Comparing Global Versus Domestic Project Network Facilitation in Virtual Workspaces

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ABSTRACT

One of the most compelling reasons to examine the globalization of the engineering and construction industry relates to the business opportunities it brings; yet global collaboration also creates distinctive challenges especially in the early stages that firms must overcome. Overcoming these collaboration challenges in a virtual environment may require different approaches for global virtual project networks (GVPNs) as compared to domestic virtual project networks (DVPNs) to achieve performance objectives. In this paper, we examine facilitation, a boundary spanning collaboration technique that may have unique requirements in GVPNs. We observed two DVPNs and two GVPNs working in a virtual workspace called the CyberGRID and studied the interactions between network members to examine whether significant differences exist in the utilization of facilitation in the initial stages of collaboration and we found that facilitators were utilized more frequently in GVPNs. This finding has important implications for the efficient functioning of the increasingly common global project networks in the construction industry that utilize virtual collaboration techniques.

INTRODUCTION

The construction industry is undergoing a phenomenal transformation. According to Accenture’s construction industry report the most important trend that is transforming the construction marketplace is accelerated globalization (Colella 2012). In the highly competitive global market, construction companies must respond quickly and effectively to changing customer demand. The expectations of the customers have also been reaching higher levels; they are looking for lower cost and higher quality services. In order to survive in this highly competitive environment, companies are sharing risk by collaborating with complementary partners by forming joint ventures (Barkema et al. 1997) or outsourcing the services and design work to countries with lower wages such as India and China (Lewin and Furlong 2005).

In order to meet the demands of the fast-paced, dynamic global economy organizations change their structure from a traditional to a networked structure (Limerick and Cunnignton 1993). The changing market conditions are prompting the formation of Global Project Networks (GPNs). GPNs are comprised of highly dispersed project teams that collaborate over geographical, temporal and cultural boundaries. One of the drivers for the change from a traditional to a networked
structure is the introduction of information and communication technologies that have made it easier to collaborate across boundaries (Maznevski and Chudoba 2000). Increasingly, GPNs work remotely by utilizing advanced technology, which leads to the formation of Global Virtual Project Networks (GVPNs). In this paper, we examine different collaboration approaches developed in GVPNs through the scheduling and 4D modeling of a construction project and compare them with Domestic Virtual Project Networks (DVPNs). We aim to develop a more robust understanding of the GVPNs that carry out global construction projects.

BACKGROUND

Features of global virtual project networks

As collaborative tools evolve and knowledge transfer becomes easier, virtual collaboration is increasingly being utilized in the construction industry. Using virtual environments, organizations are able to respond faster to increased competition, and provide greater flexibility to individuals working from various locations (Bell and Kozlowski 2002). While virtual teams provide a great deal of flexibility, the cultural and linguistic diversity among team members can have both advantages and disadvantages (Adler, 2008). According to DiStefano and Maznevski (2000), there are three different types of global teams; the destroyers, the equalizers and the creators. Among them, only the creators value the diversity and perform at high levels since the differences among team members are explicitly recognized and accepted, and their implications are incorporated into every facet of the process, which is also known as Mapping, Bridging and Integrating (MBI) model (DiStefano and Maznevski 2000). In the mapping stage, team members learn to understand their differences. In the bridging stage, they communicate and take their differences into account. In the integrating stage, they integrate ideas by monitoring participants, solving disagreements and creating new perspectives (DiStefano and Maznevski 2000). In short, cultural diversity in global business has the potential to promote creativity and the capability for problem solving (Latimer 1998). Latimer suggests that increased diversity among members leads to: 1) lower levels of risk aversion, 2) better decision-making and problem-solving capability since different perspectives brought to bear on any problem lead to the generation of alternatives, and 3) higher levels of critical analysis of those alternatives and all these factors result in higher-quality decisions (Latimer 1998).

However, not all multicultural groups belong to the “creators” class of global teams. There are also other types of global teams that do not value diversity; “destroyers” consider differences as a handicap and “equalizers” suppress differences in ideas and perspectives (DiStefano and Maznevski 2000). In unsuccessful multicultural groups, miscommunication, lack of trust, and within-culture conversations (Adler 2008) may create challenges that can be barriers to meeting project objectives. On the other hand, it has been found that after only a few collaborative projects, as multicultural project network members become accustomed to collaborating and develop strategies to overcome the initial liabilities due to cultural and linguistic barriers, global project networks start to benefit from the diversity and can potentially perform better than domestic project networks (Comu et
GVPNs may require additional support to overcome initial difficulties and to thus fully benefit from the diversity.

Facilitating virtual project networks

Facilitation is one way of supporting GVPNs that has been shown to enable more efficient collaboration. According to Bostrom and colleagues (1993, pg:147), “facilitation is a set of functions or activities carried out before, during, and after a meeting to help the group achieve its outcomes easily and efficiently.” In this sense, facilitation can help GVPNs to overcome technological problems and develop appropriate norms of technology use (Comu et al. 2013). In addition to their role in supporting the effective use of technology in GVPNs, facilitators also have a role in helping networks to leverage the benefits of cultural diversity in their project outcomes by managing human and social processes across cultures (Pauleen and Yoong, 2001). Returning to DiStefano and Maznevski’s (2000) MBI model, in a complex virtual collaboration context, facilitators can help network members become “creators.” In other words, facilitators can assist the GVPN members to go through each stage of the model. Given that the main role of facilitators is to support work processes in the virtual environment, they are well-positioned to help the network members create common ground for communication, encourage and manage participation, use the tools that support collaboration, and help to resolve disagreements, each of which can help to develop a network of “creators”.

Given the fact that GVPNs and DVPNs have different dynamics due to the impact of cultural and linguistic diversity, we expect there to be differences in their collaboration approaches, particularly in how they interact with facilitators. In this paper, we aim to identify whether such a difference in approaches exists in order to improve our understanding of the way global project networks collaborate in a virtual workspace.

RESEARCH METHODOLOGY

Hypothesis development

The collaborative efforts of team members in GVPNs are likely to result in enhanced creativity, an increased number of innovative ideas, and culturally representative solutions (Zakaria et al. 2004), which make them distinctive from DVPNs. However, restricted communication opportunities in virtual settings might prevent the benefits of diversity from being fully realized but instead increase misunderstandings and conflicts (Hertel et al. 2005) in the initial stages of collaboration (Comu et al 2011). In order to overcome these drawbacks and leverage the advantages of diversity, GVPN members are likely to need more assistance compared to DVPNs in the initial stages. We anticipate then that facilitators will be more active in the early stages of interactions in GVPNs than in DVPNs in order to help the GVPN members to create common ground for communication, encourage and manage participation, use the tools that support collaboration, and help to resolve disagreements. Therefore, we pose the following hypothesis;
Hypothesis: More frequent interactions with facilitators occur in global virtual project networks compared to domestic virtual project networks in the early stages of collaboration.

Research Setting

By testing the above hypothesis, we aim to develop an understanding of the way GVPNs collaborate differently than DVPNs in terms of utilizing facilitators in the virtual setting. In order to test this hypothesis, we observed and recorded interactions among two global and two domestic engineering project networks collaborating in a virtual workspace over a two-month period. We focused our investigation on differences in the collaboration approaches by examining interactions that included facilitators. Both the GVPNs and DVPNs were comprised of teams of graduate students from Columbia University and the University of Washington in Seattle who were studying civil engineering, construction management or architecture. Many of the students had industry experience.

In the GVPNs, all students were from different countries, and did not share the same native language, which ensured and controlled for cultural and linguistic diversity in the global network. The DVPNs were comprised of only students from the U.S. and all were native English speakers. Columbia University students were asked to develop a schedule model utilizing Simvision. Students from the University of Washington were asked to develop 4D models using Navisworks. The 4D modeling process required that they merge a 3D model provided by the supervising faculty with the schedule model developed by the Columbia University students. Because the Columbia University and the University of Washington teams were each responsible for one component of an interdependent task, we consider our research setting to simulate an inter-organizational project network. Each networked university team contained two students and each network was comprised of two teams (one from each university). Also a research assistant who was trained to provide technological and process support for the students facilitated each network. Knowing that facilitators who engage in content interactions have an adverse impact on project performance (Comu et al. 2013), facilitators were instructed not to get involved in any content related discussions. In other words research assistants were solely dedicated to a facilitation role; they provided technology support, encouraged participation and helped resolving disagreements but they did not perform any other role related to project content such as project management during virtual collaboration.

Data collection and preparation

Data collection started in February 2011 and ended in April 2011. During that period, students met in a virtual workspace called the CyberGRID (Cyber-enabled Global Research Infrastructure for Design) (Iorio et al. 2010), once a week for a two and one-half hour period. All meetings were recorded by an automated system. In order to quantify the recorded data, we coded the speaker and addressee for each meeting. With this, we could identify the cases that involved interactions with facilitators.

The CyberGRID was built with affordances designed specifically to support the work of geographically distributed engineers and architects with virtual suite of
collaboration and research tools based in Unity. The CyberGRID contains a number of communicative and collaborative features. Voice and text chat were integrated to provide synchronous communication for the virtual project networks. Additionally, document sharing and message board functionalities were integrated to facilitate collaboration on the complex project models. More importantly, the CyberGRID provides boundary spanning technologies including spatial visualization to achieve effective and clear communication. These spatial visualization technologies include: 1) an integrated 3D model that students can walk through with their avatars, and 2) a shared visualization space called the Team Wall on which they can project the models they are designing.

During the first two meetings, students were given the opportunity to get to know each other. They also received training in the use of the CyberGRID’s virtual interactional affordances, reviewed the objectives of each team and the overall work flow for the project. Students were also provided with project guidelines from their instructors during a simulated client meeting that took place in the CyberGRID. During the following four weeks, the participants were expected to complete both models and perform interventions to improve the models. More explicitly, in the schedule modeling week, Columbia University students developed a preliminary a Simvision model, which is a two-dimensional work activity. During the following week, the University of Washington students developed a preliminary 4D model, which constitutes a spatially rich task. During the two intervention weeks that followed, both teams collaborated on an optimized 4D and schedule model in order to achieve higher project quality. After finalizing the schedule and 4D models, the networks were expected to complete a written report and prepare an oral presentation of their project results. We focused our analysis on data from the schedule modeling, 4D modeling, and intervention tasks, which required integration of the schedule and 4D modeling tasks. In total we coded 18,680 interactions for the two GVPNs (10,526 interactions) and the two DVPNs (8,154 interactions).

**FINDINGS**

In order to test the hypothesis, we calculated the percentage of interactions that involved facilitators. We also calculated the average percentages of facilitation usage and statistically examined the difference between the two study groups, represented in Table 1. In the collected data set, we found that the mean percentage of interactions involving facilitators in GVPNs is greater than that in DVPNs. We found the difference in the frequency of facilitation involvement to be significant with a p value of 0.019. Therefore, we reject the null hypothesis and find that GVPNs refer to technology facilitators more frequently compared to DVPNs. Thus, our hypothesis is supported.
Table 1. Percentage of Interactions that Involve Facilitation.

<table>
<thead>
<tr>
<th></th>
<th>GVPN-1</th>
<th>GVPN-2</th>
<th>DVPN-1</th>
<th>DVPN-2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scheduling</td>
<td>14.45%</td>
<td>9.12%</td>
<td>N/A*</td>
<td>0.75%</td>
</tr>
<tr>
<td>4D Modeling</td>
<td>8.54%</td>
<td>N/A*</td>
<td>1.55%</td>
<td>0.48%</td>
</tr>
<tr>
<td>First Intervention</td>
<td>5.32%</td>
<td>4.97%</td>
<td>2.18%</td>
<td>0.11%</td>
</tr>
<tr>
<td>Second Intervention</td>
<td>2.17%</td>
<td>12.67%</td>
<td>5.39%</td>
<td>3.31%</td>
</tr>
</tbody>
</table>

*Data is not available due to a temporary malfunctioning of the recording system.

DISCUSSION

In this study, we aimed to identify whether any difference exists in the collaboration approaches of GVPNs versus DVPNs. To be able to quantify the impact of cultural diversity in the virtual collaboration setting, we analyzed the difference in the use of facilitation in both GVPNs and DVPNs. To this end, we calculated the proportion of interactions that involved facilitators and demonstrated that the facilitators were interactional participants in GVPNs significantly more often than they were in DVPNs.

In Figure 1, the ratio of utilizing facilitation in DVPNs slightly increases over the first three weeks. A shift in this pattern is observed in the last week of modeling when the networks were finalizing their tasks. Yet, the greatest amount of facilitation that DVPNs exhibit is still less than the lowest level of facilitation usage by GVPNs over the four-week task execution periods studied. The difference in the proportional use of facilitators between GVPNs and DVPNs is particularly high in the initial stage of collaboration, but we observe a decline in the following weeks. This corresponds to the theory of how culturally diverse teams develop collaborative norms, e.g., the “mapping” described in the MBI model (DiStefano and Maznevski 2000). When developing the MBI model in global teams, it is important to prepare grounds for communicating and managing participation throughout the process and finally helping to resolve any disagreements that arise. In short, leveraging the benefits of diversity is not straightforward and may require additional support such as improving
cross-cultural communication skills and having team building trainings, particularly in the initial stages, which we observe as a relatively high proportion of interactions with facilitators in the GVPNs during the first 3 weeks of their collaborative work. Similarly, Pauleen and Yoong, (2001) also demonstrated the additional role that facilitators have in multicultural teams in helping them to benefit from diversity. Therefore, the decline in the use of facilitation corresponds to the GVPNs’ need for more support during the mapping and bridging phases as compared to the integration phase.

Moreover, excessive interaction with facilitators at the beginning of the collaboration is also consistent with the initial performance liabilities identified by Comu et al. (2011). The dual impact of cultural and linguistic diversity shows that the negative impact of diversity is greater at the early stages of the collaboration (Comu et al. 2011). As the global project participants continue to work together, they gain competency and are able to establish the MBI model; thereby they begin to benefit from diversity. During this initial stage when they struggle to manage diversity, their performance level is lower. Consequently, it is rational that project participants would refer to facilitators more frequently to get support during the initial stage of their collaboration. Facilitators can help network members to create common ground for communication, encourage and manage participation and help to resolve disagreements arising from diversity.

LIMITATIONS AND FUTURE RESEARCH

In this research, we utilized graduate students as subjects in lieu of having participants from industry. Whether students are the appropriate representative of the studied research group or not has been a question of debate for some time. Researchers examined this phenomenon from various disciplines and many studies report that there is a remarkable degree of similarities between the results of students and non-student data sets (Höst et al., 2000, Liyanarachchi and Milne 2005, Svahnberg et al. 2008, Tih et al., 2008). Moreover, according to Dobbins and colleagues (1988), laboratory experimentation provides a method to rigorously test theoretical predictions and provides an insight of organizational practices, therefore using students as the experimental surrogates has important theoretical contributions. However, replicating this experiment with industry representatives can be a future research topic in order to empirically validate that using students to represent GVPNs is appropriate.

Another important limitation of this research is related to the experimental setting. The network sizes were quite small, which prevented us from running sophisticated social network analyses that provide a better understanding of dependent relation among the network actors. Instead of having a network composed of two teams, a future study may involve more teams and more students. This way, advanced methods of social network analysis can be utilized to develop a deeper understanding of network relations in GVPNs.

Another way of supporting GVPNs is through effective utilization of boundary spanning visualization technologies. The development of information technologies in the construction industry has enabled GVPNs to effectively store, display and exchange project data efficiently. GVPNs display and transfer project
information through boundary spanning visualization technologies in virtual workspaces. By using these technologies that enable synchronized collaboration, network participants can transfer project data despite the physical boundaries between them. Moreover, according to Koutsabasis et al. (2012), visualization technologies provide an effective communication environment, and by effectively utilizing boundary spanning visualization technologies, network participants can overcome linguistic and cultural boundaries. Consequently, boundary spanning visualization technologies are key elements that may also facilitate collaboration among diverse project network members. In future research, an important role that boundary spanning visualization technologies may play in allowing GVPNs to leverage the benefits of their diversity and overcome the communication difficulties can be examined.

CONCLUSION
In order to create a competitive advantage in the global construction market, many organizations are forming GVPNs to respond faster to changing market demand and to have greater flexibility. However, collaborating through advanced communication technologies over many boundaries is extremely challenging. Moreover, cultural and linguistic diversity among GVPN members might cause variances in collaboration approaches. For this reason, GVPNs should be supported to overcome these challenges. In this study, we identified a significant difference in the collaboration approaches of DVPNs and GVPNs. Facilitators were utilized more frequently in GVPNs, particularly in the early stages of collaboration. This finding is also coherent with the additional role that facilitators have in multicultural teams in helping them to overcome the initial performance liabilities and benefit from diversity. Consequently, in order to achieve a well-functioning and effective GVPN, network members must be provided not only with collaboration technology, but also with support for the effective use of the technology and in managing group diversity.

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REFERENCES


