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Fostering Fast-response Spontaneous Virtual Team: Effects of Member Skill Awareness and Shared Governance on Team Cohesion and Outcomes

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Abstract

Volatility and shocks in the environment have often generated pressing challenges that should be addressed quickly. In response to these challenges, fast-response spontaneous virtual teams (FRSVTs) have emerged. Such teams can swiftly assemble global talent by using advanced information communication technologies and are promising with respect to their benefits; however, their success is not guaranteed because FRSVT members face challenges that prevent them from operating cohesively, such as a lack of contractual bond and team-building processes. To address these problems, we present two technology-enabled facilitative factors (i.e., awareness of members' skills and perception of shared governance) that may positively influence an individual member's perception of FRSVT task cohesion and subsequent outcomes. We draw these factors from the team-shared mental model. Survey results obtained from 367 FRSVT members reveal that, although both factors significantly affected perceived task cohesion, the influence of shared governance perception was stronger. Furthermore, perceived task cohesion was positively related to performance and member satisfaction. One's propensity to reunite with team members is affected by performance and member satisfaction.

Keywords: *Fast-response, Spontaneous Virtual Team, Task Cohesion, Skill Awareness, Shared Governance.*

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1. Introduction

Globalization and advances in information communication technologies have provided impetus for groups of geographically and/or temporally dispersed members to collaborate remotely on common tasks in the form of virtual teams (VTs) (Piccoli& Ives, 2003; Wakefield, Leidner, & Garrison, 2008). VTs not only extend the boundaries of collaboration but also foster the development of new cooperation patterns. In particular, fast-response spontaneous VTs (FRSVTs) have been gaining increasingly attention. These teams are agile VTs that embody improvisation, self-organization, and rapid response to urgent, ad-hoc tasks (e.g., Munkvold & Zigurs, 2007).

FRSVTs are socially popular in activities such as crowd-sourcing for agile tasks, online gaming, and emergency telemedicine or rescue. For instance, individual players of massive multiplayer online games often form FRSVTs to accomplish exigent tasks with members drawn from a large pool containing millions of players in virtual settings (Davis, Murphy, Owens, Khazanchi, &Zigurs, 2009; Roquilly, 2011). The development of FRSVTs in such settings effectively reflects the cooperative and supportive spirits of social computing in which anonymous participants cooperate spontaneously to tackle urgent issues (Parameswaran & Whinston, 2007). The FRSVT trend has also burgeoned in organizations: avant technology firms such as Google and Twitter have embraced FRSVTs by allowing employees to collaborate voluntarily on instant innovative ideas and to self-manage the teamwork during working hours (Bick, 2007). The Gartner Group has predicted that such emergent teams will be implemented in working environments and advance exponentially in the next decade (Austin, 2010).

FRSVTs differ from conventional work teams. First, FRSVTs are usually formed spontaneously by members who are not bounded by formal contractual relationships. Second, FRSVTs are often highly self-managed, and formal leaders may not be involved. Each member is, therefore, empowered by opportunities to make decisions and assign tasks. Third, FRSVTs strongly emphasize quick team formation and rapid response to tasks at hand. These unique FRSVT traits are beneficial in that the available talent pool is widened. Moreover, diversified and flexible teams are formed to handle pressing issues. However, these same characteristics may also undermine these teams' possibility of achieving desirable outcomes. For example, time constraints and the absence of formal team leaders in FRSVTs may deprive members of sufficient information about one another and of opportunities to build long-term collaborative relationships (Majchrzak, Jarvenpaa, & Hollingshead, 2007).

Extant research suggests that team cohesion, "the tendency for a group to stick together and remain united" (Carron, Brawley, & Widmeyer, 1998, p. 213), is an important process indicator of how inputs into team functioning can affect team outcomes (Ilgen, Hollenbeck, Johnson, & Jundt, 2005). Team cohesion is a prominent concept in collaboration in conventional teams (Menon & Phillips, 2011), virtual teams (Fiol & O'Connor, 2005; Wakefield et al., 2008), and teams that require spontaneity or self-management (Singh, Tan, & Mookerjee, 2011; Stewart, Courtright, & Barrick, 2012). In this study, we focus on a specific dimension of team cohesion: task cohesion. Task cohesion refers to team members' attraction to the team because of a shared commitment to the team task (Knouse, 2006; van Vianen & De Dreu, 2001). It is especially important and relevant in the context of FRSVTs. First, it focuses on shared commitment toward a task, which inherently matches the nature of FRSVTs (i.e., a team is formed with a strong emphasis on achieving a focal task) (Knouse, 2006; Mason & Griffin, 2003). Second, task cohesion can be established within a limited time frame (Carron & Brawley, 2000) and improve team performance in urgent or time-critical situations (Zaccaro, Gualtieri, & Minionis, 1995). Thus, understanding the role of task cohesion in FRSVTs and exploring the influential antecedents of task cohesion are of great importance to researchers and practitioners.

In this study, we explore effective ways to enhance the task cohesion of an FRSVT in a specific social context with an abundant manifestation of such teams: online gaming. The characteristics of playing online games with virtual teammates fit well into the FRSVT context. First, the members of a gaming team collaborate in completing a competitive task (i.e., playing the game) over a relatively short period upon formation. Second, teams are usually self-organized and have limited communication channels. Therefore, we can quantitatively examine the FRSVT phenomenon in the context of online

gaming and meanwhile benefit from the magnitude of users and available teams on online gaming platforms. This approach is aligned with the research advocacy that, as a virtual world[1], online gaming can potentially extend the scope of the existing sociotechnical research stream by facilitating large-scale observation, realistic data collection, and process-oriented investigation (e.g., team member collaboration) (Bainbridge, 2007).

Drawing on the perspective of the team shared mental model (TSMM) (Akgun, Byrne, Keskin, & Lynn, 2006; Mathieu, Heffner, Goodwin, Salas, & Cannon-Bowers, 2000; Mohammed & Dumville, 2001), we propose that an individual member's awareness of their team members' skills and perception of shared governance can affect that member's perceived task cohesion. These factors can be manifested through technology-enabled mechanisms established by FRSVT facilitators (Putzke, Fischbach, Schoder, & Gloor, 2010). The TSMM is an appropriate theoretical foundation because it elucidates the dimensions of critical information (i.e., knowledge and belief structures) that should be rapidly acquired by FRSVT members to foster favorable collaboration (i.e., task cohesion). In this study, we focus on member-perceived task cohesion rather than team-level perception for two reasons: 1) FRSVT members usually decide individually to participate and contribute without an order from a formal team leader (Friedkin, 2004), and 2) the transient and voluntary nature of FRSVTs suggests the team may not be reformed as a whole in the future. Hence, members decide to participate in a team in the future based on their judgment about the team's collaboration status. Thus, capturing individual members' perception about task cohesion can explain the effectiveness of FRSVT activities and these perceptions' subsequent influence on members' decisions to participate in the teams in the future. In Section 2, we review the literature on task cohesion and explore appropriate antecedents through theoretical guidance from the TSMM and case findings.

2. Theoretical Background and Research Hypotheses

2.1. Task Cohesion in FRSVTs

Research on cohesion in small groups/teams spans various disciplines such as sociology, psychology, organizational management, and information systems (e.g., Lawler, Thye, & Yoon, 2000; Rozell & Gundersen, 2003; Sargent & Sue-Chan, 2001; Schwarz & Schwarz, 2007; Thompson, Kray, & Lind, 1998; Yoo & Alavi, 2001). As a psychological force that binds people (Keyton & Springston, 1990), team cohesion can help produce good team outcomes, such as favorable communication (Hogg, 1992), positive member relations (Narayanan & Nath, 1984), and good task participation and performance (Evans & Dion, 1991; Klein & Mulvey, 1995; Podsakoff, Ahearne, & MacKenzie, 1997; West & Turner, 2000). The members of cohesive teams typically report good collaborative experiences because they rely on one another to accomplish tasks. Thus, they efficiently exploit existing team resources to successfully complete tasks (Beal, Cohen, Burke, & McLendon, 2003).

One can categorize team cohesion further into social and task cohesion. Social cohesion emphasizes interpersonal attraction and social relationships beyond the tasks assigned to members. Task cohesion reasons that all teams are formed for a certain purpose; therefore, task cohesion fosters motivation/commitment toward achieving team goals and objectives (Carron & Brawley, 2000; Forrester & Tashichian, 2006). Table 1 summarizes previous conceptualizations of team/group, task, and social cohesion. First, past studies do not adopt a unified definition of team or task cohesion. As such, they usually use these terms interchangeably. Second, researchers have often applied concepts such as "attraction", "commitment", "stick together", "united", "identity", or "attachment" to define team cohesion but emphasized "commitment" in conceptualizing task cohesion (Knouse, 2006; van Vianen & De Dreu, 2001). In line with a previous study (Menon& Phillips, 2011), we consider "shared commitment" to be a core component of task cohesion in our context and, thus, define task cohesion as team members' attraction to the team because of a shared commitment to the team task.

[1] The virtual world refers to an electronic environment that visually mimics complex physical spaces. In such environments, people can interact with one another and with virtual objects as animated characters (Bainbridge, 2007). Examples include World of Warcraft and Second Life.

Table 1 summarizes previously identified antecedents of team cohesion in conventional offline teams, virtual teams, and offline self-managing teams. These factors provide insights into team cohesion research; however, they do not capture the unique traits of FRSVTs adequately. For instance, some of the identified antecedents of offline team cohesion may already be embedded in FRSVT, such as task autonomy and goal congruence. Some of the other factors may not be feasible to FRSVTs, such as the requirement for external support staff (external coaches or training personnel), the demand for a long period for team building (e.g., developmental peer appraisal and information sharing), and the focus on the social aspects of team cohesion (e.g., conflict management or identification). Moreover, some of the technology facilitators identified in the virtual setting, including dialogue technique, may be irrelevant in our context because FRSVT members usually do not have time for intensive communication. Similarly, the antecedents of team cohesion in self-managing teams (e.g., peer appraisals, employee control over team staffing) emphasize the contribution of individual members to team cohesion, but they are not the focus of the current study because we examine technology-enabled antecedents and how they can facilitate swift collaboration.

With these considerations in mind, we consider antecedents of task cohesion based on 1) their fit with unique FRSVT characteristics such as fast response and self-organization, that is, we should consider only the potential task cohesion-building factors that particularly manifest the FRSVT context; 2) the perspective of individual members regarding other members given the importance of individual thoughts, evaluations, and decisions in FRSVT participation; and 3) the ability of team members to build the antecedents through technological platforms. FRSVTs rely heavily on online mechanisms to facilitate team collaboration; thus, teams can enhance task cohesion with the assistance of current available online mechanisms.

Table 1. Literature Review on Team Cohesion, Task Cohesion, and Social Cohesion

Source	Subjects	Types of cohesion	Key antecedents	Method	Results
Type 1: conventional offline teams					
Anson, Bostrom, & Wynne (1995)	University students	Team cohesion: a core dimension known as attraction to a group: an individual's desire to identify with and be an accepted member of the group	A human facilitator and a computerized group support system (GSS)	Empirical (experiment)	Facilitated groups displayed improved group processes and cohesion, whereas the GSS-supported groups did not. Collectively, facilitators and GSS support can enhance each other's effective influence on cohesion and group processes.
Gardner, Shields, Bredemeier, & Bostrom (1996)	University baseball and softball players	Team cohesion: no clear definition is provided	Perceived coaching behavior	Empirical (survey)	The highly cohesive teams were managed by coaches who were perceived as being high scorers in training and instruction, democratic behavior, social support, and positive feedback, but low scorers in autocratic behavior. The perceptions of coaching behavior and team cohesion differed significantly with gender and with athletes at different school levels.
Barrick, Stewart, Neubert, & Mount (1998)	Organizational employees	Social cohesion: the result of all forces that act on members to remain in the group	Team composition (ability and personality)	Empirical (survey)	Extraversion and emotional stability were associated with team viability through social cohesion.
Harrison, Price, & Bell (1998), Harrison, Price, Gavin, & Florey (2002)	Organizational employees[1] University students[2]	Team cohesion (Group cohesiveness): how much the members of a group "stick together".	Surface-level (demographic) and deep-level (attitudinal) diversity	Empirical (survey)	The length of time for which group members worked together weakened the effects of surface-level diversity and strengthened the effects of deep-level diversity on group cohesion because members had the opportunity to interact meaningfully.

Table 1. Literature Review on Team Cohesion, Task Cohesion, and Social Cohesion (cont.)

Source	Subjects	Types of cohesion	Key antecedents	Method	Results
Type 1: conventional offline teams					
Van Vianen & De Dreu (2001)	Organizational employees	Team cohesion: the result of all of the forces that act on the members to remain in the team. Social cohesion: an individual's attraction to a group because of positive relationships shared with other members of the group. Task cohesion: an individual's attraction to a group because of the shared commitment to a group task.	Personality composition in teams	Empirical (survey)	Minimum levels of conscientiousness and agreeableness contributed positively to both task cohesion and team performance. High mean levels of extraversion and emotional stability contributed positively to social cohesion.
Man & Lam (2003)	Organizational employees	Team cohesion (Group cohesiveness): the commitment of members to the group task.	Job complexity and task autonomy	Empirical (survey)	An increase in job complexity and/or task autonomy improved group cohesiveness and team performance. Furthermore, the positive effects of job complexity and autonomy on group cohesiveness were more prominent for individualistic than for collectivistic work groups.
Knouse (2006)	Organizational employees	Task cohesion: the attraction or commitment of group members to the task environment in which they work.	Task relevant-skills, task identity, significant and task requirements, group goal congruence, feedback, task goal congruence, and task interdependence.	Conceptual	The study proposed several important task cohesion-related variables, including task-relevant skills, task identity, significant and task requirements, group goal congruence, feedback, task goal congruence, and task interdependence.
Hirschfeld & Bernerth (2008)	Military officers	Social cohesion: players are united in their aspirations and have a strong sense of collective identity.	Mental and physical efficacy	Empirical (survey)	Both mental and physical efficacy facilitated the establishment of internal social cohesion; however, mental efficacy alone promoted problem solving and observed teamwork effectiveness.
Chen, Tang, & Wang (2009)	Organizational employees	Team cohesion (Group cohesion): the degree of group attachment among members.	Task and goal interdependence	Empirical (survey)	Group cohesion fully mediated the effects of task and goal interdependence on employee's organizational citizenship behavior. Task interdependence had a stronger effect on cohesion than goal interdependence.
Mesmer-Magnus & DeChurch (2009)	Organizational employees	Team cohesion: no clear definition is provided	Information sharing	Meta-Analysis	Information sharing was important to team performance, cohesion, decision satisfaction, and knowledge integration.
Tekleab, Quigley, & Tesluk (2009)	University students	Team cohesion: the tendency for a group to stick together and remain united in the pursuit of its instrumental objectives.	Conflict management	Empirical (survey)	Conflict management had a direct positive effect on team cohesion and moderated the relationship between relationship conflict and team cohesion and that between task conflict and team cohesion.

Table 1. Literature Review on Team Cohesion, Task Cohesion, and Social Cohesion (cont.)

Source	Subjects	Types of cohesion	Key antecedents	Method	Results
Type 1: conventional offline teams					
Menon & Phillips (2011)	University students	Team cohesion (Group cohesion): all of the forces acting on members to remain in the group.	Even and odd team sizes	Archival data; empirical (survey; experiment)	Even-sized small groups are often less cohesive than odd-sized ones.
Thatcher & Patel (2011)	N.A.	Team cohesion: the extent to which individual workers identify with the team, are influenced by other team members, and are committed to team goals.	Demographic fault lines	Meta-Analysis	Demographic fault-line strength enhanced task and relationship conflict and decrease team cohesion.
Type 2: Virtual teams					
Tan, Wei, Huang, & Ng (2000)	University students	Team cohesion: the degree of closeness that members feel for each other.	Dialogue technique	Empirical (controlled experiment)	Virtual teams that used the dialogue technique displayed better relational development than those that did not in terms of team cohesion and decision outcome. Moreover, these differences were maintained over time.
Fiol & O'Connor (2005)	Organizational employees	Team cohesion (Group cohesion): no clear definition is provided	Identification	Conceptual	Identification in virtual organizational teams was considered especially desirable because it provided the glue that can promote group cohesion despite the relative lack of face-to-face interaction.
Ramesh, Cao, & Mohan (2006)	Organizational employees	Team cohesion: no clear definition is provided	Practice of "build trust"	Empirical (case study)	The lack of team cohesion was addressed by "build trust" group of practices, which helped customers and software developers to understand and to trust the informal processes followed during development and to build a cohesive team. Efforts to foster a cohesive team culture also helped the teams to operate with a common purpose even though they were geographically distributed.
Algesheimer, Dholakia, & Gurau (2011)	Members of online professional gaming leagues	Team cohesion: attraction to the group, satisfaction with other members of the group, and social interaction among the group members.	Team size, team tenure, team heterogeneity, and post-collaboration performance	Empirical (survey)	The findings validated the hypothesized input-mediator-output-input model and demonstrated how team cohesion is affected by team size, team tenure, team heterogeneity, and past collaboration performance.
Type 3: offline self-managing teams					
Druskat & Wolff (1999)	University students	Team cohesion: no clear definition is provided	A structured, face-to-face, developmental peer appraisal	Empirical (repeated surveys)	Peer appraisals can have immediate positive effects on perceptions of open communication, task motivation, social loafing, group viability, cohesion, and satisfaction.
Chansler, Swamidass, & Cammann (2003)	Organizational employees	Team cohesion (Group cohesion): the resultant forces which are acting on the members to stay in a group.	Perceived fairness, consensus decision making, work process understanding, and control over team staffing	Empirical (survey)	Employee control over team staffing and perceived fairness influenced the group cohesion of self-managing work teams, which are called "natural work groups".

Table 1. Literature Review on Team Cohesion, Task Cohesion, and Social Cohesion (cont.)

Source	Subjects	Types of cohesion	Key antecedents	Method	Results
Type 3: offline self-managing teams					
Stewart et al. (2012)	Organizational employees	Team cohesion (group cohesion): the extent to which individuals internalize group standards and thereby adopt group goals as their own.	Peer-based control	Empirical (survey)	Peer-based rational control corresponded with improved performance for both individuals and collective teams. Rational and normative mechanisms of peer-based control interacted to explain individual and team performance. However, the positive effects of peer-based control on performance were attenuated in cohesive teams.

When individuals encounter unfamiliar partners and need to adapt quickly to the task requirements, their primary consideration is obtaining information about these partners and enhancing the predictability of their behaviors (Mathieu et al., 2000). In other words, individual team members need to retrieve information about their team members to better process tasks, to predict their team members' movements, and to guide their own individual choice. These choices may foster team cohesion as a whole (Benkler, 2002; Feller, Finnegan, Fitzgerald, & Hayes, 2008), which includes task cohesion. Previous literature on offline fast-response tasks also recognizes the importance of individual members' identifying and recognizing the appropriate team members to facilitate task coordination and achieve good outcomes (e.g., Faraj & Xiao, 2006). In Section 2.2, we draw on the TSMM and interviews with FRSVT members to identify the key types of member information that can enhance an individual member's perception of FRSVT task cohesion.

2.2. Enhancement of FRSVT Task Cohesion: The TSMM

The TSMM represents "an organized understanding of relevant knowledge that is shared by team members" (Mohammed &Dumville, 2001, p.89). Given shared representations (e.g., tasks), team members understand the current phenomena, predict environment changes, and decide future team actions in the same way (Mathieu et al., 2000). Previous studies indicate that this shared understanding can influence team processes directly and the team's subsequent performance, especially when the team must perform a task swiftly without effective communication (e.g., Akgun et al., 2006; Cannon-Bowers, Salas, & Converse, 1993; Mathieu et al., 2000). Under such circumstances, established knowledge on interpreting and predicting a situation is crucial to directing the subsequent actions of a team and to its ultimate success (Akgun et al., 2006).

TSMM-related research suggests that understandings among team members can be shared effectively by obtaining two dimensions of structural information: knowledge and belief structures (Mohammed &Dumville, 2001). Knowledge structures are concerned with the domain expertise that team members must possess to solve a problem. It is closely related to the concept of the transactive memory system, which postulates that team members are aware of other members' expertise (Brandon & Hollingshead, 2004). By understanding "who knows what", a team member can use others as memory aids and direct specific tasks to other team members possessing relevant expertise (Ren, Carley, & Argote, 2006). Belief structures espouse commonalities among team members with respect to the desired status the team expects to achieve (Mohammed &Dumville, 2001). In other words, team members can reach a certain degree of cognitive consensus regarding task definition and the rules to follow. Team members hold similar viewpoints toward regulations and tasks when they possess a high cognitive consensus; hence, they can cope with difficulties arising from special situations (e.g., quick response to task demands with limited prior communication).

Given the scarcity of suitable literature on the critical shared understanding of knowledge and belief structures among FRSVT members, we determined antecedents by conducting a series of interviews with participants from both social and organizational FRSVTs. The context of this study is social gaming; however, we also report some possible implications for future research in the organizational setting. We conducted a total of seven interviews in the social setting; four interviewees were from the online gaming field and three were from agile teams in the crowdsourcing field. Moreover, we

conducted eight interviews in pioneer companies that supported FRSVTs. Interviewees must have been part of at least one FRSVT. We selected interviewees from different social settings and companies to obtain a comprehensive representation. During the interviews, we first asked questions to clarify the nature of FRSVTs (e.g., "Could you please describe the FRSVTs you have participated in?"; "What are the unique characteristics of FRSVTs in comparison to conventional work/study teams?"). We followed this line of inquiry with questions that elucidated the key challenges in FRSVTs. The interviews were open-ended and interactive.

According to the interview responses, FRSVTs in the social and organizational settings can differ in various aspects. First, member demographics may vary in these contexts. For instance, participants in online gaming teams are relatively younger and report lower education levels than those in the organizational setting who are mainly grass-root level employees (e.g., research and development professionals). Second, though FRSVTs in both social and organizational contexts typically do not have formally assigned leaders, initiators in organizations may screen other members' profiles prior to team formation. Appendix A summarizes the comparison among FRSVTs in different contexts.

Despite the distinctions, FRSVTs are usually formed to solve ad hoc problems in both social and organizational settings. Member participation is generally voluntary rather than assigned. Members from both settings are likely to lack prior collaboration experience. According to our interviews, the most frequent feedback received regarding FRSVT challenges involves misunderstanding regarding the skills or capabilities of other members and the lack of control over their motivations, commitments, and behaviors. For instance, an FRSVT with volunteer members with limited prior collaboration can easily fail if some members cannot perform their tasks. Existing members may also withdraw from the task and leave the team. This situation occurs in both social and organizational FRSVTs because of the minimal managerial intervention and the voluntary participation.

With these interview responses in mind, we review the appropriate manifestations of knowledge and belief structures in FRSVT. First, we posit that a member should acknowledge other members' task-related expertise, which we term as awareness of other members' skills (i.e., knowledge structure) in this study[2]. Constructing a high-level, skill-related knowledge structure (i.e., high awareness of other members' skills) enables a member to oversee a team's skill composition and to make informed decisions in task processing. One can obtain information about other members' skills through skill-profiling mechanisms (e.g., the display of general skill level and areas of expertise) in FRSVTs.

Second, we propose the concept of perception of shared governance, which reflects the perceived commonality of a member with respect to the governance rules to which the members of an FRSVT are subject. A heightened perception of shared governance strengthens a member's belief in others in terms of the possibility of their behaving appropriately to facilitate task collaboration. Members can acquire such information by using technology-enabled mechanisms in FRSVT community platforms (Antheunis, Valkenburg, & Peter, 2007), such as mechanisms that can consolidate a set of explicit regulatory rules to which each member must comply. Members can retrieve these rules from the original sub-communities to which other members belong (e.g., clans initiated by online game players). Given that members in FRSVT collaborations typically have limited time or opportunities for communication, we expect that individuals will access and possess information on members' skills and on shared governance prior to forming teams.

Figure 1 shows the research model. Our central thesis posits that the two technology-enabled constructs (namely, awareness of members' skills and perception of shared governance) effectively foster an individual member's perceived task cohesion, which, in turn, influences the member's evaluation of FRSVT outcomes: team performance, satisfaction with team members, and propensity to reunite with team members. Although members are likely to reunite beyond the context of FRSVTs,

[2] In addition to other members' skills, prior studies also recognize other important aspects of knowledge structure, such as knowledge regarding team tasks or problems (Cannon-Bowers et al., 1993; Levine & Moreland, 1991; Orasanu, 1990). However, tasks and problems are usually concrete and set prior to the formation of the FRSVTs in the social context of FRSVTs, such as in online games. Therefore, members can quickly decide to join the teams. In other words, knowledge about the task or problems is relatively well defined in this setting. Nonetheless, knowledge about the members' skills is not guaranteed as a result of limited previous interactions. Hence, we choose awareness of other members' skills to represent knowledge structure in this study.

understanding a member's propensity to continuously collaborate with FRSVT members (i.e., propensity to reunite with the same team members) is valuable. When members collaborate with one another continuously, FRSVTs can evolve into a stable type of team to accomplish long-term objectives, such as a regular spontaneous virtual team. Moreover, members' propensity to reunite can also act as a surrogate measure of their engagement with the FRSVT platform. Facilitating an engaging experience is important for platform designers and operators to continuously attract enough members and accomplish fast response tasks on their platforms.

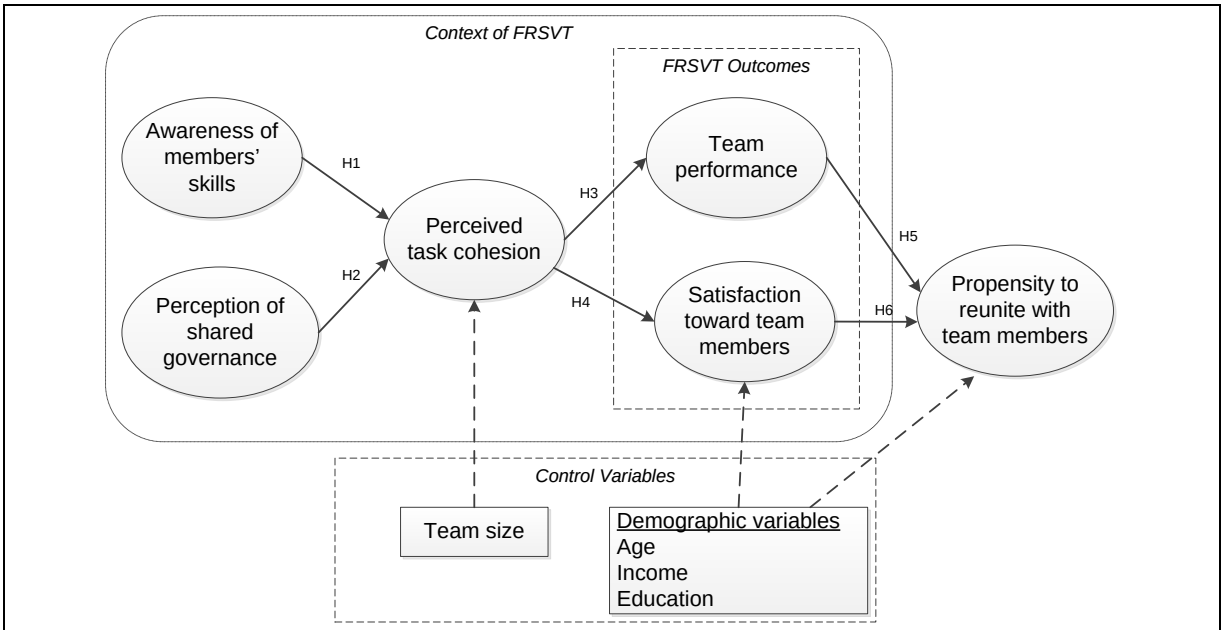

Figure 1. Research Model

2.3. Facilitators of Task Cohesion

Researchers have proposed skills-based team composition as an important enabler of task cohesion (Knouse, 2006). Given the expectation to perform immediately upon formation in the FRSVT context, members with diversified backgrounds often lack sufficient opportunities to communicate and gradually perceive one another's skills. Under such circumstances, technology-enabled mechanisms such as skill profiling repositories can aid individual members in building awareness of other FRSVT members' skills. Subsequently, task cohesion is enhanced in two ways. First, knowledge about other members' task-related skills (e.g., competency and complementarity) can foster appropriate task allocation and smooth information exchange so that team members can be united to achieve the team's goals (Bernthal & Insko, 1993; Zaccaro et al., 1995). In the context of FRSVT, all members are likely to be involved in decision making and task allocation. When an FRSVT member gets to know other members' expertise, the member can optimize task allocation and information exchange. For example, an online game player can pick a suitable member to partner with in a battle when the player checks other members' skill levels and specialized skills. Consequently, team members can be united effectively to achieve the team's goal. Second, a member who collects skill-related information on others on a technology platform expects that the platform will also facilitate other members to do the same. Therefore, the member is likely to believe that all members can appropriately allocate tasks for the team to achieve its goal(s) (i.e., high perceived task cohesion), which is in line with previous research that has applied a team member's perception (e.g., individual perception on a team leader's effectiveness) to predict the team's outcome (e.g., team performance) (Wakefield et al., 2008).

H1: *An FRSVT member's awareness of other members' skills will be positively related to the member's perception of task cohesion.*

Governance refers to a set of behavioral rules that regulates the initiation, termination, and ongoing interactions among a set of parties (Heide, 1994). Prior research states that team members should reach a consensus on task processing and team effort to maximize their achievements (Campion, Papper, & Medsker, 1996). In the context of FRSVTs, members are likely to be drawn temporarily from a disparate mix of communities with various governance modes, be minimally guided by formal control, and lack sufficient time to discuss common principles to adhere to. In other words, members may not be governed by the same sets of rules and regulations. For example, players in an online gaming platform from different clans may disagree about whether to save team members or attack an enemy or about whether to disallow premature retreats from the game or allow members to decide themselves whether they wish to withdraw. If a member perceives that most FRSVT team members share the same rules of behavior, the member is less concerned with possible rule-breaking or opportunistic behaviors. Furthermore, the member becomes more comfortable with interpreting the equivocal situation or with decision making. Consequently, the member is likely to believe that all team members are committed in working toward the same goal. This occurrence is consistent with the logic that one's perception of other members can be developed swiftly with limited validation in an emergent team setting (Majchrzak, Malhotra, & John, 2007).

H2: *An FRSVT member's perception of shared governance will be positively related to the member's perception of task cohesion.*

2.4. Effects of Task Cohesion

We expect task cohesion to enhance team effectiveness on tasks such as facilitating task performance, productivity, and achievement (Carless & Paola, 2000; Carron et al., 1998; Cohen & Bailey, 1997; Gammage, Carron, & Estabrooks, 2001). The behavioral perspective on cohesion theories suggests that the cohesion-performance link is attributed to a group's aspiration and commitment to a task rather than to the social relationship of the members to one another (Mullen & Copper, 1994). In the presence of strong task cohesion, team members can coordinate activities and perform tasks effectively, especially when the team is new or is facing environmental pressures (e.g., immediate response requirement) (Beal et al., 2003; Zaccaro et al., 1995). Therefore, team performance is an important measure of FRSVT success because members are often expected to handle demanding tasks. When an FRSVT member perceives that the team possesses strong task cohesion, the team is likely to be committed to the task and members can confidently rely on each other to execute the task. Thus, members can efficiently exploit existing team resources to effectively accomplish a task even in time-critical situations.

H3: *Perceived task cohesion in an FRSVT will be positively related to team performance.*

Satisfaction with other team members typically encompasses a member's affective responses to the individual's relationships with other team members during the collaboration process. In particular, the social-emotional stream of literature emphasizes that task cohesion can significantly facilitate favorable task-processing experiences and in meeting members' affective needs, such as satisfaction with team collaboration (Dobbins & Zaccaro, 1986; Narayanan & Nath, 1984; Williams & Hacker, 1982). An FRSVT team with strong task cohesion is likely to infer that the collaboration among members is satisfactory (Beal et al., 2003). Under such circumstances, members are likely to be satisfied with their own collaborative relations with other members during the short period of time they work together.

H4: *Perceived task cohesion in an FRSVT will be positively related to a member's satisfaction with other team members.*

A member's propensity to reunite with other members refers to the member's tendency to collaborate with previous teammates on a different task after the current team disbands. Researchers have empirically confirmed prior performance and satisfaction to directly influence individuals' future decisions and endeavors (e.g., Bhattacherjee & Premkumar, 2004; Szajna & Scamell, 1993). Specifically, the previous performance of a team can act as a guideline by which a member judges the eligibility of other members and the probability of success in future collaborations. Furthermore, satisfaction influences future decision making, including the continued use of technologies

(Bhattacherjee, 2001) and the repeat purchase of different products and services (Westbrook & Oliver, 1991). In our context, satisfaction with team members in previous FRSVT collaborations can significantly motivate future collaborations with the same members, especially when most members are working with one another for the first time. Hence, we propose that team performance and satisfaction with other members can affect one's intention to continue the collaboration, even when repeat collaboration produces different forms of teams, such as the regular spontaneous virtual teams under normal task requirement conditions.

H5: *FRSVT performance will be positively related to a member's propensity to reunite with the member's current team members in future tasks.*

H6: *An FRSVT member's satisfaction with other members will be positively related to the member's propensity to reunite with those members in future tasks.*

3. Research Methodology

To test the proposed hypotheses, we conducted an online survey on a renowned third-party international online gaming platform, which hosts various team-based games such as Defense of the Ancients (a real-time strategy, multiplayer role playing game) and Counter-Strike (a multiplayer shooting game based on team collaboration). These games allow multiple global players to participate in team-based competitions and tournaments. The chosen platform also facilitates mutual understanding among its members through various mechanisms, including detailed player profiles, game ladders (skill profile-ranking system), and clan rules (rules of behavior in the subcommunities). All of these mechanisms enable team players to obtain and assess other members' background information (e.g., their capabilities and their clans' governance). Clans are important sub-communities in gaming platform, and they vary in membership from two members to several dozen members or more. Each clan can specify governance rules that members should follow during the game. Therefore, team members belonging to different clans can be subject to different sets of governance rules. One can retrieve the governance rules that a particular member follows either through searching by username or simply by clicking on users' profile tag on the gaming platform.

We posted the invitations to participate in our survey on the gaming platform. Prior to participating in the survey, we required each participant to have immediately completed a game with other players (i.e., within two minutes after gameplay). The system captured the logout time and the period at which the participant entered the survey page. We then verified the time interval after data collection and retained only those participants who reported actually began the survey within two minutes after completing their game for further data analysis. Nonetheless, we also considered some individuals who began the survey slightly after the two-minute threshold (i.e., no more than additional 30 seconds). This procedure ensured that participants could accurately recall the past experience of collaborating with other players in the team. After the survey, we provided each participant with 1,000 experience points that they could use on the gaming platform later as a reward. We collected a total of 423 responses that we scrutinized further for reliability. First, the first two authors independently validated the accuracy of each respondent ID in the questionnaires and those of their team members by checking the reported IDs against the platform's database. Second, we checked respondents' IP addresses and the time they took to fill in the survey. We checked these inputs to prevent multiple entries from the same source. We removed inappropriate, incomplete, missing, and irrecoverable responses based on these two criteria. Third, we anticipated the possibility of non-independent observations during data collection; therefore, we employed the following procedures to avoid this problem: 1) we asked respondents to list the usernames of their teammates for the recently completed game, and 2) we identified the respondents who belonged to the same team with this information. We found that majority of the respondents belonged to different teams but that there were eight teams with more than one player participating in the survey. Therefore, we decided to eliminate all the responses in these eight teams so that the observations used in the data analysis did not violate the assumption of independent observation. This elimination decision also helped to minimize the selection bias if we chose one response from each of the eight teams. In total, we excluded 56 responses from further analysis. In total, we analyzed 367 responses from different teams (i.e., 367 members who belonged to 367 FRSVTs).

Table 2. Definition and Measurement of Constructs

Construct	Definition	Measurements
Awareness of members' skills (self-developed)	An acknowledgement of other members' task-related expertise by an individual member.	1. I knew other members' skill levels (e.g., overall game points as calculated by the platform). 2. I knew other members' specialized expertise (e.g., information on the win rate of certain weapons or on certain maps of the game that the platform provides).
Perception on shared governance (self-developed)	The perceived commonality of a member with respect to the governance rules to which members are subject.	1. I feel that our team members shared the same rules in playing the game (e.g., no quitting as indicated in the clan rules). 2. I feel that our team members shared the same rules besides playing the game (e.g., the way they treated each other and their contribution to the forum as indicated by the clan rules).
Perceived task cohesion (adapted from Carless & Paola, 2000; Kidwell, Mossholder, & Bennett, 1997)	Team members' attraction to the team because of shared commitment to the team task	1. In general, all team members were enthusiastic about the game we just played. 2. Our team was united in trying to reach the goal for performance. 3. Our team had a high level of commitment to the game we just played.
Team performance	The final results after completing the team task.	1. The team won the game. 0. The team lost the game.
Member satisfaction toward team members (adapted from De Wulf, Odekerken-Schroder, & Iacobucci, 2001)	The affective responses of a member to the member's relationship with other team members.	1. As a team member, I had a high-quality relationship with other members in the team. 2. I am satisfied with the degree of respect and fair treatment I received from other members in the team. 3. I am satisfied with the amount of support I received from other members in the team.
Propensity to reunite with team members (adapted from Bone & Ellen, 1992)	The tendency of a member to collaborate with previous teammates on a different task after the current team disbands.	1. The next time I play the game, I would like to stay in the same team. 2. If possible, I would continue playing in the same team next time. 3. If possible, I would like to play with these members again next time.

3.1. Operationalization of Constructs

In this study, we adapted some items from validated scales in previous research, while we specifically designed others to measure the constructs. We modeled awareness of members' skills and perception of shared governance as formative constructs to assess the constructs' different dimensions. We measured the awareness of members' skills by the general skill level and the specific expertise to capture the competency and the complementarity of the skill structure in an FRSVT. The perception of shared governance covered both the governance rules of the focal task (i.e., playing the game) and other related activities such as contributing to the clan. Hence, these dimensions can appropriately and adequately capture these two constructs in the FRSVT context. With this study, we primarily sought to identify the technology-enabled antecedents of task cohesion in FRSVTs. However, a person may also become aware of other members' skills from non-technology related sources, such as word-of-mouth or personal experience. Therefore, we specified "platform-supported mechanisms" in the survey to minimize the possibility of respondents relating their beliefs with other sources. This specification is in line with a principle of reducing common method bias; that is, the development of clear, concise, and specific items to measure target constructs (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003).

We also rephrased some of the adapted original items to reflect the specificity of the proposed constructs and to fit the current research model and the online gaming context. The sources based on which task cohesion can be measured are limited (e.g., Carless & De Paola, 2000). Hence, we operationalized this construct by adapting measures for both task and general team cohesion (i.e., Carless & De Paola, 2000; Kidwell et al., 1997). For instance, some of the original sample items for task cohesion include "our team members have conflicting aspirations of the team's performance", "our team is united in trying to reach its goals for performance", and "I'm unhappy with my team's level of commitment to the task". We restated these items to emphasize task collaboration and members' common goal. In addition, we deleted representations irrelevant to online gaming. We adapted the items related to satisfaction with members and propensity to reunite with team members from previous studies that developed relevant measurements (e.g., Bone & Ellen, 1992; De Wulf et al., 2001), and we modified them to reflect the current context.

We conducted an unlabeled and a labeled sorting session by recruiting postgraduate information systems students (eight per session) to enhance conceptual validity. We modified some items slightly to address the concerns raised by these "judges". For example, we changed reversed items, such as those reflecting the construct of task cohesion, to positive representations because they were prone to misinterpretation. Moreover, two senior managers of the gaming platform reviewed the completed survey forms to ensure face validity. Table 2 presents the items and sources for each construct. We measured each question on a seven-point Likert scale (strongly disagree to strongly agree) unless otherwise specified.

4. Data Analysis and Results

Table 3 summarizes the demographic information for our study. We mainly tested our hypotheses through structural equation modeling (SEM) because we can allocate different weights to the indicators on the construct estimate (Chin, Marcolin, & Newsted, 2003). We used partial list squares (PLS) of smartPLS version 2.0.M3 for several reasons: first, PLS maximizes the variances described for all endogenous constructs in the model; hence, it suitably predicts the relationships among latent variables or research in the early stages of theory development. Second, PLS is based on several ordinary least squares (OLS) regressions and does not necessitate the normal distribution of independent constructs or their interval scaling. Third, PLS is suitable for analyzing models with a mix of formative and reflective constructs (Wetzels, Odekerken-Schröder, & Van Oppen, 2009). Given that this research is prediction oriented (i.e., identifying the technology-enabled factors of task cohesion in the context of FRSVT), performance construct is at a non-interval scale, and the two independent variables are formative, PLS is appropriate for the objectives of this study and preferable to other covariance-based SEM techniques that are often used to confirm theory and require normally distributed and interval-scaled constructs. Furthermore, we analyzed the effect of task cohesion on performance by applying logistics regression in PASW 17.0 because we operationalized performance as a binary variable. As we mention previously, we collected data from individual members who belonged to different FRSVTs. Therefore, we maintained the basic assumption of independent observations when testing the model.

Table 3. Demographic Information

Variables	Category	Frequency (n = 367)	Percent
Gender	Female	22	6.0%
	Male	345	94.0%
Age	19 and below	221	60.2%
	20-24	131	35.7%
	25-29	14	3.8%
	30 and above	1	0.3%
Education	High school and below	167	45.5%
	Junior college or pre-university	75	20.4%
	Polytechnic	7	1.9%
	Diploma	38	10.4%
	Bachelor	63	17.2%
	Masters	15	4.1%
	Doctorate	1	0.3%
	Post doctorate	1	0.3%
Annual personal income (in Singapore Dollar)	≤S$12,000	289	78.7%
	S$12,001-S$24,000	47	12.8%
	S$24,001-S$48,000	12	3.3%
	S$48,001-S$60000	12	3.3%
	S$60,001-S$72,000	3	0.8%
	≥S$72,001	4	1.1%

Tables 4 and 5 list the descriptive statistics and the intercorrelations of the constructs, respectively. The mean value was relatively low for the construct awareness of members' skills, which we can attribute to three factors. First, some of the skills required for multiplayer online games are rather implicit and complex (e.g., the ability to maneuver game characters using a keyboard or the strategically collecting and allocating multiple resources). Hence, they can be difficult to observe comprehensively. Second, the presentation of different types of skill information tends to be scattered in online gaming platforms. As a result, members need to check multiple webpages to obtain all information on other members. Third, the time most FRSVT members have to look up the skill information of other members can be limited. Therefore, the complexity and multidimensionality of the skills involved in multiplayer online games and the dispersed mechanisms of skill display hinder individuals' awareness of others' skills. Nonetheless, the standard deviation of this construct was relatively high, which indicates that respondents displayed varying efforts to obtain members' skill information. By contrast, the mean value of perception of shared governance was relatively high (mean = 4.955). We ascribe this difference to the fact that individuals could obtain shared governance information from other members' clan pages, on which governance rules were listed completely in a single page. As a result, understanding shared governance in full was relatively easy.

Table 4. Descriptive Statistics of Variables (Latent Variable Scores)

Studied variable	Mean	Std dev
Awareness of members' skills (*latent variable score*)	3.050	2.528
Perception of shared governance (*latent variable score*)	4.955	1.430
Perceived task cohesion	4.748	1.243
Member satisfaction with team members	4.895	1.289
Propensity to reunite with team members	4.514	1.781

Table 5. Intercorrelations among Variables (Latent Variable Scores)

	1	2	3	4	5	6	7	8	9
Awareness of members' skills (1)	1								
Perception of shared governance (2)	0.048	1							
Perceived task cohesion (3)	0.146	0.376	0.803*						
Satisfaction with team members (4)	0.190	0.375	0.530	0.843*					
Propensity to reunite with team members (5)	0.206	0.346	0.510	0.548	0.926*				
Age (6)	-0.019	-0.113	-0.110	-0.037	0.026	1			
Income (7)	-0.017	-0.041	-0.072	0.034	0.013	0.195	1		
Education (8)	0.013	-0.031	-0.068	-0.041	0.019	0.552	0.253	1	
Team size (9)	0.041	0.030	0.063	0.037	0.072	-0.025	0.003	0.028	1

*Values in the diagonal are the square roots of the AVE measures for the constructs

4.1. Assessment of the Measurement Model

We verified the validity of reflective multiple-item constructs by assessing their reliability, convergent validity, and discriminant validity. We evaluated reliability based on item reliability and Cronbach's alpha. We assessed convergent validity according to the composite reliability of constructs and on the readings of average variance extracted (AVE). The levels of the AVE results are acceptable when they are 0.5 and above (Hair, Anderson, Tatham, & Black, 1998). Constructs are deemed highly reliable if they have Cronbach's alpha and composite reliability values greater than 0.707 (Nunnally, 1978). Table 6 shows that all scores met these criteria. We evaluated discriminant validity based on cross loadings and construct correlation. Furthermore, Table 7 indicates that all three constructs were correctly loaded into different factors. Subsequently, we assessed whether the square root of the AVE value of a construct was greater than those of its correlations with other constructs. Table 6 suggests that all constructs satisfy the AVE criterion. Therefore, our constructs displayed good discriminant validity.

Table 6. Assessment of Convergent Validity

Dimensions	Item reliability	Cronbach's alpha	Composite reliability	AVE
Perceived task cohesion		0.725	0.845	0.645
Item 1	0.775			
Item 2	0.822			
Item 3	0.812			
Member satisfaction with team members		0.798	0.881	0.711
Item 1	0.841			
Item 2	0.849			
Item 3	0.840			
Propensity to reunite with team members		0.917	0.948	0.858
Item 1	0.930			
Item 2	0.945			
Item 3	0.904			

Table 7. Results of Discriminant Validity

Items	Components		
	1	2	3
Perceived task cohesion 1	**0.775**	0.401	0.379
Perceived task cohesion 2	**0.822**	0.401	0.406
Perceived task cohesion 3	**0.812**	0.481	0.444
Member satisfaction with team members 1	0.478	**0.841**	0.530
Member satisfaction with team members 2	0.414	**0.849**	0.408
Member satisfaction with team members 3	0.454	**0.840**	0.454
Propensity to reunite with team members1	0.484	0.560	**0.930**
Propensity to reunite with team members2	0.486	0.506	**0.945**
Propensity to reunite with team members3	0.450	0.471	**0.904**

We validated the formative constructs (i.e., awareness of members' skills and perception of shared governance) by assessing their variance inflation factors (VIFs), weights, and loadings (Cenfetelli & Bassellier, 2009; Petter, Straub, & Rai, 2007). Table 8 shows that all VIF statistics did not exceed 10. Negative and positive weights co-occurred for two indicators of awareness of members' skills, which indicates that the relative contribution of specialized expertise was lower than skill level (Cenfetelli & Bassellier, 2009). We then verified the absolute importance of these two indicators according to loadings and the conceptual overlap between them. The elimination of an indicator should be based on the conceptual overlap (Cenfetelli & Bassellier, 2009); therefore, we retained the items associated with specialized expertise because skill level and expertise are conceptually different.

Table 8. Assessment of Formative Constructs

Dimension	VIF	Weights	T-value	Loadings
Awareness of members' skills (1)				
Skills 1	1.603	1.015	3.613**	1.000
Skills 2	1.603	-0.025	0.063	0.596
Perception of shared governance (2)				
Governance 1	1.399	0.674	5.589**	0.920
Governance 2	1.400	0.463	3.440**	0.821
* 5% level of significance; ** 1% level of significance				

4.2. Assessing the Structural Model

We examined the structural model by assessing the explanatory power (R2) and significance of paths through PLS and logistic regression. We generated 500 random samples by using a bootstrapping procedure to assess the importance of path coefficients with a sample size of 367, with the exception of the path between task cohesion and performance. All statistical tests were assessed at a 5 percent level of significance with two-tailed t-tests. Figure 2 and Table 9 present the data analysis results, and all six hypotheses were supported. Specifically, awareness of members' skills and perception of the shared governance by members were positively related to a member's perception of FRSVT task cohesion (i.e., H1 and H2 were supported). Moreover, perceived team task cohesion was positively related to both team performance and member satisfaction (i.e., H3 and H4 were supported). Team performance and member satisfaction were also positively related to the propensity to reunite with team members (i.e., H5 and H6 were supported).

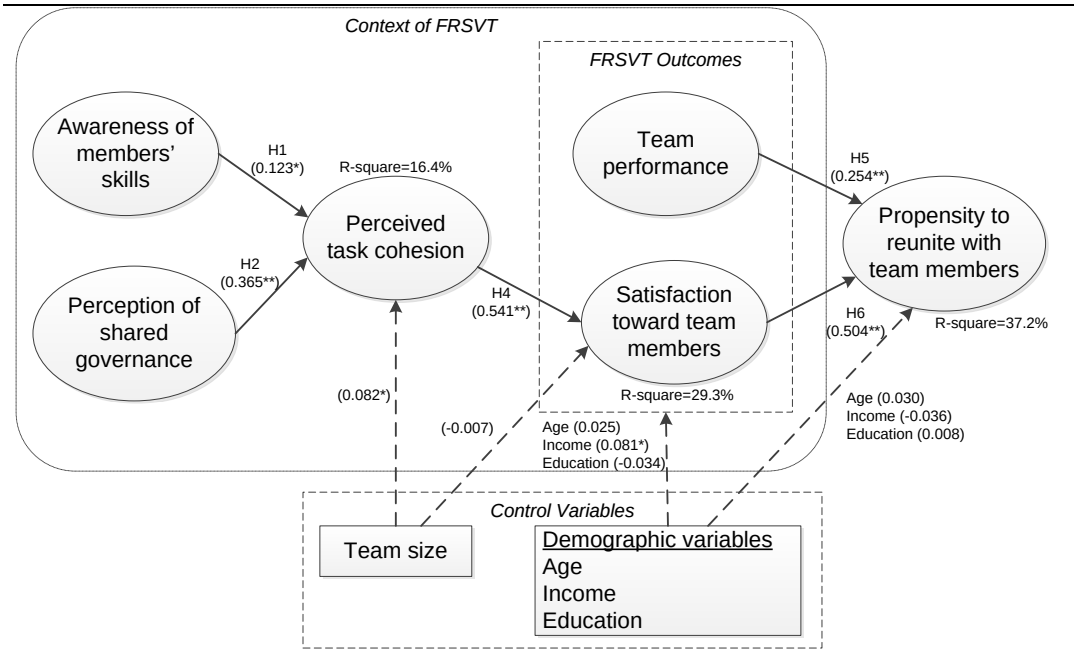

Figure 2. Data Analysis Results in PLS(* 5% level of significance; ** 1% level of significance)

Table 9. Results of Data Analysis in Logistic Regression (n = 367)

Hypothesis (team performance as dependent variable)	Path coefficient (Wald)	Hypothesis Test
Perceived task cohesion	0.440 (17.909)**	H3 was supported
Team size	0.092 (1.283)	
Nagelkerke R^2	8.5%	

* 5% level of significance; ** 1% level of significance

We performed two multiple regressions in SPSS to further assess the relative importance of predictors for perceived task cohesion and for propensity to reunion. We found perception of shared governance (standardized coefficient = 0.370, semipartial correlation^2 = 0.136) to be more important than awareness of members' skills (standardized coefficient = 0.106, semipartial correlation^2 = 0.011) when predicting the perceived task cohesion. Satisfaction toward team members (standardized coefficient = 0.508, semipartial correlation^2 = 0.246) was more important than team performance (standardized coefficient=0.239, semipartial correlation^2 = 0.054) in predicting the propensity to reunite with team members.

Team performance and satisfaction were associated with different scales (i.e., binary vs. continuous); thus, we conducted two sets of tests to assess the eligibility of task cohesion as the mediator 1) between two technology-enabled factors and team performance (in SPSS) and 2) between two technology-enabled factors and satisfaction (in smartPLS). For each test set, we first linked two independent variables directly to the two dependent variables (step 1) and then to task cohesion (step 2). Finally, we linked both independent variables and task cohesion to the dependent variable (step 3). We considered relevant control variables in the mediation tests.

The results in Table 10 and Table 11 show that two independent variables were significantly related to member satisfaction but not to team performance in step 1. In step 2, both independent variables were significantly related to task cohesion. In step 3, the two independent variables and task cohesion were significantly related to member satisfaction alone. Therefore, task cohesion partially

mediated the relationships between independent variables and satisfaction but not those between independent variables and team performance.

Table 10. Results of the Mediation Test in PLS(Satisfaction)

Step (technique)	Relationship	Path coefficient
Step 1 (PLS)	Awareness of members' skills →satisfaction	0.178**
	Perception of shared governance →satisfaction	0.378**
	Team size →satisfaction	0.019
	Age →satisfaction	0.038
	Income →satisfaction	0.055
	Education →satisfaction	-0.075
Step 2 (PLS)	Awareness of members' skills →task cohesion	0.123*
	Perception of shared governance →task cohesion	0.367**
	Team size →task cohesion	0.083*
Step 3 (PLS)	Awareness of members' skills →satisfaction	0.123**
	Perception of shared governance →satisfaction	0.214**
	Task cohesion → satisfaction	0.446**
	Team size →satisfaction	-0.015
	Age →satisfaction	0.050
	Income →satisfaction	0.079*
	Education →satisfaction	-0.054

* 5% level of significance; ** 1% level of significance

Table 11. Results of the Mediation Test in Regression (Team Performance)

Step (technique)	Relationship	Path coefficient
Step 1 (logistic Regression)	Awareness of members' skills →team performance	0.080
	Perception of shared governance →team performance	0.002
	Team size →team performance	0.092
Step 2 (linear Regression)	Awareness of members' skills →task cohesion	0.051*
	Perception of shared governance →task cohesion	0.316**
	Team size →task cohesion	0.018
Step 3 (logistic Regression)	Awareness of members' skills →performance	0.056
	Perception of shared governance →performance	-0.171
	Task cohesion →performance	0.511**
	Team size →performance	0.098

* 5% level of significance; ** 1% level of significance

An important assumption in our study is the limited prior interaction between members of many FRSVTs. To verify this assumption, we conducted a post hoc analysis on the platform from which we collected our survey data. We randomly selected 100 members and tracked their games and their team members according to user IDs over a one-week period with the platform operator's facilitation. In total, we captured a total of 1,657 games with 13,053 members. On average, a player participated in approximately 16 games per week. The average number of team members was 7.9 in each game. The probability of a player collaborating with a teammate for two games was only 5.6 percent and the probability for three games or more was only 1.8%. These low rates serve as a proxy measure for participants' limited prior interaction in FRSVTs.

Common method bias can pose a problem for our study because we collected data from a single source (Podsakoff et al., 2003). Thus, we conducted two statistical tests to assess the extent of this potential bias. First, we examined the constructs through Harman's one-factor test (Podsakoff& Organ,

1986). Results indicate the presence of five factors and that the highest covariance associated with a factor was 19.9%, which suggests that common method effects were unlikely to affect the results adversely. Second, following the specifically designed method to examine common method variance for PLS analysis (Liang, Saraf, Hu, & Xue, 2007), we included a common method factor whose indicators included all of the indicators of the constructs. We calculated the variances of each indicator, which were substantively explained by the principal construct and by the method factor. The findings demonstrate that the average substantively explained indicator variance was 0.754 whereas the average method-based variance was 0.006. Furthermore, all method factor loadings were insignificant. Hence, we believe that our results are free from common method bias.

5. Discussion of Results

This study an early one to examine an important and parsimonious set of factors that can enhance perceived task cohesion in an FRSVT and can be facilitated by the technological mechanisms provided by online platforms. The results from analyzing our individual-level data support all six hypotheses at a 5% level of significance.

As we hypothesized, we found that an individual member's awareness of members' skills and the member's perception of shared governance were positively related to perceived task cohesion (H1 and H2 were supported). Perception of shared governance influenced task cohesion more strongly than awareness of members' skills in terms of standardized coefficients and squared semipartial correlation. This result implies that team members' conforming to common governance rules can more effectively enhance an FRSVT member's perceived task cohesion than does that member's awareness of other members' skills or expertise. Task cohesion was also positively related to FRSVT performance and satisfaction with other members (hence, H3 and H4 were supported).

For awareness of members' skill, the weight of specialized expertise was not significant. A plausible explanation could be that, in a short time, players of FRSVTs may care more about overt indicators that can directly affect the task such as skill level in this case. However, FRSVT players may not have sufficient time to deliberate on areas of expertise (i.e., whether the expertise of a potential member can serve to complement the expertise of other team members).

Perceived task cohesion had a much stronger explanatory power for satisfaction with other members (R^2 = 29.3%) than for team performance (Nagelkerke R^2 = 8.5%). Previous studies have also reported a low R^2 with respect to the effect of team cohesion on team performance (van Vianen et al., 2001). This finding may be attributed to the fact that, in a competition-based gaming context wherein team performance is determined by wins or losses, the success of one round of a game can also be affected by non-team related factors. These factors can include the opposing team's expertise and luck. Similarly, performance can be affected by external assistance or time allocation in a general team setting, which complicates the factors in team success (Ericksen & Dyer 2004).

As we hypothesized, team performance and member satisfaction were positively related with propensity to reunite with team members (hence, H5 and H6 were supported). Nonetheless, satisfaction influenced individuals' propensity to reunite with team members more strongly than performance. This difference suggests that satisfaction with other team members can be more important than the performance of a task to induce FRSVT members' reunion. Given that the reunion is less likely to occur in the context of FRSVT, this result highlights potential factors facilitating the conversion from FRSVTs into relatively stable spontaneous virtual teams.

The mediation test reveals different roles of task cohesion in the relationship between its two antecedents and FRSVT outcomes. Specifically, two antecedents can enhance member satisfaction both directly and indirectly via establishing task cohesion (i.e., task cohesion partially mediated the effects of two antecedents on member satisfaction). However, these two antecedents did not influence team performance even though they significantly affected task cohesion. This variation may be related to the different natures of surface- and deep-level factors. Previous studies suggest that overt information on team members such as individual demographics can be considered as surface-level factors. The effects of these factors attenuate over time as the team progresses. In contrast, deep-level factors unfold gradually during team development (e.g., individual personality) (Harrison et

al., 1998, 2002). With the facilitation of technological platforms, we can classify awareness of members' skills and perception of shared governance in FRSVTs as surface-level factors and task cohesion as a deep-level factor because it is developed during collaboration. In line with prior literature, a deep-level factor influenced the team performance and member satisfaction. By contrast, the effects of the surface-level factors (i.e., awareness of members' skills and perception of shared governance) only affected members' satisfaction with other members in the FRSVT.

6. Limitations and Future Research

This study has some limitations. First, we collected our data in a single FRSVT context (namely, online gaming). Prior studies suggest some linkages between gaming and organizations. For instance, some skills developed in online gaming collaboration such as teamwork spirit are similar to those applied in organizational contexts (Wasko, Teigland, Leidner, & Jarvenpaa, 2011). Furthermore, playing online games can develop positive personality traits that are appreciated in the workplace, such as openness, conscientiousness, and extraversion (Teng, 2008). While our interview data also reveal the need for member information in both online gaming and organizational contexts, we recognized several differences (e.g., demographic information) in these two contexts (see a summary in Appendix A). Future research can validate our findings in other contexts such as the context where team performance is measured as a continuum rather than as a dichotomy (i.e., winning or losing a game). Moreover, it would be interesting to validate our research model for agile activities in crowdsourcing or for employee-driven team innovations in organizations.

Second, our research methodology did not enable us to establish a temporal precedence although the theoretical development argues for the causal nature of relationships presented in the research model (Stewart & Gosain, 2006). We suggest that future researchers can resolve this problem by collecting data from different stages of task processing for FRSVTs.

Third, we focused on individual-level perceptions because we aimed to recognize the important role of an individual member in the success of an FRSVT. In line with this principle, we collected data from members who belonged to different teams. It would be interesting for future researchers to scrutinize the different responses in a team and apply multilevel analysis when observations are not completely independent.

Finally, we did not measure the previous collaboration experience of each respondent and task duration based on the nature of FRSVT: many players tend to cooperate with different players in short game sessions. Future studies can explore these factors by distinguishing members in terms of their history or experience of previous collaborations and/or duration of a task.

7. Implications for Theory

Notwithstanding the limitations that provide opportunities for future research, this study contributes theoretically to the fields of FRSVTs, the TSMM, and VTs in general. First, this study is the first to fill the void of theory-based VT research in the emergent FRSVT area to the best of our knowledge (Schiller & Mandviwalla, 2007). Given the diverse issues and the lack of a dominant theory in VT research, researchers have called for research that can theoretically appropriate and develop specific VT types (Powell, Piccoli, & Ives, 2004; Schiller & Mandviwalla, 2007). Responding to this call, we identify the TSMM as our theoretical foundation because of its close fit with the FRSVT context (such as the high demand for other members' information because of the lack of prior collaboration and formal leaders). Drawing on the TSMM, we establish the key constructs in FRSVT success theoretically (e.g., awareness of a member's skills, perception of shared governance and task cohesion). Furthermore, this study contribute to FRSVT literature by examining the key dimensions of team dynamics from the viewpoint of individual members (Martins, Gilson, & Maynard, 2004). Given the prominent role played by individual members in FRSVTs, our findings show that individual-level factors can influence one's perception of task cohesion and subsequent FRSVTs outcomes. With respect to the TSMM literature, this study contributes by operationalizing two high-level structures (i.e., knowledge and belief structures) into two concrete, technology-enabled facilitative constructs (i.e., awareness of members' skills and perception of shared governance).

Second, our findings may contribute to the literature on general VTs. The spontaneous and rapid response characteristics of FRSVTs may serve as an example for the initial development of general VTs (e.g., enforcing task cohesion in a short period of time). While prior research mainly focuses on a relatively long period of team building (e.g., Majchrzak et al., 2005), our results may be useful for the forms of VTs that require quick and high-quality outputs during the early stages of formation (e.g., Piccoli& Ives, 2003; Tan, Teo, & Wei, 1995). We also considered the propensity of a member to collaborate with present FRSVT members, and, thereby, we link FRSVTs with general VTs.

Third, in this study, we specifically focus on how individual members use these mechanisms instead of their availability or presence in the online platform per se. The proposed theoretical model reveals the effects of exploiting technology mechanisms by an FRSVT member on collaboration and team outcomes. If unused, the benefits of this technology are not optimized. Furthermore, the focus on mechanism use limits the constraints on specific platform configurations. Our findings (i.e., enhancing the awareness of members with respect to others' skills and shared governance) can act as the underlying theoretical principles based on which effective technological mechanisms can be designed for FRSVTs to facilitate team members' actions and decision making in volatile and quick-functioning VTs.

Fourth, we compare and discuss the different roles of members' perception of task cohesion in the relationship between the two antecedents (awareness of members' skills and perception of shared governance) and team outcomes. Task cohesion perception partially mediated the relationship between these antecedents and member satisfaction, but we did not observe this effect in the relationship between the antecedents and team performance. By defining the two antecedent factors as surface-level factors (Harrison et al., 1998, 2002), we suggest that their effects on objective team outcomes (e.g., performance) could be more limited than those of subjective team outcomes (e.g., satisfaction). This finding sheds light on a nuanced perspective of how the perceptions established via technological platforms can affect team outcomes in different ways and, thus, enriches our understanding of the theoretical roles of these factors in FRSVT development.

8. Implications for Practice

8.1. Implications for FRSVTs in Social Settings

This study offers important practical implications for FRSVT community practitioners and FRSVT members in social settings. Participants in social FRSVTs tend to have diversified backgrounds. It is also typically difficult for the platform in question to acquire or publicize a comprehensive set of personal information due to privacy concerns. Under such circumstances, this study offers suggestions to help FRSVT community practitioners build technological mechanisms to facilitate favorable FRSVT outcomes. First, we demonstrate that the awareness of members' skills and the perception of shared governance can facilitate successful FRSVT outcomes. To this end, FRSVT community practitioners can build mechanisms to acquire such information through participators' prior experience on the platform. For instance, one could develop a skill-profiling support mechanism that records and displays general skill levels and/or areas of expertise. FRSVT members should be encouraged to proactively discover and use the mechanisms to obtain information related to other members' skills and to governance rules. If FRSVT members are unable to retrieve appropriate information quickly, FRSVT community practitioners should assist them to better use the mechanisms in place to do so. For instance, shared governance rules among potential candidates can be listed automatically and presented to an individual when the individual searches for other members with whom to form an FRSVT.

Second, our results demonstrate that team performance and one's satisfaction with other members are important predictors of that individual's propensity to reunite with those other members. Hence, one can design a system to record prior performance and collect member feedback upon the completion of each task to facilitate future reunions. When an individual initiates a new task, the system can then filter the information and provide the initiator with a list of potential team members who have satisfactory past collaboration experiences. Over time, FRSVTs may, therefore, evolve into relatively stable memberships with satisfactory effectiveness and efficiency, which is currently difficult to achieve because most members lack the channels or support to reunite teams in emerging online platforms.

8.2. Implications for FRSVTs in Organizational Settings

This study focuses on the social setting of FRSVTs; nonetheless, the findings may also offer some implications for FRSVT success in organizations. First, the importance of individual members in FRSVT success highlights the significance of collecting information, evaluating it, making decisions based on it, and the actions of individual FRSVT members rather than leaders as emphasized in conventional work teams. To encourage the practice of FRSVTs, organizational management should empower the grass-root level employees to initiate the FRSVTs and cultivate the autonomous culture.

Second, organizational management can leverage existing enterprise systems to better support FRSVTs. Compared with community practitioners in the social setting, companies have more information of employees and more resources in facilitating the FRSVTs. Given the importance of obtaining members' skills, companies can develop or enhance electronic expertise repository systems to record multi-faceted nature of members' skills. Moreover, with the identified antecedents of reunion propensity, the repository system can also capture historic records of their past project performance, peer comments, or recommendations on collaboration. The integration and filtering of such information are important to simplify member access to multiple information sources. Business intelligence techniques can be applied in this field to facilitate awareness of the information. For instance, if an initiator from a sales department seeks a marketing expert with whom to form an FRSVT, a well-integrated system can provide multiple categories of information on the candidates based on the key requirements of the expert. The system may even provide recommendations according to the overall evaluation of stated information. These functions can raise team members' awareness of comprehensive information on other members' skills and on their shared rules of governance to effectively identify the most appropriate members.

Third, organizations can use the setting of FRSVTs in the gaming context in employee training. Large companies have adopted game-based training as an intriguing and effective way to transfer knowledge to employees. Organizations that intend to foster FRSVTs can design specific games and support mechanisms to provide a simulation environment in which employees can develop skills in fast and effective team collaboration.

9. Conclusion

FRSVTs are rapidly gaining importance and recognition. However, the emergence of FRSVTs with little prior interaction among members raises questions regarding their effectiveness (Friedkin, 2004). Thus, this study provides a nuanced theoretical understanding of how technology-enabled factors can reduce team members' information deficiency, enhance their ability to predict others' behaviors, and improve cohesive task collaboration. In this way, satisfactory FRSVT outcomes can be achieved.

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Appendix

Appendix A-1. Comparison of Key Influential Factors in FRSVTs in Three Contexts

	The present study (online gaming)	Social context (e.g., crowdsourcing)	Organizational context
Demographics	Usually teenagers, but can also be adults Lower education levels and social status	Professionals or amateurs Higher education levels and social status	Mainly grass-root level employees Higher education levels and social status
Leader	No formally assigned leaders Team members typically decide independently to join an FRSVT A leader may emerge during collaboration	No formally assigned leaders, but they usually have initiators Team members typically decide independently to join an FRSVT Initiators or other members may become leaders during collaboration	No formally assigned leaders, but they usually have initiators Initiators may screen other members' profiles prior to team formation; regular members may also decide independently to join an FRSVT Initiators or other members may become leaders during collaboration
Technology	Online gaming mechanisms	Online communities (e.g., crowdsourcing platforms)	Internal organizational systems (e.g., knowledge management systems)
Members' Skills	The general gaming levels and specific expertise of members (e.g., weapons/maps)	The general skill levels and specific expertise of members (e.g., graphics or programming)	The general skill levels and specific expertise of members (e.g., database or web design)
Governance	Members can be subjected to rules set by their respective clans	Members can be subjected to rules set by the respective online communities	Members can be subjected to rules/norms set by respective departments
Task cohesion	Shared commitment to an online gaming task	Shared commitment to a social task	Shared commitment to an organizational task
Performance	Winning or losing a game	Number of downloads/votes gained; winning a crowdsourcing project	Effectiveness, efficiency, and new product/patent development
Other team outcomes	Satisfaction with team members and members' propensity to reunite with one another		

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