance, but rather that 1) the relationship between a leader and a team member influences the degree to which a team member is allocated and develops resources, and 2) team members with more resources will have higher performance (see Figure 1).

2.1. Leader-Member Relationships and Allocation of Resources

According to LMX theory, a key responsibility of leaders is to provide team members with the resources necessary to perform their job functions. Moreover, the quality of the leader-member relationship impacts resource allocation, such that members who develop high-quality relationships with their leaders gain greater access to resources (Graen & Uhl-Bien, 1995; Van Breukelen et al., 2006; Yukl, 1998). LMX theory suggests several reasons for this. High-quality leader-member relationships are the result of a series of positive social and work-related exchanges (Liden, Wayne, & Stillwell, 1993). As a result of successful exchanges, the leader and member become increasingly interdependent, and their relationship is characterized by higher levels of mutual trust, obligation, reciprocity, and support (Dienesch & Liden, 1986; Schriesheim et al., 1999). High-quality leader-member relationships lead to increased levels of formal and informal rewards, access to and communication with supervisors, and supervisorial support for members (Dienesch & Liden, 1986; Graen, Novak, & Sommerkamp, 1982). For example, members gain access to their leader's network of resources, receive better job assignments, and are chosen to fill more important organizational roles (Gerstner & Day, 1997; Graen & Uhl-Bien, 1995; Harris, 2004). Leaders know that they can depend on certain members, and, as those members are increasingly relied on, they develop a greater sense of self-efficacy and are awarded greater job empowerment and job latitude (Gerstner & Day, 1997).

Figure 1. Research Model
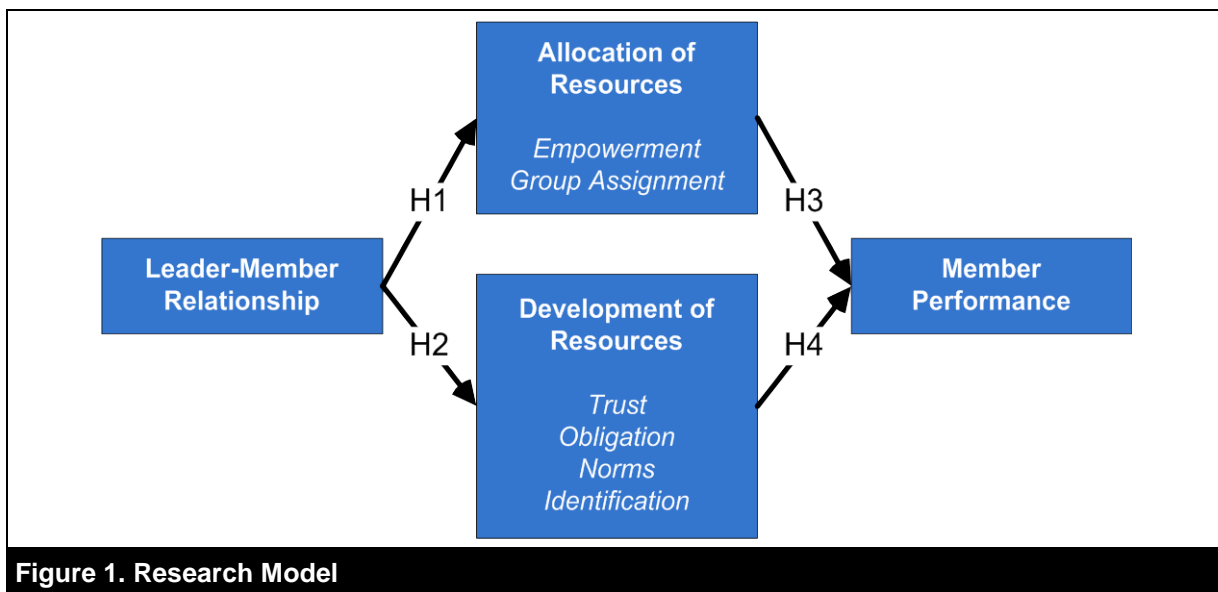
The opposite also holds – members who have an ineffective working relationship with their leaders – those considered part of the "out-group" – receive none of the additional benefits afforded to the in-group. Sometimes characterized as "hired hands", members of the out-group are managed almost exclusively by what is denoted in the formal employment contract, and the influence leaders have on these members is diminished (Dansereau et al., 1975; Graen & Uhl-Bien, 1995). Members who have low-quality relationships with leaders are also viewed more negatively, are perceived to have lower performance capabilities, and are selected for less-important organizational roles (Dienesch & Liden, 1986; Harris, 2004; Schriesheim et al., 1999). Uhl-Bien et al. (2000) have further suggested that low-quality relationships may negatively impact member motivation, curtail effective communications between leaders and members, and reduce resource allocations such as training and development opportunities. As a result, these members are not expected to perform as well as the in-group because they receive less support and fewer resources and because the in-group has lower expectations of them.

To illustrate leader-member relationship dynamics in a VWT team setting, the quality of the leader-member relationship may influence the work assignments and composition of groups in a raid. Strategically, having the proper balance of classes and groups has a direct impact on a VWT's success and survival (Williams et al., 2006). In EverQuest, a VWT raid of 54 participants comprises nine smaller ad-hoc groups of six members each, and the composition of groups is extremely important for each team member's performance. For instance, a group comprised solely of warrior avatars that are unable to heal themselves is not effective – the avatars are slain quickly and the battle lost. Because certain avatars have abilities that enhance other avatars' performance beyond what can be achieved alone, there are benefits to being assigned to an in-group. For example, bards have the ability to play songs that substantially enhance the fighting ability of every member in the group. Therefore, bards are commonly allocated to groups optimized for dealing damage to the VWT's raid target. Because certain classes are rare (e.g., only one bard may be available), the group members who get access to this resource are determined by the VWT leader and given a significant advantage. Therefore, we predict that:

> **H1:** A higher-quality leader-member relationship will positively influence the degree to which a member is allocated resources.

2.2. Leader-Member Relationships and Development of Resources

Leader-member relationships can also influence members' development of resources. Graen & Uhl-Bien (1995) integrated LMX theory with transactional and transformational leadership and proposed

that "effective leaders transform or change the basic values, beliefs, and attitudes of followers so that they are willing to perform beyond the minimum levels specified by the organization" (Podsakoff, MacKenzie, Moorman, & Fetter, 1990, p. 108). High-quality leader-member relationships result in a change of expectations, through which members "experience a transformation from self-interest to a larger interest" (Graen & Uhl-Bien, 1995, p. 238). First, leaders exhibit specific behaviors to encourage followers to buy into collective beliefs in order to achieve extraordinary goals (Antonakis, Avolio, & Sivasubramaniam, 2003). For example, leaders can exemplify core beliefs and ethics, communicate achievable goals and an optimistic future, and instill the value of higher-order ideals (Antonakis et al., 2003). Members internalize these ideals in two ways. The first way is by a social exchange mechanism in which members feel obligated to reciprocate the support received from the relationship by adopting the same beliefs and goals as the leader (Wayne et al., 1997). The second way occurs as a result of leaders successfully tying group efforts to the collective identity of the group (Shamir, House, & Arthur, 1993).

One way to understand the impact of this transformation and subsequent buy-in to a collective ideal is to examine relational capital (Uhl-Bien et al., 2000). As a form of social capital, relational capital refers to "assets created and leveraged through relationships" (Nahapiet & Ghoshal, 1998, p. 244). Relational capital may be especially useful in virtual settings because it helps unite team members by emphasizing the need to work towards a common cause, which leads to less free-riding (Zaccaro & Bader, 2003). Like LMX, relational capital is developed by repeated interactions between individuals, which allow individual team members to develop their own resources through relational capital with others and the team as a whole. High-quality leader-member relationships encourage members to develop relational capital based on high levels of trust, obligation, awareness of norms, and identification with the team (Nahapiet & Ghoshal, 1998).

Trust is defined as "the willingness of a party to be vulnerable to the actions of another party based on the expectation that the other will perform a particular action important to the trustor, irrespective of the ability to monitor or control that other party" (Mayer, Davis, & Schoorman, 1995, p. 712). A key assumption of virtual teamwork is that trust is "critical to the cooperative behavior that leads to the success of all teams, but is especially important for virtual teams" (Greenberg, Greenberg, & Antonucci, 2007, p. 327). For example, trust facilitates the sharing of ideas (Zigurs, 2002), aids in knowledge sharing and the development of transactive memory (Rosen, Furst, & Blackburn, 2007), and helps reconcile differing goals and conflicts in virtual teams while reducing opportunistic behavior and agency costs (Jarvenpaa & Tanriverdi, 2003). While trust is recognized as being essential to a virtual team's functioning, building it takes a significant amount of effort and time (Lai & Burchell, 2008). Trust is critical in VWTs because of the way interactions are structured in MMOGs. For example, VWT members have to trust that leaders are implementing the correct overall strategies in order for the VWT to be successful in a raid (Goh & Wasko, 2009). VWT members have to count on each other in order to successfully accomplish VWT goals. Just like in real life, one's avatar dying in a virtual world has consequences (albeit not as severe), such as a loss of status, items, avatar statistics (e.g., experience, which takes time and effort to get back), and time.

Obligations "represent a commitment or duty to undertake some activity in the future" (Nahapiet & Ghoshal, 1998, p. 255). Obligations may be durable and can arise from feelings such as gratitude, respect, and friendship, or may be accorded from membership in a collective (Bourdieu, 1986). Professional and personal obligations develop over time through a variety of social exchanges. For example, frequent information exchanges between members bind members closer together because the exchanges increase members' expectations about future obligations (Nahapiet & Ghoshal, 1998). Obligations change as the quality of the leader-member relationship increases. For example, in a relationship's early stages, individuals are more likely to track favors by watching for and expecting payback shortly after an exchange, whereas individuals in better-developed relationships take a longer view by continuing to contribute while lengthening the time frame of expected reciprocity (Uhl-Bien et al., 2000). Building a sense of obligation to the VWT is an essential undertaking in order to assure the survival and success of the VWT. For example, raiding's goal is to reap the rewards earned from successfully accomplishing the raid's objectives. However, the rewards derived (e.g., loot) are typically scarce. For example, a raid event that takes a VWT of 50+ members to accomplish

will commonly bestow rewards for only 2 to 3 members. Without a sense of obligation to motivate continued participation over a long period of time, self-interest and arguments over the allocation of loot can tear apart VWTs (Williams et al., 2006).

Norms represent a degree of consensus about the appropriate actions of members within an organization, where control over actions is held by the collective (Nahapiet & Ghoshal, 1998). Bell and Kozlowski (2002) argue that one of leaders' critical functions is to develop the team into a "coherent, seamless, and well-integrated work unit" (p.17). They suggest that leaders may accomplish this through a socialization process, in which leaders set goals and norms and reduce role ambiguity to structure team members' interactions. For example, leaders should set norms prescribing where and when communications between team members should take place (Cascio & Shurygailo, 2003). Leaders also establish ground rules and model teamwork to set the tone for future interactions between team members (Cascio & Shurygailo, 2003). Establishing an awareness of norms may be especially important in VWTs due to the unique nature of participation. Unlike real life, work is voluntary in VWTs; people can choose to stop attending or free-ride at any time. One way around this lack of formal control is for leaders to effectively establish expectations and encourage member adherence to norms by building high quality leader-member relationships characterized by mutual influence (Graen & Uhl-Bien, 1995; Uhl-Bien et al., 2000).

Identification is the extent to which individuals see themselves as one with another person or collective (Nahapiet & Ghoshal, 1998). LMX theory prescribes that leaders and members move beyond a relationship that is characterized as "working for" to one that is characterized as "working together" (Graen & Uhl-Bien, 1995). Bell and Kozlowski (2002) suggest instilling team orientation and team coherence by promoting shared goal commitment and positive affect while shaping climate perceptions, developing individual-linked goals to a repertoire of team task strategies, and shaping role expectations. In seeking to encourage members to identify with a collective ideal, VWT leaders strive to build a culture that encourages cohesion, pride, and a shared sense of purpose and vision for VWT members (Williams et al., 2006; Yee, 2006b). For instance, a strong sense of identification is established through "guild tags", which prominently display the name of the guild one belongs to above their avatar (akin to a sports team's uniform). Membership in guilds is important in the social dynamics of the MMOG place – people often care who you are associated with and make attributions about you based on your guild tag.

Overall, high-quality leader-member relationships encourage team members to advance to what Graen and Uhl-Bien (1995) call the "partnership stage". In this stage, team members "experience a transformation from self-interest to a larger interest" by developing relational capital with the team (Graen & Uhl-Bien, 1995, p. 238). This leads to members who trust each other, who feel obligated to each another, who understand the norms of the team, and who identify strongly with the team, which creates significant resources for purposeful action. Therefore:

> **H2:** *A higher-quality leader-member relationship will positively influence the degree to which a member develops relational resources.*

2.3. Resources and Member Performance

The extent to which team members have access to better resources should have a direct impact on their performance (Uhl-Bien et al., 2000). For example, empowerment serves as an individual-level source of motivation that positively impacts job outcomes. Individuals who feel more empowered perform better because they are more self confident, and because they care about what they are doing, have the latitude to perform their job roles, and feel like what they are doing has a meaningful impact on the overall work unit. These links have been extensively explored and validated in a variety of work settings (Spreitzer, 1995). Tangible resources also matter. Strategically, having the proper balance of classes and groups has a direct impact on a VWT's success and survival (Williams et al., 2006). In VWTs, being allocated group-based resources impacts member performance because certain avatar classes have special skills which, in combination, allow for better performance by everyone else in the group. According to parses (data analysis of game logs that objectively assess

member performance), this effect is quite noticeable. Group members who have access to a bard are up to 25% more effective, a large impact on member performance. Just like in real life, being allocated better resources in VWTs has a direct impact on member's performance. Therefore:

>**H3:** *Higher resource allocations will positively influence a member's performance.*

Relational capital binds VWT members together in relationships characterized by mutual trust, obligation, and identification under established norms that regulate the interactions between members and determine how things should work. As members develop higher levels of relational capital, individuals can move beyond self-interest and work effectively as a team. This collective interest is what motivates individuals to work beyond the minimum levels specified (Podsakoff et al., 1990). Trust facilitates the sharing of ideas (Zigurs, 2002) and aids in knowledge sharing and the development of transactive memory (Rosen et al., 2007). This helps reconcile differing goals and conflicts in virtual teams while reducing opportunistic behavior and agency costs, which directly impact member performance (Jarvenpaa & Tanriverdi, 2003). Higher levels of obligation impact member performance because members feel a responsibility to contribute and put forth more effort due to the development of personal, professional, and exchange relationships (Nahapiet & Ghoshal, 1998; Uhl-Bien et al., 2000). In VWTs, members who feel obligated to the VWT are more likely to attend raid activities, exceed the minimum requirements, and perform better. Norms impact member performance by establishing expectations about the enactment of roles and how work is evaluated. In VWTs, norms about what is expected from members also allows for raids that are more effective when members have clear expectations about their job roles, about the team's goals, and about how their performance will be evaluated. Identification with a collective positively influences member performance because higher levels of identification enhance member concern for collective processes and outcomes – the more an individual identifies with a collective, the more motivated that individual is to work harder on an individual level for collective benefits (Uhl-Bien et al., 2000). Members of VWTs with high levels of identification are strongly motivated to build guild reputation, success, and accomplishments. Therefore:

>**H4:** *Higher levels of relational resources will positively influence a member's performance.*

3. Methodology

In order to test our hypotheses, the unit of analysis for this study is the individual guild member in a MMOG, where a guild is an example of a large VWT. Our population of interest includes guilds where the primary purpose is to raid. A raid is a large-scale, real-time collaboration by members of a VWT towards a common goal, and raiding-oriented guilds share many similarities with teams in real-world organizations in terms of makeup, shared sense of purpose, and the interdependent nature of how work is performed (Castronova, 2005; Ducheneaut et al., 2007; Williams et al., 2006).

We chose a 68-member guild in the MMOG EverQuest as the VWT for this study. Data collection occurred in 3 stages and spanned an eight-week time frame. In stage 1, we collected data that assessed the quality of the leader-member relationship, member demographics, and control variables via surveys. During stage 2, which spanned five-and-a-half weeks, the principal investigator actively participated in guild raids in order to gather objective data assessing each team member's resource allocation. We collected these data by using the built-in guild organization tool in the EverQuest client and exporting it to a text-based log. In stage 3, following this five-and-a-half week time period of active raiding, we sent guild members follow-up web-based surveys to assess resources (mediating variables) and team member performance (the dependent variable).

3.1. Measures

We used previously validated survey items to assess the leader-member relationship (Graen & Uhl-Bien, 1995), empowerment (Spreitzer, 1995), trust (Jarvenpaa & Leidner, 1999), obligation (Nahapiet & Ghoshal, 1998), norms (Nahapiet & Ghoshal, 1998), identification (Kreiner & Ashforth, 2004), and performance (Becker, Billings, Eveleth, & Gilbert, 1996). We assessed all items using a 1 – 5 ("strongly disagree" to "strongly agree") Likert scale, and, where necessary, we adapted the items to the research context. We provide the survey items in Appendix A.

3.2. LMX

We measured the leader-member relationship with the LMX-7 scale (Graen & Uhl-Bien, 1995), which is a commonly accepted one-dimensional measure of the leader-member relationship (Gerstner & Day, 1997). We asked the guild leader to complete the LMX-7 scale to assess his relationship with every team member. Additionally, we asked every team member to complete the LMX-7 scale to assess their relationship with the guild leader. We measured the quality of the leader-member relationship by taking the average of the LMX-7 responses from the leader and member, which captures the dyadic nature of the leader-member relationship (Schriesheim et al., 1999).

3.3. Resources

We assessed the allocation-of-resources construct by examining individual perceptions of empowerment and the frequency of in-group team assignments. We assessed empowerment via surveys that used Spreitzer's (1995) multi-dimensional scale, which measures an individual's perceptions of their competence, impact, meaning, and self-determination.

We operationalized an objective measure of resource allocation by assessing group assignments to determine the frequency with which members were assigned to an in-group. In order to raid, the 54 VWT members were decomposed into smaller groups of up to six people by the guild leader. Optimal groups have a mix of avatar classes that complement each other and/or contain veteran (experienced) members. Suboptimal groups are groups that have a mix of classes that do not gain any synergistic performance effects from being assigned together and/or are made up mostly of newer members. We assessed the quality of the group assignments for each raid event via a rubric, with scores ranging from 1 (suboptimal) to 5 (optimal). To do this, we reviewed the group assignments on each raid using the data collected via the built-in guild organization tool in the EverQuest client. To ensure that groups were accurately assessed, we randomly selected and evaluated 10 percent of the raids and presented and the results to three raid leaders to ensure coding reliability. After confirming reliability, we evaluated the remaining raids. We assessed the group assignment scores for each individual by averaging the group scores of that individual for their participation over the 124 raiding events collected. Higher group-assignment scores indicate that these members were more consistently assigned to the in-group, which indicates that the raid leader allocated better resources to those individuals.

We assessed relational resources via surveys that used previously validated measures of relational capital, which includes trust (Jarvenpaa & Leidner, 1999), obligation (Nahapiet & Ghoshal, 1998), norms (Nahapiet & Ghoshal, 1998), and identification (Kreiner & Ashforth, 2004).

3.4. Performance

We assessed individual performance by triangulating individual performance from a variety of perspectives. As such, we used survey data collected from three sources: 1) self-assessments, 2) leaders, and 3) peers. Due to possible biases (e.g., a leader rating an employee as higher performing for affective and not objective reasons), measuring performance from a variety of perspectives is considered to have higher validity (Gerstner & Day, 1997; Graen & Uhl-Bien, 1995; Schriesheim et al., 1999). Individuals self-assessed their performance via surveys. We asked guild members who performed the same job functions on raids to provide peer performance assessments using the same performance measures. Additionally, the guild leader and six out of seven guild officers assessed every guild member's individual performance. We created an overall individual performance measure

by calculating the weighted average of individual (33 percent), peer (33 percent), and leader-rated performance (33 percent).

3.5. Control Variables

We included three control variables in the study that we collected via surveys and objective raid logs: age, guild tenure, and hours-per-week played. These variables served as proxies for individual human capital or the resources innate to the member that could influence performance but that could not be allocated or developed because of the leader-member relationship.

4. Results

In all, we collected 61 usable responses from the VWT members, an 89.7 percent response rate. On average, subjects were 33.62 years old, had 9.1 years of MMOG experience, had been members of the VWT for 2.5 years, and spent 27.69 a week in Everquest. The sample was 77 percent male. Also, 91.8 percent had some college or higher education experience, and 86.9 percent were employed. Over the eight-week study timeframe, objective raid data was available from 124 usable snapshots out of a total possible 157 database entries (78.9 percent). The VWT spent an average of 21.45 hours per week during this timeframe on raiding activities. Because an average of 51 guild members attended each raid, this sampling frame captures approximately 6,000 avatar-hours of work.

To ensure that there was agreement between the leader's and the member's assessment of their relationships, we first established that the leader-member perspectives were strongly correlated ($r=0.62$). Also, the results of an exploratory factor analysis revealed that the LMX items from both perspectives exhibited factor loadings exceeding 0.7 on the same factor. Therefore, we felt confident in combining the LMX measures to better assess the overall dyadic leader-member relationship.

We tested the hypotheses = using SmartPLS 2.0 by Ringle, Wende, and Will (2005). Partial least squares (PLS) is a commonly accepted method of structural equation modeling (SEM) analysis in information systems (IS) studies, and is robust to conditions that include small sample sizes, non-normal data, and multicollinearity (Chin, 1998b). In addition, PLS offers advantages over first-generation regression techniques, such as the ability to assess measurement and structural models simultaneously (Gefen, Straub, & Boudreau, 2000). Because this study uses multi-item scales, and because the model to be tested is a path model with a small sample size, these conditions are ideally suited to SEM analysis using PLS.

4.1. Measurement Model

SmartPLS provides item composite reliabilities (ICRs), which may be interpreted as similar to a Cronbach's α. Calculated from the block of indicators comprising each construct, ICRs that exceed the 0.70 level are the generally accepted threshold (Chin, 1998a). All constructs used in this study exceeded this level; Table 1 presents the number of items used for each construct, construct means and standard deviations, ICRs, and average variance extracted (AVEs).

Table 1. Descriptive Statistics					
	Mean	**SD**	**AVE**	**ICR**	**R^2**
Age	33.620	8.730	-	-	-
Guild tenure	29.720	28.360	-	-	-
Hours per week	27.690	7.140	-	-	-
LMX (dyadic)	3.810	0.530	0.703	0.934	-
Empowerment - Competence	4.460	0.580	0.782	0.915	0.246
Empowerment - Impact	3.060	0.750	0.708	0.879	0.323
Empowerment - Meaning	3.930	0.650	0.820	0.932	0.058
Empowerment - Self Determination	4.090	0.650	0.764	0.906	0.274
Group assignment	4.270	0.470	-	-	0.252
Trust - Competence	4.010	0.630	0.579	0.797	0.031
Obligation	4.100	0.640	0.802	0.924	0.265
Norms	4.190	0.570	0.948	0.982	0.345
Identification	4.230	0.470	0.612	0.863	0.211
Performance (All)	4.100	0.480	0.936	0.986	0.809

SD: Standard deviation
AVE: Average variance extracted
ICR: Item composite reliability
R^2: Explained variance of construct

We assessed convergent validity by verifying that AVEs were larger than 0.50 to demonstrate that the constructs account for the majority of variance (Chin & Newsted, 1999). We assessed discriminant validity by verifying that 1) the factor loading of each item on its underlying construct exceeded the generally accepted threshold of 0.60, 2) each item's factor loading was higher on its underlying construct than on any other construct, and 3) the constructs shared more variance with their measures than with other constructs by confirming that the AVE's square root was greater than the correlation between constructs. Appendix B presents loadings and cross loadings, and Table 2 presents a full correlation matrix with the square root of the AVEs in the diagonal. Overall, acceptable psychometric properties were demonstrated with ICRs exceeding 0.70, AVEs exceeding 0.50, factor loadings on the proper constructs being higher than any cross-loadings, and the square root of the AVEs being larger than any of the correlations between constructs.

Table 2. Descriptive Statistics

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1 Age	—														
2 Guild tenure	.17	—													
3 Hours per week	-.05	-.10	—												
4 LMX	-.02	.57**	-.03	**.84**											
5 Emp - Competence	-.16	.30*	.12	.50**	**.88**										
6 Emp - Impact	.12	.25*	.05	.57**	.54**	**.84**									
7 Emp - Meaning	.07	.03	.00	.24	.08	.23	**.91**								
8 Emp - Self determination	-.18	.30*	.17	.52**	.69**	.57**	.11	**.87**							
9 Group assignment	-.23	.20	.19	.50**	.46**	.30*	.00	.49**	—						
10 Trust - Benevolence	.02	-.16	.00	.20	.14	.39**	.30*	.23	.03	**.78**					
11 Trust - Competence	.12	.01	.02	.18	.25*	.17	.45**	.29	-.04	.52**	**.77**				
12 Obligation	-.13	.17	.16	.51**	.63**	.52**	.13	.52**	.60**	-.01	.16	**.90**			
13 Norms	.05	.46**	.05	.59**	.40**	.41**	.24	.42**	.29*	-.02	.10	.45**	**.97**		
14 Identification	-.01	.14	.20	.46**	.47**	.36**	.25	.47**	.45**	.26*	.42**	.49**	.42**	**.78**	
15 Performance	-.14	.30*	.28*	.61**	.72**	.49**	.13	.72**	.72**	.18	.24	.71**	.39**	.62**	**0.86**

Notes: Square root of AVEs are bolded and in the diagonals. Correlations shown at the .05 (*) and .01 (**) levels.

4.2. Structural Model

Figure 2 presents the results from the tests of the structural model, which includes the path coefficients and explained variances (R^2) for the endogenous constructs.

Figure 2. Structural Model (* = p < .05, ** = p < .01, *** = p < 0.001)
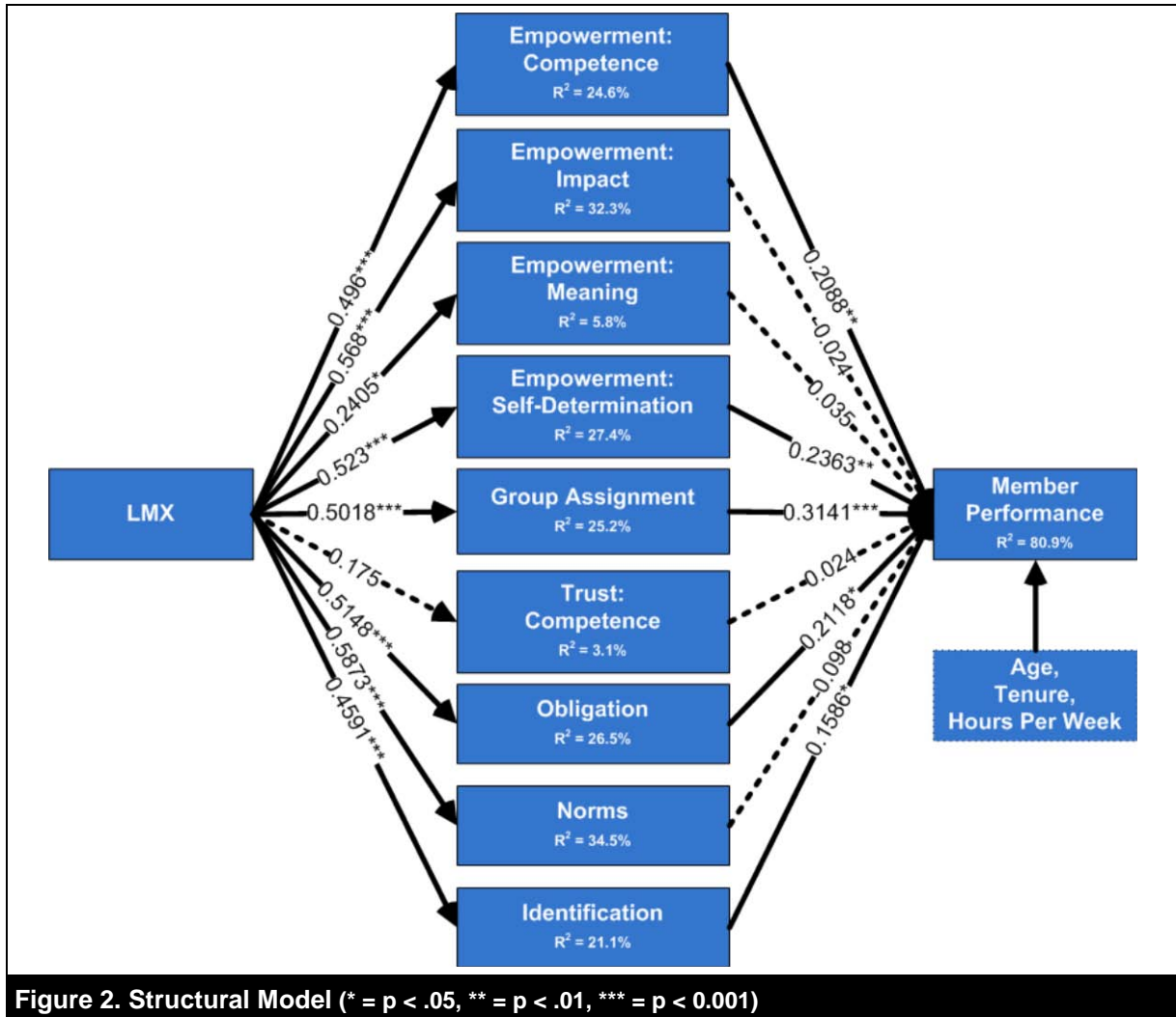
Overall, support was generally strong for hypotheses 1 and 2, which predicted that the quality of the leader-member relationship would positively influence the allocation and development of resources. Higher-quality leader-member relationships significantly influenced all of the allocation of resource components (H1) and nearly all of the relational capital constructs (H2) with the exception of trust. Hypothesis 3, which predicted that higher levels of member empowerment and better group assignments would lead to higher levels of member performance, was partially supported. Hypothesis 4, which predicted that team members who developed higher levels of relational capital would perform better, was also partially supported.

To understand how the leader-member relationship influenced member performance, we performed a test of mediation. While LMX had a significant direct impact on member performance in a model with only the control variables added (β = 0.625, p < 0.01), when we added the mediating variables to the analysis, the direct path was fully mediated (β = 0.160, ns). Notably, these results suggest that the leader-member relationship does not directly impact member performance. Instead, the results suggest that the leader-member relationship influences the level of member resources, which then subsequently impact member performance.

5. Discussion

5.1. Theoretical Implications

Team members assessed their perceptions of resource allocation (operationalized as empowerment), and we also objectively measured resource allocations by examining group assignments in raids. While the leader-member relationship significantly influenced all four dimensions of empowerment, a comparison of the explained variance (R^2) for each of these dimensions offers one interesting insight. The leader-member relationship explained a good deal of variance in members' perceptions of self-competence, impact, and self-determination (24.6 to 32.3%), but only explained 5.8% of the variance in perceptions of personal meaning.

These results suggest that the leader-member relationship may not have a large impact on the meaning that members derive from the jobs they are performing. While not tested in this study, alternative explanations for this observation may include the explanatory role of intrinsic motivations, individual differences, or differences in individual motivations to participate in VWTs. For instance, some reasons that could impact the meaning members associated with VWT activities could include personal achievement, socially oriented goals, and immersion-oriented goals (Yee, 2006a). Therefore, while the findings suggest that the degree to which one finds their job meaningful may be partially influenced by the relationship with the leader, it is also clear that there may be other theoretically influential factors for future studies to consider.

We created an objective measure that assessed resources allocation (group assignments). This measure was based upon the coding of five-and-a-half weeks of log data that we collected from VWT activities. As we predicted, the leader-member relationship significantly influenced the degree to which members were assigned to in-groups, which comprise more experienced individuals with complementary skills. These findings add rare empirical support for the general tenants of LMX theory that suggest that in-group subordinates generally receive better job assignments.

Hypothesis 2 predicted that higher quality leader-member relationships would positively influence the development of VWT resources in terms of relational capital, which leads to higher levels of trust, obligation, norms, and identification. The leader-member relationship significantly influenced the development each of these except VWT trust, which provides empirical evidence for the propositions linking LMX and relational capital (Uhl-Bien et al., 2000). However, because trust has been widely touted as essential for virtual-team performance, it is surprising that trust was neither influenced by the leader-member relationship nor a significant predictor of performance in VWTs.

These non-significant findings provide some interesting insights for theory when we consider the work context of VWTs. For example, virtual teams that rely on text-based, asynchronous communications limit the visibility of team member actions to those specifically contributed by each team member, and members must trust each other to perform the majority of work offline. In VWTs, unlike face-to-face or virtual teams, every team member's actions are easily observable and recorded for later review. Just like in real life, one may watch other avatars directly to assess their input and performance for team tasks, but avatar activities may also be logged and evaluated at a later time. While the literature links trust (of all types) to the successful functioning of virtual teams (Jarvenpaa & Leidner, 1999; Jarvenpaa, Knoll, & Leidner, 1998; Martins, Gilson, & Maynard, 2004; Powell, Piccoli, & Ives, 2004) and suggests that leaders play a key role in the development of trust (Jarvenpaa & Tanriverdi, 2003; Kayworth & Leidner, 2000; Lim & Ployhart, 2004; Uhl-Bien et al., 2000; Zaccaro & Bader, 2003), the findings from this study suggest that the leadership role may be limited, and that perceived trustworthiness does not have a direct effect on member performance. Therefore, an interesting twist to VWTs is that trust may not be needed when members are collectively aware each other's actions and logging enhances the team's accountability. This motivates future studies that examine the impacts of avatar logging on calculus-based trust and the dynamics of trust in large virtual world teams.

Hypotheses 3 predicted that the degree to which a member was allocated resources would have a direct impact on performance. Two of empowerment's dimensions – competence and self-determination – had a positive influence on performance. Also, better group assignments had a large and positive influence on performance. Members performed better when they felt more self-confident, when they were allocated better group/work assignments, and when they had more latitude in how they performed their jobs. The other two empowerment dimensions – meaning and impact – were not significantly related to performance. These were unexpected findings given the voluntary nature of participation with this particular VWT. After all, much like collaboration in, for example, open source software teams, VWT members are not formally controlled by leaders and can choose to free-ride or withdraw participation at any time. Meaning may motivate individuals to show up to raids; however, by itself, meaning does not motivate individuals to perform beyond some minimal performance level.

Surprisingly, the extent to which an individual believed they had an impact on VWT outcomes did not directly influence performance. One possible explanation is that what this VWT may value are individuals who perform their roles without the need for receiving personal accolades. Consistent with the attraction-selection-attrition (ASA) framework (Schneider, Goldstiein, & Smith, 1995), individuals who are motivated to perform by a need to perceive that they have a large impact on VWT outcomes self-select themselves out of this particular VWT. This line of reasoning suggests that perceived impact did not influence performance because the enacted VWT culture emphasizes placing team outcomes before individual ones.

Hypothesis 4 predicted that the degree to which a member developed relational resources would have a direct impact on performance. Obligation and identification had a strong influence on performance but, contrary to expectations, trust and norms did not. Hypothesis 2 suggested that the leader-member relationship had a positive influence on a members' awareness of team norms. However, given that the items used for this study assessed only the awareness of VWT norms, this theoretically suggests that awareness of norms alone may not predict performance and that the extent to which individuals adhere to norms or standard operating procedures may be an influential predictor of performance.

Taken together, the findings tease out the theoretically important resources for member performance: self-determination and competence, tangible allocation of resources, VWT obligations, and VWT identification. These findings help shed light into more precise causal mechanisms by which higher quality leader-member relationships influence member performance. This is a significant advance for LMX research that helps the theory move past the many prior correlational "LMX plus" studies.

5.2. Practical Implications

For managers seeking to build on this study's findings, we make three suggestions. First, train your VWT's members and get out of the way. Our results suggest that the leader-member relationship has an impact on the degree to which employees feel empowered to perform their roles. Two dimensions of empowerment are of particular interest because they have a direct impact on performance: 1) self-competence and 2) self-determination. Leaders should, therefore, focus on activities that elevate members' perceptions of competence (e.g., coaching or positive feedback), and they should avoid micro-management. When members are confident in their abilities and have the latitude to perform their roles as they choose, this "can-do" attitude can improve their performance.

Second, tangible resources matter. Consistent with LMX theory, stronger leader-member relationships were positively related to the degree to which members were assigned better resources in terms of group assignments. Better group assignments allowed members to take advantage of the complementary skill sets between members with different job roles. The synergistic effects derived from group diversity in turn improved the performance of members who participated more often in better groups. This suggests that managers should pay careful attention to the initial assignment of members to teams because the team's composition and team members' complementary skills and experiences has a large effect on member performance.

Third, set your members free but bind them to each other. As the literature suggests, managing large numbers of collocated avatars in a virtual world environment can be difficult due to the disruptive effects of geographical, temporal, cultural, and technology-mediated discontinuities. Based on the results of this study, one way to lead in environments where formal control is limited is for leaders to encourage the development of relational capital among members. This is because stronger leader-member relationships promote members to transform their self-interest into a collective interest. Thus, members become tightly bound together by durable obligations and identification with the team.

This suggests that a key way that leaders can impact VWTs is to focus on building a strong *esprit de corps* in which individual members maintain positive beliefs about the larger collective. When members buy into a collective interest, the governance of VWT activities can shift from formal leader-member relationships to the enactment of or adherence to the individually held beliefs of members. Members regulate their performance based upon the extent to which they share relational capital with the team, and do not necessarily perform solely at the behest of their leaders. Given that organizations increasingly rely on virtual and self-directed teams in the workplace, this may inform a promising research agenda for the future.

The idea that developing collective interest is a key motivator of individual performance may have large implications for practice beyond the study of VWTs. Consider recent geopolitical events in the Middle East where rapid exchanges of information and ideas enabled by technology have spawned grassroots movements. These movements are united by common beliefs and interest on a size and scope not previously witnessed. In our study, members are willing to lay down their avatars' lives for other team members. That hundreds of thousands of real-life people fighting for freedom are willing to lay down their actual lives speaks to the strong influence of collective ideals. However, this is not to say that leadership will be of decreasing relevance in the future because there are many important contributions leaders may make towards the genesis, coordination, and sustainability of social movements. This study offers one perspective into the new realities facing leading technology-driven collectives. Given the lack of formal control facing leaders of large collectives and how quickly technology "supercharges" movements, understanding the facets of relational capital identified in this study offers one possible solution for understanding how to effectively manage VWTs and the future's virtual organizations. Naturally, there remains much room for future work.

5.3. Limitations

With any research, a study's findings should be considered in light of its limitations. For this study, there are three main limitations: the small sample size, the choice of LMX instrument, and the generalizability of the findings. Given the sample size guidelines for PLS analysis suggested by Chin and Newsted (1999), smaller sample sizes can impact the extent to which complex path models can be tested and the number of indicators used for each latent variable. Thus, the possibility that there was insufficient statistical power to detect small effect sizes that could increase the probability of Type II errors remains.

Second, it is important to note the significant debate in the LMX community about the LMX construct itself. For this study, we chose to measure the leader-member relationship using the LMX-7 scale, which assesses three highly correlated dimensions: mutual trust, respect, and obligation (Graen & Uhl-Bien, 1995). Other LMX researchers, such as Dienesch, Liden, Schriesheim, and colleagues offer alternative one- and multi-dimensional instruments with varying underlying dimensions such as loyalty, affect, and contributions (Dienesch & Liden, 1986); loyalty, affect, contributions, and professional respect (Liden & Maslyn, 1998); trust, liking, latitude, support, attention, and loyalty (Schriesheim et al., 1999); and perceived contribution, loyalty, and positive affect (Schriesheim et al., 1992). Naturally, the many alternatives engender much debate and some confusion (Avolio, Walumba, & Weber, 1999; Schriesheim et al., 1999)

Our choice of the LMX-7 scale was rooted in the theoretical arguments for the transformation of self to collective interest. The justification for our hypotheses lie in the propositions by Uhl-Bien et al. (2000), which reflect theoretical extensions of their past work and specifically argue that collective

interest is achieved through the development of mutual trust, respect, and obligations (Avolio et al., 2009) – the exact dimensions that the LMX-7 scale measures. Sufficient evidence exists to suggest that relationships between leaders and members are inherently complex, and there are facets that the LMX-7 scale does not capture. We acknowledge that there are other worthy dimensions of these relationships that can and should be studied to further the understanding of leadership in VWTs.

The last limitation deals with the generalizability of the study's findings. Because data collection was limited to one VWT, it is difficult to conclude how generalizable the findings are to other VWTs or virtual teams that use different communications media. However, the VWT sampled bears similarity to other guilds in MMOGs. For example, the demographics of the respondents are consistent with what other studies have noted (Castronova, 2005; Yee, 2006a). Also, the ways VWT operate and are managed and controlled tend to be very isomorphic in nature; that is, VWTs often copy best practices observed in other leading VWTs (Williams et al., 2006). For example, the use of a "points" system to measure and to reward participation is the norm among large, raiding-oriented VWTs. Without surveying multiple VWTs, however, it is difficult to definitively suggest how generalizable the results are to VWTs that do not share these characteristics.

Also, there are suitable concerns about how the findings from a study in a gaming environment may translate to the workplace. While other authors have suggested that the boundaries between work and play are shifting, consider these additional points. The VWT studied comprised members who shared a common identity (guild), were highly interdependent on each other (avatar classes), and worked towards mutual goals (raids) – the common definition of a team. The results of their work, even if the rewards were virtual in nature, were tangible, salient, and meaningful to the VWT's members. Finally, the demographics of the VWT studied did not fit the stereotypical gamer profile but instead represented well-educated and gainfully employed adults. Members possessed significant experience collaborating virtually using avatars (an average of over nine years), and had time to build a significant shared history – the VWT studied at the time of writing was nearly 10 years old. For these reasons, we believe that studying this VWT in a gaming setting presents a reasonable learning opportunity applicable to large real-life teams in the workplace; though, of course, the results should be carefully interpreted.

These limitations should be balanced against the study's goals. Oftentimes, gaining access to organizations is challenging for researchers interested in examining phenomena *in situ*. The study of VWTs presents a similar challenge to researchers (Assmann et al., 2010). Because a valid criticism of past LMX research has been the common practice of studying small, temporary virtual teams of student subjects (Powell et al., 2004), the goal for this study was to examine how leader-member relationships in large, real-world VWTs functioned. The research agreement with the VWT chosen for this study provided deep access to a VWT's members and to sources of objective data (i.e., DKP database, group assignments). In total, we collected data from 89.7 percent of the total population for the VWT during the sampling frame, which ensures that the majority of leader-member relationships and performance outcomes were assessed for this particular VWT. Gaining deep access to one VWT also allowed for opportunities to use better measures. For instance, measuring the leader-member relationship from both perspectives and creating a more precise overall performance measure help improve validity. This depth and ability to combine perceptual survey measures with objective data sources are significant strengths of the research presented here.

6. Conclusion

This paper examines how the leader-member relationship influences member performance. Building on LMX theory, our study proposed that higher-quality leader-member relationships would have a direct impact on the degree to which members were allocated and developed resources. Higher resource levels would enable members to perform better than their peers. Evidence from a longitudinal study of 61 members of a VWT generally suggests the leader-member relationship does impact members' allocation and development of resources. Furthermore, this study's findings suggest that it is the quantity and the type of resources that impacts performance, not the leader-member relationship.

This research makes important contributions about understanding LMX theory and how to influence member performance. From a theoretical standpoint, this study explored more precise causal mechanisms by which leader-member relationships impact performance. Consistent with LMX theory, the findings suggest that the leader-member relationship is important, and that it has a positive influence on nearly all the resource variables. However, further examination helps tease out what the influential resources on member performance are. In particular, self-confidence, self-determination, group assignments, obligation to and identification with the team influenced member performance. Also, contrary to expectations, trust was not influenced by leadership, nor did trust directly influence performance. The unique nature of collaboration in metaverses, where one's avatar may be directly observed and later evaluated via collected logs, provides one explanation for this finding.

Practically, this study furthers our understanding about how large virtually distributed teams may be managed. As technology enables increasingly larger team sizes, leaders must think past the traditionally emphasized transactional-based approaches in which they concentrate on controlling, monitoring, and evaluating each individual team member. Rather, our study suggests that all relationships, individually and collectively, matter for team performance, not just the relationship with the leader. Leaders should pay careful attention to build self-reliance in their members, avoid micro-management, provide the requisite resources, and focus on strategies that enable members to transform self-interest into collective interest.

As more work becomes distributed, future generations of workers experienced with collaborating in VWTs will enter the workforce, and larger technology-enabled teams and collectives will emerge. Thus, understanding new ways lead, assign, and motivate people in virtual environments will continue to be a critical issue for the successful accomplishment of work.

References

Antonakis, J., Avolio, B. J., & Sivasubramaniam, N. (2003). Context and leadership: An examination of the nine-factor full range leadership theory using the multifactor leadership questionnaire. *The Leadership Quarterly*, *14*, 261-295.

Assmann, J. J., Drescher, M. A., Gallenkamp, J. V., Picot, A. O., Isabell, M., & Wigand, R. T. (2010). *MMOGs as emerging opportunities for research in virtual organizations and teams.* Paper presented at the Proceedings of the 16th Americas Conference on Information Systems, Lima, Peru.

Avolio, B. J, Walumba, F. O., & Weber, T. J. (2009). Leadership: Current theories, research, and future directions. *Annual Review of Psychology*, 60, 421-449.

Bass, B. M., & Bass, R. (2008). *The Bass handbook of leadership: Theory, research, and managerial applications.* New York: Free Press.

Becker, T., Billings, R., Eveleth, D., & Gilbert, N. (1996). Foci and bases of employee commitment: Implications for job performance. *The Academy of Management Journal*, 39(2), 464-482.

Bell, B., & Kozlowski, S. (2002). A typology of virtual teams: Implications for effective leadership. *Group & Organization Management, 27*(1), 14-49.

Bourdieu, P. (1986). The forms of social capital. In J. Richardson (Ed.), *Handbook of theory and research for the sociology of education* (pp. 241-258). New York: Greenwood.

Cascio, W. F., & Shurygailo, S. (2003). E-Leadership and virtual teams. *Organizational Dynamics*, *31*(4), 362-376.

Castronova, E. (2005). *Synthetic worlds: The business and culture of online games.* Chicago, IL: University of Chicago Press.

Chin, W. (1998a). The partial least squares approach to structural equation modeling. In G. Marcoulides (Ed.), *Modern methods for business research.* Mahway, NJ: Erlbaum.

Chin, W. (1998b). Issues and opinion on structural equation modeling. *MIS Quarterly*, *22*(1), 7-16.

Chin, W., & Newsted, P. (1999). Structural equation modeling analysis with small samples using partial least squares. In R. Hoyle (Ed.), *Statistical strategies for small sample research* (pp. 307-341). Thousand Oaks, CA: Sage Publications.

Dannecker, A., Richter, S., Lechner, U., Dressner, N., Fabisch, S., & Ilsemann, A. (2008). *Towards World of Warcraft as an experiment platform for teams.* Paper presented at the AMCIS 2008, Torronto, Canada.

Dansereau, F., Graen, G. B., & Haga, W. (1975). A vertical dyad linkage approach to leadership in formal organizations. *Organizational Behavior and Human Performance*, *13*, 46-78.

DeMarco, M., Lesser, E., & O'Driscoll, T. (2007). Leadership in a distributed world: Lessons from online gaming. *IBM Institute for Business Value.* Retrieved from http://www.ibm.com/ibm/gio/ media/pdf/ibm_gio_ibv_gaming_and_leadership.pdf

Dienesch, R. M., & Liden, R. C. (1986). Leader-member exchange model of leadership: A critique and further development. *Academy of Management Review*, *11*(3), 618-634.

Ducheneaut, N., Yee, N., Nickell, E., & Moore, R. J. (2006). Alone together? Exploring the social dynamics of massively multiplayer online games. In *Proceedings of the SIGCHI conference on Human Factors in computing systems* (pp. 407-416). New York, NY: ACM Press.

Ducheneaut, N., Yee, N., Nickell, E., & Moore, R. J. (2007). *The life and death of online gaming communities: A look at guilds in World of Warcraft.* Paper presented at the CHI 2007, San Jose, CA.

Gefen, D., Straub, D., & Boudreau, M. C. (2000). Structural equation modeling and regression: Guidelines for research practice. *Communications of the Association for Information Systems*, *4*(7), 1-70.

Gerstner, C. R., & Day, D. V. (1997). Meta-analytic review of leader-member exchange theory: Correlates and construct issues. *Journal of Applied Psychology*, *82*(6), 827-844.

Goh, S. H., & Wasko, M. C. (2009). *Leadership in MMOGs: Emergent and transformational leadership candidates.* Paper presented at the Americas Conference on Information Systems, San Francisco, CA.

Graen, G., Novak, M., & Sommerkamp, P. (1982). The effects of leader-member exchange and job design on productivity and satisfaction: Testing a dual attachment model. *Organizational Behavior and Human Performance*, *30*(1), 109-131.

Graen, G. B., & Cashman, J. (1975). A role-making model of leadership in formal organizations: A development approach. In J. G. Hunt & L. J. Larson (Eds.), *Leadership frontiers: 143-165*. Kent, OH: Kent State University.

Graen, G. B. (1976). Role making processes within complex organizations. In M. D. Dunnette (Ed.), *Handbook of industrial and organizational psychology* (pp. 1201-1245). Chicago, IL: Rand-McNally.

Graen, G. B., & Scandura, T. A. (1987). Toward a psychology of dyadic organizing. *Research in Organizational Behavior*, *9*, 175-208.

Graen, G. B., & Uhl-Bien, M. (1995). Relationship-based approach to leadership: Development of leader-member exchange (LMX) theory of leadership over 25 years: Applying a multi-level multi-domain perspective. *Leadership Quarterly*, *6*(2), 219-247.

Greenberg, P. S., Greenberg, R. H., & Antonucci, Y. L. (2007). Creating and sustaining trust in virtual teams. *Business Horizons*, *50*(4), 325-333.

Harris, K. (2004). *An examination of multiple predictors and outcomes from different dimensions of LMX relationship quality*. Tallahassee, FL: The Florida State University.

IBM. (2008). Gaming and leadership report: Virtual worlds real leaders. *IBM.* Retrieved from http://domino.watson.ibm.com/comm/www_innovate.nsf/pages/world.gio.gaming.html

IBM. (2007). Virtual worlds, real leaders: Online games put the future of business leadership on display. In I. Global (Ed.), *IBM Global Innovation Outlook 2.0 Report* (pp. 1-34). Retrieved from http://www.ibm.com/ibm/gio/media/pdf/ibm_gio_gaming_report.pdf

Jarvenpaa, C. S., & Leidner, D. E. (1999). Communication and trust in global virtual teams. *Organization Science*, *10*(6), 791-865.

Jarvenpaa, S., Knoll, K., & Leidner, D. (1998). Is anybody out there? Antecedents of trust in global virtual teams. *Journal of Management Information Systems*, *14*(4), 29-64.

Jarvenpaa, S., & Tanriverdi, H. (2003). Leading virtual knowledge networks. *Organizational Dynamics*, *31*(4), 403-412.

Kahai, S. S., Carroll, E., & Jestice, R. (2007). Team collaboration in virtual worlds. *The DATA BASE for Advances in Information Systems*, *38*(4), 61-68.

Kayworth, T. R., & Leidner, D. E. (2000). The global virtual manager: A prescription for success. *European Management Journal*, *18*(2), 183-194.

Kreiner, G., & Ashforth, B. (2004). Evidence toward an expanded model of organizational identification. *Journal of Organizational Behavior*, *25*(1), 1-27.

Lai, Y., & Burchell, B. (2008). Distributed work: Communication in an "officeless firm". *New Technology, Work, and Employment*, *23*(1-2), 61-74.

Liden, R. C., & Maslyn, J. M. 1998. Multidimensionality of leader-member exchange: An empirical assessment through scale development. *Journal of Management*, 24(1) 43-72

Liden, R. C., Wayne, S. J., & Stillwell, D. (1993). A longitudinal study on the early development of leader-member exchanges. *Journal of Applied Psychology*, *78*(4), 662-674.

Lim, B., C., & Ployhart, R. E. (2004). Transformational Leadership: Relations to the five-factor model and team performance in typical and maximum contexts. *Journal of Applied Psychology*, *89*(4), 610-621.

Martins, L., Gilson, L., & Maynard, M. (2004). Virtual teams: What do we know and where do we go from here? *Journal of Management*, *30*(6), 805.

Mayer, R., Davis, J., & Schoorman, F. (1995). An integrative model of organizational trust. *The Academy of Management Review*, *20*(3), 709-734.

Nahapiet, J., & Ghoshal, S. (1998). Social capital, intellectual capital, and the organizational advantage. *The Academy of Management Review*, *23*(2), 242-266.

Nardi, B., & Harris, J. (2006). *Strangers and friends: Collaborative play in World of Warcraft*. Paper presented at the Proceedings of the 2006 20th anniversary conference on Computer supported cooperative work, Banff, Alberta, Canada.

Podsakoff, P. M., MacKenzie, S. B., Moorman, R. H., & Fetter, R. (1990). Transformational leadership behaviors and their effects on followers' trust in leader, satisfaction, and organizational citizenship behaviors. *Leadership Quarterly*, *1*(2), 107-142.

Powell, A., Piccoli, G., & Ives, B. (2004). Virtual teams: A review of current literature and directions for future research. *The DATA BASE for Advances in Information Systems*, *35*(1), 6-36.

Reeves, B., Malone, T., Yee, N., Cheng, H., Abecassis, D., Cadwell, T., Abbey, M., Scarborough, J., & Read, L. (2007). *Leadership in games and at work: Implications for the enterprise of massively multiplayer online role-playing games.* Palo Alto, CA.

Ringle, C., Wende, S., & Will, A. (2005). *SmartPLS 2.0 (beta).* Hamburg, Germany: University of Hamburg.

Rosen, B., Furst, S., & Blackburn, R. (2007). Overcoming barriers to knowledge sharing in virtual teams. *Organizational Dynamics*, *36*(3), 259-273.

Schneider, B., Goldstiein, H. W., & Smith, D. B. (1995). The ASA framework: An update. *Personnel Psychology*, *48*(4), 747-773.

Schriesheim, C. A., Neider, L. L., Scandura, T. A., & Tepper, B. J. (1992). Development and preliminary validation of a new scale (LMX-6) to measure leader-member exchange in organizations. *Educational and Psychological Measurement*, 52(1), 135-147.

Schriesheim, C. A., Castro, S. L., & Cogliser, C. C. (1999). Leader-member exchange (LMX) research: A comprehensive review of theory, measurement, and data-analytic practices. *Leadership Quarterly*, *10*(1), 63-113.

Shamir, B., House, R. J., & Arthur, M. B. (1993). The motivational effects of charismatic leadership: A self-concept based theory. *Organization Science*, *4*(4), 577-594.

Shultze, U., Hiltz, S. R., Nardi, B., Rennecker, J., & Stucky, S. (2008). Using synthetic worlds for work and learning. *Communications of the Association for Information Systems*, *22*(19), 351-370.

Spreitzer, G. M. (1995). Psychological empowerment in the workplace: Dimensions, measurement, and validation. *The Academy of Management Journal*, *38*(5), 1442-1465.

Steinkuelher, C. A. (2004). *Providing resources for MMOG guild leaders.* Paper presented at the MUD Developers Conference, San Jose, CA.

Uhl-Bien, M., Graen, G., & Scandura, T. (2000). Implications of leader-member exchange (LMX) for strategic human resource management systems: Relationships as social capital for competitive advantage. In G. Ferris (Ed.), *Research in personnel and human resources management* (Vol. 18, 137-186). Greenwich, CT: JAI Press.

Van Breukelen, W., Schyns, B., & Le Blanc, P. (2006). Leader-member exchange theory and research: Accomplishments and future challenges. *Leadership*, *2*(3), 295-316.

Wayne, S. J., Shore, L. M., & Liden, R. C. (1997). Perceived organizational support and leader-member exchange: A social exchange perspective. *Academy of Management Journal*, *40*(1), 82-111.

Williams, D., Ducheneaut, N., Xiong, L., Zhang, Y., Yee, N., & Nickell, E. (2006). From tree house to barracks: The social life of guilds in World of Warcraft. *Games and Culture*, *1*(4), 338-361.

Williams, D., Yee, N., & Caplan, S. E. (2008). Who plays, how much, and why? Debunking the stereotypical gamer profile. *Journal of Computer-Mediated Communication*, *13*, 993-1018.

Yee, N. (2006a). The demographics, motivations, and derived experiences of users of massively multi-user online graphical environments. *Presence: Teleoperators and Virtual Environments*, *15*(3), 309-329.

Yee, N. (2006b). The psychology of MMORPGs: Emotional investment, motivations, relationship formation, and problematic usage. In R. Schroeder & A. Axelsson (Eds.), *Avatars at work and play: Collaboration and interaction in shared virtual environments* (pp. 187-207). London: Springer-Verlag.

Yee, N. (2006c). *The Deadalus project: Life as a guild leader.* Retrieved from http://www.nickyee.com/daedalus/archives/pdf/4-2.pdf

Yee, N. (2006d). The labor of fun: How video games blur the boundaries of work and play. *Games and Culture*, *1*(1), 68-71.

Yukl, G. A. (1998). *Leadership in organizations* (4th ed.). Upper Saddle River, NJ: Prentice-Hall.

Zaccaro, S. J., & Bader, P. (2003). E-Leadership and the challenges of leading E-Teams: Minimizing the bad and maximizing the good. *Organizational Dynamics*, *31*(4), 377-387.

Zigurs, I. (2002). Leadership in virtual teams: Oxymoron or opportunity? *Organizational Dynamics*, *31*(4), 339-351.

Appendix

Appendix A

Item	Measure
Table A-1. Measures	
LMX1_L	Does this member know where he/she stands with you?
LMX2_L	Does this member usually know how satisfied you are with what he/she does?
LMX4_L	How well do you recognize this member's potential?
LMX5_L	Regardless of how much formal authority you have, what are the chances that you would use your power to help solve this member's problems in the guild?
LMX7_L	I have confidence that this member would defend my decisions if I were not present to do so.
LMX8_L	How would you characterize your working relationship with this member in the guild?
LMX1_M	Do you know where you stand with your guild leader?
LMX2_M	Do you usually know how satisfied your guild leader is with what you do?
LMX4_M	How well does your guild leader recognize your potential?
LMX5_M	Regardless of how much formal authority your guild leader has built into his/her position, what are the chances that your guild leader would use his/her power to help you solve problems in the guild?
LMX7_M	I have enough confidence in my guild leader that I would defend and justify his/her decision if he/she were not present to do so.
LMX8_M	How would you characterize your working relationship with your guild leader?
Emp_Comp1	I am confident in my ability to do my job on raids.
Emp_Comp2	I am self-assured about my capabilities to perform raiding activities.
Emp_Comp3	I have mastered the skills necessary to do my job on raids.
Emp_Imp1	My impact on what happens in my guild is large.
Emp_Imp2	I have a great deal of control over what happens in my guild.
Emp_Imp3	I have significant influence over what happens in my guild.
Emp_Mean1	The raiding I do is very important to me.
Emp_Mean2	Raiding is personally meaningful to me.
Emp_Mean3	The raiding I do is meaningful to me.
Emp_SelfD1	I have significant autonomy in determining how I do my job on raids.
Emp_SelfD2	I can decide on my own how to go about my role on raids.
Emp_SelfD3	I have considerable opportunity for independence and freedom in how I do my job on raids.
Trust_C1	I feel very confident about guild members' skills.
Trust_C3	Guild members have specialized capabilities that can increase the guild's performance.
Trust_C4	Guild members are very capable of performing their tasks.
Oblig1	Do you feel a sense of obligation to participate in raids with the guild?
Oblig2	Do you feel responsible to help other guild members?
Oblig3	Do you feel that other guild members expect you to participate in raids?
Norms1	I am aware of this guild's set of norms or rules for participation.
Norms2	I am aware of this guild's guidelines about appropriate behavior.
Norms3	The guild has norms and expectations about what constitutes appropriate interaction.
Org_ID1	There is a common sense of purpose in this guild.
Org_ID3	There is a strong feeling of unity in this guild.
Org_ID4	This guild has a specific mission shared by its members.
Org_ID5	When someone criticizes my guild, it feels like a personal insult.

Table A-1. Measures (cont.)	
Item	**Measure**
Perf1_LP	On raids, this guild member does his/her job in a timely and effective manner.
Perf2_LP	On raids, this guild member performs high quality work.
Perf4_LP	This guild member's quality of work is…
Perf5_LP	This guild member's quantity of work is…
Perf6_LP	This guild member's overall performance is…
Perf1_M	On raids, I do my job in a timely and effective manner.
Perf2_M	On raids, I perform high quality work.
Perf4_M	My quality of work is…
Perf5_M	My quantity of work is…
Perf6_M	My overall performance is…

Appendix B

Table 2. Descriptive Statistics

	Emp_Comp	Emp_Impact	Emp_Meaning	Emp_SelfD	Identification	LMX	Norms	Obligation	Trust_C
Emp_Comp1	**0.920**	0.466	0.130	0.653	0.445	0.482	0.364	0.589	0.189
Emp_Comp2	**0.896**	0.557	0.128	0.669	0.423	0.449	0.412	0.566	0.241
Emp_Comp3	**0.835**	0.412	-0.091	0.450	0.343	0.371	0.269	0.512	0.165
Emp_Impact1	0.496	**0.882**	0.186	0.504	0.261	0.543	0.402	0.500	0.076
Emp_Impact2	0.445	**0.836**	0.278	0.499	0.334	0.485	0.387	0.495	0.146
Emp_Impact3	0.424	**0.805**	0.112	0.438	0.343	0.387	0.230	0.292	0.254
Emp_Meaning1	0.167	0.203	**0.816**	0.102	0.143	0.113	0.223	0.139	0.472
Emp_Meaning2	0.030	0.238	**0.936**	0.130	0.262	0.267	0.204	0.073	0.448
Emp_Meaning3	0.065	0.193	**0.953**	0.110	0.201	0.233	0.246	0.148	0.340
Emp_SelfD1	0.673	0.465	-0.029	**0.865**	0.379	0.380	0.320	0.473	0.210
Emp_SelfD2	0.603	0.496	0.119	**0.882**	0.459	0.420	0.316	0.474	0.165
Emp_SelfD3	0.521	0.524	0.200	**0.865**	0.399	0.560	0.455	0.416	0.311
Org_ID1	0.326	0.329	0.161	0.424	**0.815**	0.461	0.401	0.445	0.219
Org_ID3	0.240	0.185	0.211	0.248	**0.701**	0.261	0.246	0.179	0.134
Org_ID4	0.513	0.285	0.271	0.389	**0.812**	0.311	0.341	0.472	0.458
Org_ID5	0.362	0.304	0.128	0.377	**0.784**	0.396	0.298	0.395	0.412
LMX1	0.486	0.482	0.096	0.511	0.471	**0.876**	0.590	0.565	0.071
LMX2	0.444	0.475	0.175	0.499	0.442	**0.864**	0.534	0.528	0.074
LMX4	0.478	0.553	0.181	0.434	0.377	**0.871**	0.501	0.413	0.071
LMX5	0.260	0.419	0.294	0.333	0.302	**0.754**	0.345	0.351	0.154
LMX7	0.422	0.506	0.249	0.464	0.423	**0.818**	0.465	0.350	0.292
LMX8	0.356	0.417	0.286	0.427	0.353	**0.844**	0.482	0.350	0.208
Norms1	0.405	0.394	0.261	0.451	0.434	0.601	**0.989**	0.470	0.117
Norms2	0.366	0.407	0.256	0.451	0.408	0.585	**0.981**	0.432	0.119
Norms3	0.393	0.410	0.187	0.348	0.389	0.524	**0.951**	0.416	0.072
Obliq1	0.504	0.437	0.156	0.434	0.432	0.476	0.420	**0.903**	0.040
Obliq2	0.644	0.521	0.093	0.535	0.479	0.507	0.420	**0.893**	0.176
Obliq3	0.533	0.434	0.077	0.404	0.411	0.383	0.366	**0.890**	0.124
Trust_C1	-0.125	0.066	0.316	0.003	0.172	-0.016	-0.071	-0.119	**0.660**
Trust_C3	0.218	0.179	0.441	0.262	0.382	0.166	0.116	0.114	**0.996**
Trust_C4	-0.006	0.045	0.328	0.126	0.264	0.021	-0.115	-0.026	**0.634**

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