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ABSTRACT

The emergence of online tools supporting collaboration has allowed more people to work together online. Virtual team members are expected to collaborate in order to solve predefined problems. Several factors influence a virtual team member intention to collaborate. In this paper, a conceptual model and a measurement scale are derived from previous literature on online collaboration and virtual teams and have been pretested to refine the derived scale items. The scale under development makes important contributions to both research and practice. For research, it will provide a validated scale to measure intention to collaborate, which will support further research in this field. For practice, it will help identify what contributes to a team member's intention to collaborate; this can assist practitioners in establishing virtual teams within their organizations.

Keywords

Online Collaboration, Virtual Teams, Conceptual Model, Measurement Scale.

INTRODUCTION

Globalization along with continuous improvement in information and communication technologies has led more professionals to work together online. Nowadays, more organizations are virtual and inter-organizational collaboration is crucial to rapid response in an environment where few products are fully produced and distributed by a single organization (Zwass, 2003). The Internet is evolving into a platform for collaboration, sharing, innovation and user-created content (Lai and Turban, 2008). The Internet also offers a platform for innovation in the way organizations arrange their business processes, address their marketplaces, and partner with other enterprises (Zwass, 2003). Web2.0 and the variety of tools it provides have led to the emergent of new kinds of services such as social networks, aggregation services, and replicate office-style software in browser. These tools provide means for organizations to establish teams based on required expertise regardless of physical place. Literature on inter-organizational systems argues the role of information technology in enabling the transition from inter-firm competition to cooperation (Kumar and Dissel, 1996).

This study investigates the factors which influence a virtual team member intention to collaborate. Prior research on online collaboration has focused on finding new constructs that contribute to online collaboration; whereas, this study improves our understanding of how different factors combine to influence an individual's intention to collaborate. The foundation of this approach is based in the Socio-technical theory and the Theory of Reasoned Action.

THEORETICAL FOUNDATION

Virtual Teams

Virtual teams are groups of geographically, organizationally and/or time dispersed workers brought together by information and communication technologies to accomplish one or more organizational tasks (Powel, Piccoli, and Ives, 2004). Virtual teams exist according to identification to an idea or task rather than place, they are organized around an activity, and formed as need arises (Squire and Johnson, 2000).

The imperative for moving from traditional face-to-face teams to distributed teams derives primarily from five specific factors; the increasing prevalence of flat organizational structures, the emergence of environments that require inter-organizational cooperation as well as competition, changes in workers' expectations of organizational participation, a continued shift from production to service/knowledge work environments, and the increasing globalization of trade and

corporate activity (Townsend, DeMarie, and Hendrickson,1998). The increasing prevalence of accomplishing collaborative work online makes the study of such practices important (Kurduvalli and Faraj, 2008).

Traditionally, virtual teams have been established based on a need to gather necessary expertise to solve complex problems. Recently more organizations and professionals are establishing virtual teams to work on everyday tasks and many organizations are allowing their employees to work remotely from their homes, which is described by Griffith et al. (2003) as the degree of "virtualness". Furthermore, as companies increasingly specialize, and as information technologies make inter-organization coordination increasingly feasible and cost-effective. This allows processes in corporate value chains to be outsourced to their most efficient sources regardless of physical boundaries (Zwass, 2003).

Moving to virtual teams has an impact on organizational structure. The literature reports that virtual teams create forms that are more reconfigurable, flexible (DeSanctis and Monge, 1999), and require mass collaboration (Zammuto et al. 2007). Challenges to virtual team work reported in the literature include time difficulties, feedback delays, misinterpretation, cultural barriers (Jarvenpaa and Leidner, 1998; Powell et al, 2004), scheduling, lack of communication, cognitive overload, and delayed responses (Fussell et al. 1998). These challenges can threaten the success of virtual team efforts because even when resources are available, they cannot be leveraged for knowledgeable outcomes (Kudravalli and Faraj, 2008). We argue that virtual teams can only thrive if individual team members can overcome these challenges and manage to work in a coordinated effort to solve problems together. This suggests the need for an improved understanding of how to create virtual teams that work effectively.

Online Collaboration

Collaboration has been successfully accomplished in face-to-face-teams. However, the change from a physical to a virtual work space brings changes to how professionals collaborate within the same team. The technological infrastructure necessary to support virtual teams is now available, further research on the range of issues surrounding virtual teams is required to understand how to manage them effectively (Powell et al, 2004). Durate and Snyder (2006) discuss seven types of virtual teams, they argue that all of them have in common that team members must communicate and collaborate to get work done. Evidence in the literature suggests that when virtual teams are given sufficient time to develop strong intergroup relationships and to adapt to the communication medium, they may communicate as effectively as face-to-face groups (Warkentin, Sayeed, and Hightower, 1997).

Henttonen and Blomqvist (2005) argue that interest in virtual team collaboration has been mainly technological and the social side has been under-researched. On an organizational level Kumar and Dissel (1996) argue that three arguments are needed to explain collaboration in an inter-organizational system, economic, technical, and socio-political. Taylor (1975) argues that the social system is not a friendship system, but rather the coordinating and integrating buffer between the technical transformation process and the demands and constraints of a turbulent environment. The importance of both technology usage and social relationships to a virtual team success is consistent with the Socio-Technical theory which states that an organizational work system is made up of two jointly independent, but correlative interacting systems; the social and the technical. The technical system is concerned with the processes, tasks, and technology needed to transform inputs into outputs. While the social system is concerned with the attributes of people, the relationships among people, reward systems, and authority structures. Thus, any design of a work system must consider both systems in an integrated form (Bostrom and Heinen, 1977).

Collaboration and cooperation are sometimes used as synonymous terms; however, many scholars consider them to be distinctive constructs. In cooperation, partners split work, solve sub-tasks individually and independently, and then assemble partial results into the final output. In collaboration, partners do the work in a coordinated effort to solve a problem together (Dillenbourg, 1999). Previous studies have investigated why virtual team members share their knowledge especially outside the organization boundaries (Bechky, 2003, Wasko and Faraj, 2005). However, collaboration goes beyond sharing information or knowledge in a forum or a wiki, it's about working together in a coordinated effort through continuous discussion and communication in order to solve a problem. Kudaravalli and Faraj (2008) argue that collaborating online has received limited attention in the research on new organizational forms enabled by IT.

MODEL DEVELOPMENT AND PROPOSITIONS

Model Development

The first step in creating a conceptual model of online collaboration is a thorough investigation of the literature on virtual teams, collaboration, and surrounding research areas. While there is a considerable volume of research that investigates online collaboration, much of it has focused on finding new constructs that contribute to online collaboration as opposed to

understanding how different factors combine to influence an individual's intention to collaborate. For example, Hall and Graham (2004) examined motivation to participate in virtual teams and found that in order to motivate active participation online incentives offered should match the values of the group in question. Another study investigating why people contribute their knowledge online argues that people contribute their knowledge when they perceive that it enhances their professional reputations, when they have the experience to share, and when they are structurally embedded in the network (Wasko and Faraj, 2005).

Several studies have examined the importance of coordination on virtual team performance. These studies have found that communication and coordination are essential to the performance of virtual teams (Fussell et al., 1998; Van der Hoek et al., 2004; Kanawattanachai and Yoo 2007; Holton, 2001; Beers et al., 2005; Leinonen et.al. 2005). Hemetsberger and Reinhardt (2009) argue that online cooperation is not just a matter of task coordination but rather a question of overcoming tensions that derive from the alignment of strategic activity and individual action within a highly dispersed group. Other studies have found factors that contribute to effective collaboration including initiating dialogue and sustaining dialogue as well as participant diversity (Kudaravalli and Faraj, 2008). Other factors reported in the literature include meeting face-to-face (Holton, 2001) and appropriate IT support (Beers et al. 2005; Desanctis et al. 2003).

Investigation of the literature on virtual teams, collaboration, and surrounding research areas revealed eleven factors that could influence virtual team members' intention to collaborate. These factors are background similarities, communication, coordination, level of expertise, incentives, IT support, meet in person, openness, social exchange, tension, and voluntariness.

These eleven factors can be organized into three categories, factors which are antecedents of intention to collaborate, factors which are outcomes of collaboration, and factors which moderate collaboration. Antecedents are factors which an organization can manipulate when establishing the make-up of a virtual team and which also can potentially contribute to an individual's willingness to collaborate. The moderating factors are environmental factors that support collaboration but which are not specific to the virtual team context. Finally, outcome factors are those factors that describe the way collaboration and interaction actually occurs within a virtual team. Table1 presents a mapping of online collaboration factors into antecedents, moderators, and outcomes.

Building upon this discussion, a research model depicting the constructs and relationships examined in this study is depicted in Figure1. In the model, six antecedent factors identified in prior literature influence a virtual team member's intention to collaborate online. Intention is relevant for this model because without intent, actual collaboration will not occur. This is consistent with the theory of reasoned action (TRA) which states that a person's action is a function of his intention (Fishbein and Ajzen's, 1975). As such "intention" is seen as the primary driver of actual collaboration online. The relationship between intention to collaborate and collaboration is moderated by the ability to meet in person and the availability of IT support. The remainder of this paper will focus on further understanding the relationship between these six factors and intention to collaborate. The study of actual collaboration is beyond the scope of this study.

Antecedents	Moderators	Outcomes
Perceived Background similarities	IT Support	Openness
Communication	Meet in person	Social exchange
Coordination	Tension	
Perceived Different level of expertise		
Perceived Incentives		
Perceived Voluntariness		

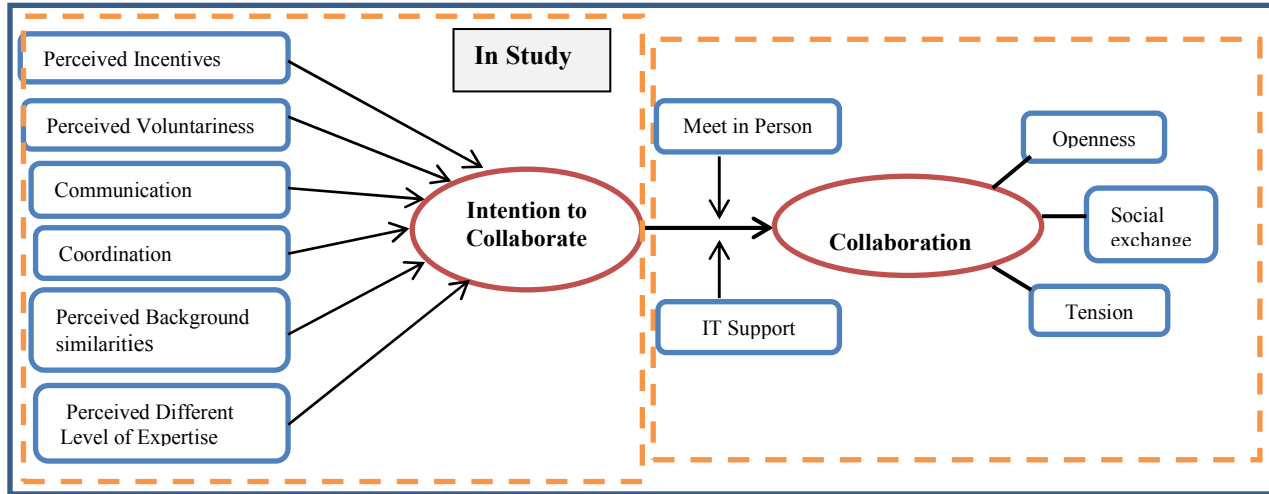**Table1. Mapping Online Collaboration Factors**

Figure1: Intention to Collaborate Online

Propositions

Organizations offer incentives to individuals in order to induce them to contribute activity, the incentive system may be regarded as the principal variable affecting organizational behavior (Clark and Wilson, 1961). Normally, there are incentives for a virtual team member to collaborate, some of which could be tangible (e.g. raise, promotion) while others could be intangible (e.g. reputation, recognition). Hertel et al. (2004) argue that rewards can support a good team spirit and foster team members' perception of responsibility and importance of their personal contribution for the team's success. Hall and Graham (2004) argue that offering reward of access to individual is important to attract people into joining online communities.

The literature on knowledge sharing has reported interesting findings regarding incentives. Bock et al. (2005) reported that organizations had implemented monetary incentives, points toward promotion, or both as extrinsic motivators for knowledge sharing. Hall and Graham (2004) reported that code breakers joined an online group to share knowledge and collaborate to break a code in the hope of winning an award. They also reported that some members were more interested in giving back to the community for their own personal satisfaction and enhanced reputation which are important motivational factors for those who wish to be appreciated. This is consistent with the findings of Wasko and Faraj (2005) who argue that online group members contribute their knowledge when they perceive that it enhances their professional reputations.

Social exchange theory posits that individuals engage in social interaction based on an expectation that it will lead in some way to social rewards such as approval, status, and respect (Blau, 1964). People tend to act so as to maximize reward and minimize cost over time (Emerson, 1976). Homans (1974) argues that the more often an action of a person is rewarded, the more likely the person to perform that action. Based on the preceding discussion, we argue that incentives could have a positive influence on a virtual team member intention to collaborate.

Proposition1: A virtual team member's intention to collaborate is positively related to perceived incentives offered for collaboration.

Professionals join online communities voluntarily based on shared interest. However, organizations normally mandate team collaboration to solve problems. Voluntariness may be viewed as a form of social influence through compliance processes (Karahanna et al., 1999). Durate and Snyder (2006) argue that teams became virtual without a choice of their members. Collaboration refers to voluntary cooperation and voluntariness could affect collaboration practices in virtual teams (Kudaravalli and Faraj, 2008), mainly because individuals function most effectively when they are guiding their own behavior (Eisenberger and Cameron, 1996). Roberts and Bradley (1991) argue that voluntary membership is a principal element of collaboration.

Perceived voluntariness could be a determinant of usage behavior (Moore and Benbasat, 1991) and it could play a significant role in acceptance behavior in current use and future use intentions (Agarwal and Prasad, 1997). The Unified Theory of Acceptance and Use of Technology (UTAUT) model posits that voluntariness has a moderating effect on factors affecting

behavioral intention and use behavior (Venkatesh et al. 2003). Therefore, we argue that perceived voluntariness of online collaboration is posited to have a positive influence on a virtual team member's intention to collaborate

Proposition2: A virtual team member's intention to collaborate is positively related to the perceived voluntariness of the collaboration.

Virtual teams represent new ways of organizing collaboration across the boundaries of organizations. It allows members to bring different skills, experience, and backgrounds to the team to help solve problems (Wasko and Faraj, 2005). A key concept in this form of team work is that the sum of the community knowledge is greater than sum of individual participant knowledge (Johnson, 2001). For this sort of knowledge sharing to occur, it requires creating shared meaning and a commitment to a culture of collaboration (Holton, 2001).

Crossing geographical boundaries affects the ways in which virtual teams communicate and collaborate (Durate and Snyder, 2006). In the absence of face-to-face interaction, developing common ground and shared understanding in technology mediated communication can be challenging. The productivity of collaboration is threatened by a lack of common ground among team members (Beers et al. 2005; Leinonen et al. 2005). Furthermore, computer-mediated communications filter out rich social and relational cues among team members (Sproull and Kiesler, 1986), which can inhibit the creation of common ground.

The failure to establish common ground or mutual knowledge has shown to lead to failures of information exchange, failures of interpretation, and incorrect attribution, thus creating roadblocks to effective collaboration (Cramton, 2001). For virtual teams to collaborate they need an open communication that allows them to reflect on problems, conceptualize new ideas, present different perspectives of the problem, point out flaws, disagree, and defend their own ideas in a constant process of idea generation and reviewing (Hemetsberger and Reinhardt, 2009).

This suggests that open communication that leads to establishing mutual understanding and common ground is crucial for a virtual team member's intention to collaborate.

Proposition3: A virtual team member's intention to collaborate is positively related to open communication and the establishment of common ground.

Organizations are facing highly volatile environments often characterized by dynamism and discontinuous change (Faraj and Xiao, 2006). Coordinating activities in group work is already difficult for collocated teams and is even more challenging for virtual teams (Fussell et al. 1998). When collaborating in traditional face-to-face settings, conversations play an important role in coordinating activities (Kudaravalli and Faraj, 2008). However, in virtual team settings where members are geographically distributed and mediated by technology, coordination becomes more complex. Existing collaborative tools discretize time and tasks in concrete but isolate process steps (vander Hoek et al. 2004).

Collaborating partners do their work in a coordinated effort to solve a problem together (Dillenbourg, 1999). The importance of coordination is increasing as organizations become reliant on interdisciplinary teams of specialists and distributed operations (Faraj and Xiao, 2006). Prior research has found continuous coordination supported with appropriate tools and the information is essential for supporting collaborative work (van der Hoek et al. 2004).

Based on the preceding discussion we argue that coordinating tasks in virtual teams has a positive influence on a virtual team member's intention to collaborate.

Proposition4: A virtual team member's intention to collaborate is positively related to coordinating tasks across the team.

Transforming from traditional team work into virtual team work changes the way work is carried out which has an effect on the social aspects of team work. As members from different organizations join a virtual team, integration of work methods, organizational culture, technologies, and goals makes collaboration difficult (Durate and Snyder, 2006). Virtual team work requires a greater degree of autonomy as team members generally work in isolation from their organization's support structures (Bal and Foster, 2000). Differences in backgrounds and interests also can add problems and complications to virtual teams (Bechky 2003). The existence of different backgrounds among team members could affect the objectives, meeting behavior, reward structure and team member selection (Bal and Foster, 2000).

The social categorization or identity argument is that the more similar the group members are to one another in terms of certain characteristics, the more they identify with the group (Abrams et al. 2005). Increased identification leads to increased motivation to participate in the group to ensure its success, therefore, homogenous groups achieve better communication due to their shared characteristics (Kudaravalli and Faraj, 2008). This suggests that increased background similarities among virtual team members influence their intention to collaborate online.

Proposition5: A virtual team member's intention to collaborate is positively related to the perceived background similarities across the team.

Realistic problem-solving is often carried out in teams, in which different members bring different skills and experience to help solve problems (Johnson, 2001), Kurduvalli and Faraj (2008) argue that diversity of expertise and resources have an overall positive impact on knowledge when working online. Members benefit from network connections since they gain access to new information, expertise, and ideas not available locally, and can interact informally, free from the constraints of hierarchy and local rules (Wasko and Faraj, 2005).

The integration of expert users increases opportunities by enlarging the workforce. However, collaboration among people with such varying expertise requires a dynamic, open relationship between team members so that tasks can be more freely shared and collaborated on (Engeström, 2004).

Based on the preceding discussion we posit that having varying levels of expertise within a virtual team influence members' intention to collaborate online.

Proposition6: A virtual team member's intention to collaborate is positively related to the variance of expertise among members.

SCALE DEVELOPMENT

The methodology used to develop the scale in this research is based on procedures described in Moore and Benbasat (1991), and in MacKenzie et al. (2011). The first stage was to create a number of items for the scale, the initial items were adopted from the literature on collaboration, virtual teams, online communities, and knowledge contribution. Additional items were created through interviews and group discussions. An initial set of 65 items was developed in this stage.

The next stage was a pretest to refine the initial set of items in order to assess their content validity. In this stage a panel of seven expert judges was asked to sort the items into categories based on the similarities and differences among them. The judges were all PhD students with experience in virtual team work. They were given the set of items randomly distributed and the factors on which the items should be categorized. The judges were also asked to rank order the items within each factor based on the closeness in meaning with the factor itself.

The card sort analysis revealed a confusion caused by the "Different Level of Expertise" items. All judges misplaced some of this factor's items within other factors. Specifically, the judges reported that this factor could easily be confused with "Background Similarities" suggesting that these two factors might actually be part of the same underlying construct. As this overlap between constructs represents a threat to the validity of the model, the "Different Levels of Expertise" factor was eliminated from the proposed model.

Post card sorting interviews were conducted with the judges to further refine and improve the items. These interviews resulted in rewording some items to improve their clarity and dropping the items that the judges felt did not adequately represent the underlying construct they were measuring. This process resulted in a refined scale containing 33 scale items in Table2.

Factor	Item
Background Similarities	The background of my online team members does not influence my intention to collaborate with them
	I'm more likely to collaborate online with members with whom I share a similar culture
	I'm more likely to collaborate online with individuals with whom I share similar background
	My intention to collaborate online is positively affected by the diversity of my team members' background and expertise
	Having team members of different backgrounds makes me less likely to collaborate online
	I tend to collaborate online with team members that have different backgrounds than mine

Communication	I'm more likely to collaborate online when the team reaches common ground from the beginning
	Reaching a common ground has nothing to do with my intention to collaborate online
	Collaborating online requires me to engage in continuous communication with other team members to reach common ground
	I collaborate online even when my team members and I do not fully share the same vision of the problem we are trying to solve.
	Mutual understanding is essential for me to collaborate online
	It is not essential to have a mutual understanding with other team members for me to collaborate online
	For me to collaborate online, the team should share a common understanding of problems to be addressed.
Coordination	Coordinating activities among team members makes me more willing to collaborate online
	I find it difficult to collaborate online when tasks are coordinated among members
	I collaborate online even when nobody is coordinating team activities
	It's hard for me to collaborate online having a team leader coordinating the activities
	I collaborate online when tasks are properly coordinated
	I'm more likely to collaborate online when I choose the task to work on.
Incentives	I collaborate with my online team members regardless of any incentives
	I expect to be rewarded by my organization or team supervisor when I collaborate online.
	I expect something in return when I collaborate with team members online
	I collaborate with others online to improves my image within the team
	I only collaborate online when there are incentives for my collaboration
	I'm less likely to collaborate online without getting something in return
	Collaborating online enhances my professional reputation
Voluntariness	I only collaborate with online team members when I'm asked to
	I'm more likely to collaborate online when I voluntarily join the team
	I collaborate with other team members online even when not mandated by my organization
	I'm less Likely to collaborate with other team members online when I'm forced to do so
	Mandating online collaboration makes me less willing to collaborate with team members
	Mandating online collaboration makes me more willing to collaborate with team members
	I'm more likely to collaborate online when I choose to join a team

Table2: Items for intention to online Collaboration Scale

CONCLUSION

Virtual team members are expected to collaborate online to solve problems. This study intended to investigate the factors which influence a virtual team member intention to collaborate online. The outcomes of this study were a theoretical model for online collaboration and a measurement scale to test this model, the measurement scale was pretested and refined through a card sort exercise.

Future research will focus on validating the proposed model and measurement scale. We shall conduct a study to validate the model and further refine the scale. In addition, a confirmatory study shall be conducted to examine the validity and generalizability of the proposed model.

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