Global Construction Project Management: A Model for Virtual Teams

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Introduction

Global construction projects utilize international resources to minimize cost and risk, and to maximize knowledge transfer. Such projects generally take advantage of partnering arrangements, competitive design, manufacturing and supply chain locations, and of local firms that can bridge cultural and governmental barriers. This diversity of culture, knowledge, and location offers very strong benefits, and very large challenges. Some of the challenges faced include virtual teams, complex contract structures, complex supply chain issues, cultural and governmental hurdles, and economic considerations such as exchange rates. Our paper will focus on virtual teams, within the context of these benefits and challenges.

The objective of our paper will be to consolidate the theory and practice on virtual teams from the perspective of the global construction industry. Our objective will be to describe a procurement structure for a theoretical project, the communications channels, some of the available software, and the principles of leadership for virtual teams. We will also outline some of the metrics that are possible to determine the efficacy of virtual teams, from our experience, and will suggest some new measurements that can be applied in the future.

This paper will provide a review of the research on virtual teams, and on their use in the construction industry, utilizing research from the Project Management industry for virtual teams, for it is more robust at this time. We will then compare this theory with actual practice on a number of large global projects.

Having provided a backdrop of theory and past practice, we will propose a model for building, leading, and controlling effective virtual teams on global construction projects. We also plan to identify some of the software systems that are currently being used to support virtual teams.

Virtual Teams

Virtual teams are commonplace in the international construction industry, and indeed in most global businesses. Increasing competitive pressures and the drive to meet higher and higher profit targets have forced a new paradigm to emerge in business. Companies have been forced to downsize their core staff, and utilize outside consultants and

Table 2. Overall Statistics from Industry Study on Current and Future of Virtual Team Technologies

Question focus	Options	Answer percentage
Current use of virtual technologies	Integral part of all projects	13
	Use on some projects	39
	Use of first projects	3
	Testing	19
	Not using	26
Part of the project currently using VT	Predesign	31
	Design	36
	Construction	22
	Start-up	11
Five-year projected use of VT	Decrease	0
	Marginal increase	7
	Considerable increase	35
	Routine business	58

companies for the pockets of expertise that they need. Few firms today maintain all of the skills sets necessary to conduct business in the diversity of the global marketplace. The internet has helped to internationalize the distribution of work, and the virtual workforce is a reality. The construction industry has a long history of performing projects in locations remote from the design and procurement expertise that resides in home offices, or what we call the center-of-gravity. Chinowsky (Chinowsky 1998) provided a summary table of the findings of a survey that had been conducted of 94 members of the Construction Industry Institutes' members. Table 2 shows that the majority of respondents see that virtual teams will be routine business within 5 years (that was in 1998), or forecast by 2003.

The internet has opened the way for a number of blessings for the industry, and a number of challenges. The blessings are that the industry is under increasing economic and competitive pressure to make use of new technologies, and to innovate.

Schwen (Schwen and Hara 2003) provides a solid review of the research on the design of virtual CoP's and summarizes by saying that *we believe that community of practice is not likely to be forced, but is emerging, and designers need to be aware of the characteristics of existing communities of practice*. Schwen goes on to state *that Communities of practice are about content—about learning as a living experience of negotiating meaning—not about form,* and *Workers in a CoP are responding to their work environment by sharing stories, problematizing work-related issues, and actively constructing their knowing processes*.

According to Koh (Koh and Kim 2003) the sense of community springs from membership, influence (people influence other members of their community), and immersion (people feel the state of flow during virtual community work). McMillan (McMillan 1996) re-visited his original work performed in 1986 and stated that the research showed that spirit of belonging together, an authority structure that can be trusted, mutual benefit from traded knowledge, and the art that comes from the shared experience defines a sense of community.

Chinowsky (Chinowsky 1998) reported on a study done by the Construction Industry Institute focusing on making virtual teams work in the engineering, procurement, and construction industry. The findings were that there are the following considerations for leadership in forming and keeping CoP's engaged:

1. Team issues
    - Virtual teaming requires initial face-to-face meetings.
    - Managers must visit remote participants during the course of the project.
    - Trust between team members is difficult to establish.
    - Virtual team leaders should be selected with an acknowledgment of the unique demands placed on distributed teams.
2. Process issues
    - The project objectives must be restated and reinforced frequently.
    - Conflicts must be addressed quickly.

- Discussions on decisions will be more difficult to contain.
- Expectations of each team member must be stated clearly.
- Team member workloads should be monitored to ensure that significant increases do not occur due to increased electronic communications.
- Regular training must occur equally for all members.

In their study of global virtual teams (Jarvenpaa 1998) Jarvenpaa found a number of compelling findings. First they found that the old adage of first impressions is the same in the virtual world as it is in the conventional workplace, and that trust is critical. The following is an excerpt quoted from Jarvenpaa for completeness:

> *For the manager of a virtual team, one of the factors that might contribute to smooth coordination early in the existence of the team is a clear definition of responsibilities, as a lack of clarity may lead to confusion, frustration, and disincentive. Particularly if the work is only part of the team members' organizational responsibilities, which is likely to be the case, providing guidelines on how often to communicate and, more importantly, inculcating a regular pattern of communication, will increase the predictability, and reduce the uncertainty, of the team's coordination. Furthermore, ensuring that the team members have a sense of complementary objectives and share in the overall aim of the team will help prevent the occurrence of desultory participation. Another critical factor will be the effective handling of conflict. One strategy is to address perceived discontent as early as noticed: emotions left unchecked in the virtual environment might erupt into sequences of negative comments which will be difficult to resolve asynchronously. Another strategy in handling conflict will be to address as much as possible only the concerned individual and to avoid copying the entire team to messages that might be best to address to a single individual where a potentially conflictual problem has arisen. Finally, not all individuals may be equally adept at handling the uncertainty and responsibilities inherent in virtual work. Managers should carefully choose individuals for virtual teamwork; such qualities as responsibility, dependability, independence, and self-sufficiency, while desirable even in face-to-face settings, are crucial to the viability of virtual teamwork.*
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> *For the participants on virtual teams, there are some observations derived from our study which may be relevant to practice. Although it is not necessarily critical to meet in person, it is critical to engage in an open and thoughtful exchange of messages at the beginning of the team's existence. Cavalier attitudes that the virtual environment is no more challenging than a face-to-face environment prove to have ephemeral effects on participant enthusiasm and, once difficulties arise, the team lacks a substantive foundation upon which to overcome the real challenges imposed by the virtual context. Participants should also have an awareness of the importance of their providing to the others timely and detailed accounts of the work they are doing. Likewise, participants must be aware of the need to provide thorough feedback on the contributions of the other members. Finally, participants should be aware that it is not the quantity, but the quality and predictability, of their communication that is most critical to the effective functioning of the team.*
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> *Finally, one might be surprised of the lack of cultural effects in the study. The insignificance of culture in predicting perceived levels of trust as well as the lack of individuating information exchange may be related to the fact that the respondents were of similar ages, functional backgrounds, and educational levels. Additionally, electronically facilitated communication may make cultural*

differences irrelevant: the lack of nonverbal cues eliminates evidence of cultural differences, such as variations in dressing, gesticulating, and greeting. Likewise, the written medium eliminates the effect of accents which would again reduce the saliency of differences in cultural background. In addition, because the asynchronous mode gives individuals more time to process messages and respond, there might be fewer language errors, particularly among nonnative speakers of the language being used by the group, which would in turn reduce the saliency of differences in cultural background. Hence, by making cultural differences less noticeable, electronic media may thereby increase the perceived similarity among members.

In summary, the results of the study suggest that in global virtual teams, trust might take on a form of swift trust with some variations. Trust might be imported, but is more likely created via a communication behavior established in the first few keystrokes. Communication that rallies around the project and tasks appears to be necessary to maintain trust. Social communication that complements rather than substitutes for task communication may strengthen trust. Finally, responding behaviors are as critical as initiating behaviors and members have to explicitly verbalize their commitment, excitement, and optimism.

Experience on international projects confirms that there are special considerations that are necessary for virtual teams to succeed, and especially for virtual CoP's. The following sections will address these considerations and some techniques for enhancing the effectiveness of virtual teams and CoP's.

Project Manger Considerations & Techniques

For purposes of this paper a team will be a group of people that are assigned to work together to achieve a common goal. Many of the considerations for virtual teams are the same as for conventional teams. Teams need to have a common goal, a clear understanding of their responsibilities, a sense of belonging, effective communications, and they need to be motivated by leadership. Teams must have a level of mutual trust to encourage the sharing of information without fear of reprisal or usurpation of power.

Teams can also evolve into effective CoP's. Members have the opportunity to work side by side in attacking a problem or completing a task. Through this process there is a perfect opportunity to learn a lot about one another: their work ethic, their social and religious beliefs, their personal characteristics, the way they process information, the way they handle pressure, the way they communicate, the knowledge they possess, and the trust that they command. In many ways teams resemble families and in many cultures the time spent with a team is greater that the time spent with a family each day. A new player on a soccer team will not have the same standing or understanding as a long-term member who has played with the team for years. The maturity of the relationships for long-term members would more closely resemble those of a CoP member.

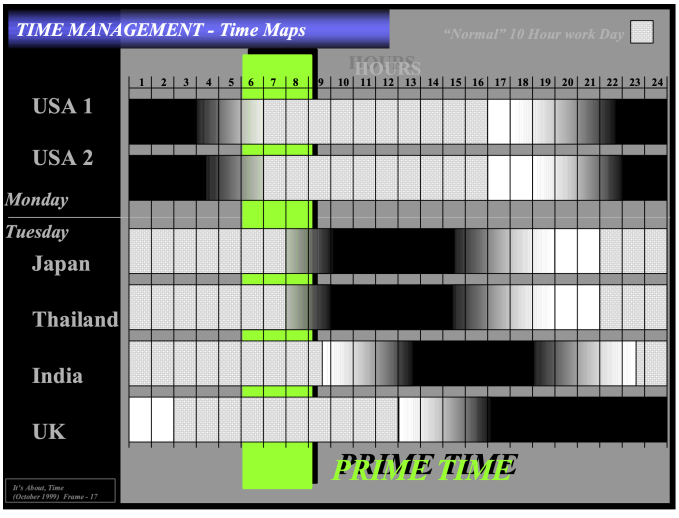
Teams are generally either discipline/process groupings, or geographical groupings. But they can have many other faces like teams of company-diverse or discipline/process diverse individuals that are combined to tackle a specific problem, or to address a multifaceted issue. As such the goals and objectives of the team can normally be well defined. Clear goals and objectives need to be established by the Project Manager when the team is initiated. This will avoid lost time, confusion, internal strife, and disunity in the team. In our experience teams that suffer from a lack of goals and objectives will either self destruct or will evolve into a desultory self absorption. Occasionally, experience shows that a leader will emerge in these conditions that will initiate the

formation of goals and objectives themselves. While this is encouraging on one level, the problem is that the goals and objectives thus established are frequently not those required, or desired.

A Project Manager should be mindful of the scope or duration associated with the goals and objectives. One team might be formed to complete the design and resolve electrical issues during a project, with another formed to correct a one-time problem where equipment has been damaged in shipping. The team with the longer contact time may well evolve into a CoP, and the relationships could endure past the project completion. This can be useful to the Company if a continuing relationship is in place. Experience has shown that short-term teams transform into a CoP due to the intensity and charged atmosphere that normally exists when critical issues are attacked by a team.

There needs to be a Trust Environment created by the Project Manager if virtual CoPs and virtual teams are to form and evolve. This means that the Project Manager must take the lead and demonstrate that she/he is trustworthy, dependable, honest, caring, and willing to share power. The citations confirm that trust is critical for all teams, but particularly for virtual teams. *Leadership inevitably requires using power to influence the thoughts and actions of other people* according to Zaleznik (Zaleznik 1998). Leadership characteristics consistently displayed by the Project Manager will create an environment in which people share stories about the Project Manager's actions and ideas, and encourages people to model their actions and thinking after those of the Project Manager. This personal willingness to emulate the Project Manager's attributes (trustworthy, dependable, honest, caring, and willing to share power) by the participants in the project is what we mean by a Trust Environment. It is the anchor for virtual teams.

The Project Manager assigns teams and should create the goals and objectives with the participation of the team members. At the same time the Project Manager should establish the expectations regarding the type and regularity of communications that are expected to inform on progress, problems, and for guidance if needed. In our experience it is extremely critical that the Project Manager not micro manage virtual teams, or conventional teams for that matter. This places an impossible burden upon the Project Manager to act as a traffic policeman for the team, and it undermines the Trust Environment foundation. Virtual teams must quickly create strong bonds, and interference in the communications between the members will quickly erode any chances of success.



The Project Manager must also facilitate the virtual teams and CoPs by providing the necessary tools. One of these is a Roster of participants, discussed earlier in this paper. The Roster provides contact information and brief biographies of the project participants, and should identify teams as they are formed. By adding the team identification, the Project Manager can aid in creating a feeling of membership, and perhaps a desire to become a member of a team for some. In addition to the Roster the Project Manager should also create what we call a time map (Grisham 2000) for the project which calibrates the virtual communities to work hours. The example shows when people are sleeping, waking, or at work so that synchronous communications (phone or internet

software enabling speech) can occur at mutually considerate times. The example is from a project in Thailand, with multiple countries and multiple virtual teams.

In addition to the Time Map, the Project Manager should also create a holiday map that considers the holidays for all of the cultures involved in the project. On a project in Saudi Arabia the weekend for the local population began at noon on Thursday, and lasted through Friday. The start of the work week was Saturday. In the UK and the USA, the work week ended on Friday and recommenced on Monday (officially). In Thailand and Japan, the workweek ended on Saturday, and there was no special attention devoted to Sunday. It is the responsibility of the Project Manager to establish guidelines for the project, and understanding of the work week is critical for virtual teams.

In selecting the team leader the Project Manager should exercise some care to choose people who are self-starters, who are comfortable with the technology, who have experience working virtually, who have understanding of different cultures, and who are pliable (open to new ideas, flexible, willing to share power, and display leadership traits). Clearly individuals with all of these characteristics may be hard to find, but a Project Manager can weigh these considerations when making a selection.

In addition to the above, the Project Manager must also show continuing interest in the functionality and progress of the virtual teams and CoPs. Periodic communications with the teams are highly recommended to demonstrate concern for the team and prove that they have unobstructed access if necessary. The Project Manager must not be perceived to be either intrusive or disinterested. The foundation of the virtual team and CoP, the goals and objectives of the virtual team, the identification of the participants, the timing of communication, and the expectations for reporting of progress must be constructed by the Project Manager.

Virtual Team and Virtual CoP Considerations

Many of the basic structural and communication issues for virtual teams and CoPs are similar, so we will discuss them in this paper together. The considerations for the virtual team will begin with the foundation considerations that are the responsibility of the Project Manager. Once the team leader is assigned, there are some initial steps that should be taken immediately.

The tasks for the team leader (for a CoP this person is selected by the group) should mirror those of the Project Manager. As Jarveenpa (Jarvenpaa 1998) found, establishment of the plans to meet the goals and objectives, and clearly defining the responsibility of each team member are the critical first steps. Jarveenpa also found that so called swift trust is an important ingredient for successful virtual teams - experience confirms this. This first work, when and how it is undertaken, and the initial perception of the team leader will shape the discourse and effectiveness of the team. Once the Project Manager creates a Trust Environment, then the team leader must mirror this philosophy in the first contact with the team.

The team leader must also quickly establish the type and timing for communications. Due to time differences, cultural differences, and business differences it is important to set regular contact intervals for the team. For example email contact will occur once each day, and phone/conference communications will occur once each week. This creates a habit for the team members. It also reduces the uncertainty associated with a lack of response to emails and phone calls. Knowing that the team will be reading the email daily gives some comfort and stability to the communications, and releases the team to concentrate on the content. The type of communications for virtual teams includes various mediums, including email as the primary mode, phone, fax, CoP

software, knowledge software, and conferencing software. The team leader must assure that everyone understands who needs to be included on the communications (matrix), how often, and the medium(s) to be utilized. Setting basic expectations for email communications can prove invaluable. A few rules from experience are (Grisham 1999):

- Provide an opening and closing. Think of an email as being a personal card that you are sending to another. Be polite, starting with their first or last name, and an honorific if suitable (Dear Dr. Smith, Dear Joe, James, etc.). For the closing think of using the closing for letters, like sincerely, yours truly, regards, cheers, ciao, etc. For both the opening and closing the formality should be adjusted to fit the respect and consideration you want to convey.
- Make the subject line descriptive. Confine the scope of the email to answering a question, posing a question, offering an opinion, requesting an opinion, etc. Don't try to solve the world's problems with a single email. The subject should inform what is in the message. Also, keep to one subject per email.
- Include contact information. Include your phone and fax numbers, location (country for example), company, and title for easy reference in the footer.
- Keep distribution to minimum. As the author of a first email try to think about who needs to know the information (from a communications matrix). When responding to emails we suggest reply to all, and only add people if really necessary. Copying too few people can result in the information not reaching those who may need it most, and copying too many can result in hurt feelings and a sense that the originator was attempting to withhold information. If there is a communication matrix, these problems can be avoided or blamed on the matrix.
- Keep the email short. When longer documents are necessary include them as attachments. We suggest no more than 2 paragraphs for an email. Do not include photos or graphic files in the text of emails, make them an attachment. Help people to respond quickly by making the message easy to read.
- Keep it simple. There are no "Booker Prizes" awarded for emails. Keep them in simple easy to understand English (or whatever language is the standard for the project). Avoid unusual vocabulary and structure, and use full sentences.
- Check Quality. Names and titles, correct phone numbers, dates, times, etc. should be proofed. Run a spell check on the message.
- Avoid long chain emails (e.g. Re: Re: Re: Re: New Project). It takes a lot of time to scroll through multiple responses for everyone. It can lead people to the feeling that they are being monitored and scrutinized, or it can create running dialogues that never find fruition.
- Stop and Think. There are three major problems that experience has shown on projects that use email heavily. The first is the SEND button. Recently a colleague sent an internal email, complaining in colorful language about a business partner, and one of the people receiving it accidentally forwarded it to the business partner. One way to avoid this is to keep a personal directory that segregates internal from external contacts. Or another possible option is the use of a graphic overlay on the SEND button warning about casual use, like the example.
- Timely response. Recently a colleague informed me, with a grin, that he had 1,900 unopened emails. In the age of quick communications, email must be answered promptly, like one would a phone call. The goal for a team should be to respond to every email each day. Priority email should be answered within one hour. The team leader sets the required metrics.
- Review. The team leader must review the email traffic for the first two weeks and provide guidance for the team as required. This will help to ensure that any conflicts are worked through immediately, and that the above guidelines are being followed. After this, periodic checks to see that the responses are timely and appropriate to the guidelines are strongly recommended.

Experience shows that an initial face-to-face meeting is recommended for virtual teams, and especially for virtual CoP's. This serves to emulate the benefits of co-located teams, and it provides a golden opportunity for the team or CoP to quickly learn about one another. An initial face-to-face meeting is also a perfect opportunity for the team or CoP leader to assess the interpersonal dynamics, locate potential interpersonal problems, train the team on the expectations, motivate the team to communicate regularly, underscore the goals and objectives of the team, and to define responsibilities. If the project is of adequate duration and size, periodic refresher meetings are also recommended throughout the course of the project. Often these can be combined with meetings for progress updates, reports, or technical meetings.

Practice

On a large power plant project in Thailand the authors were able to test the hypothesis and the techniques outlined in this paper. The project had teams in Thailand at different locations, a team in Japan, a team in Spain, a team in Romania, a team in the UK, teams in multiple locations in the USA, and suppliers in numerous other countries. The primary project teams were located in the USA, and the primary implementation team (lead by the two authors) was located in Thailand. The purchaser was performing the work, and the supplier team was a consortium of two firms that prepared the design, manufactured the equipment, delivered the equipment, supervised the installation, and the training.

In Thailand the purchaser team and the supplier teams were co-located at the project jobsite. As a result the issues of virtual teams were not an issue, and in fact CoP's did develop and produced innovation and tacit knowledge transfer as would be expected. Most of the virtual team interaction was restricted to intra-firm or intra-consortium communications.

As with most projects, and particularly international projects, the structure of the contracts in large measure dictate the communications that are permitted *(Grisham 2005)*. Most of the communications outbound from the project site pertained to status of equipment procurement or design, and most of the communications inbound pertained to requests for status of the work and the status of overall Customer satisfaction. There was no initial meeting on the project for the teams to meet one another, but there were meetings within each firm to review their responsibilities. Also, as the project progressed there were opportunities for members of the non-Thailand groups to visit the project site and meet their colleagues face-to-face.

The consortium firms used email heavily, but the Thailand firm did not. The consortium firms also made use of weekly conference calls to discuss the issues on the project. For purposes of this paper, we will only discuss those intra-firm communications for one of the consortium teams.

Our starting point was to take implied procedures from previous projects as a basis. In fact none of the suggestions described in this paper were being utilized by our firm when the project began. The first problem that we encountered was email addresses. Our firm was a global entity with offices in numerous locations worldwide, and numerous email servers and platforms. We also employed contract workers who had their own intra firm email addresses. The issue is not one of connectivity here, but rather the lack of a single database that can be accessed by all members of the firm. A further complication occurred when the team members were reassigned to other projects and new team members were assigned to our project. The lesson learned was that we needed to

produce and keep updated an accurate database of participants.

In our virtual teams, the next challenge was to make sure that everyone knew the correct name (emails do not always include full proper names) of each person and their position in the organization. In addition, the supervisor needed to be known because of the matrix nature of our organization. We clearly needed to understand the power structure of the offices from which the people worked. Telephone and fax numbers, office location, and holidays were also not known to the team.

When we began we did not establish a fixed time for email contact, but rather relied on an as-needed basis for communications. Likewise, we did not establish a regular schedule for conference calls. As with many projects, the initial communications are very light at the beginning phase of the work. We quickly discovered that there was a productivity price to be paid for not having a structured approach from the beginning. Adjustments were made approximately two months into the work to establish a communications schedule.

We were relying upon email daily, weekly conference calls, and face-to-face meetings at least quarterly for the management. At working levels, there were no face-to-face or conference calls, only emails. As is well known, not everyone looks at email communications the same way. Many people still consider email requests to be informal, and only consider faxes or letters to be actionable. Many people consider emails to be like discussion boards, and do not choose to reply to emails that do not request something specifically. Also the Thai's on staff did not consider anything other than verbal instructions to be actionable. So there were numerous opportunities for miscommunications to occur.

We undertook to address these issues by implementing the techniques that are discussed in this paper. What we found was a marked improvement in communication frequency and accuracy (meaning both parties understood and confirmed receipt of the virtual communications). The email content generally improved, and the time for the weekly conference calls was reduced as more of the information was communicated via the email system.

Conclusions

On our example project we did not initially follow the suggestions described in this paper. The results were poor communication practices, and misunderstanding amongst the virtual team. The intermediate face-to-face meetings, where people visited the site, were inadequate to correct the mis-communications on any thing other than a temporary basis. Our lessons learned were that the email system is the backbone of a virtual team, and must be thoroughly and thoughtfully planned, designed, implemented, and monitored just as with all other aspects of Project Management.

The theory and techniques described in this paper are proven from our field experience, and on a qualitative basis demonstrated the gains to understanding and productivity on our example project.

Chinowsky, P. (1998). "Virtual Teams: Guide to Successful Implementation." Journal of Management in Engineering ***19****(3): 98.*

Grisham, T. (1999). "Global Project Management Communication Challenges & Guidelines." PMI Conference, USA.

Grisham, T. (2000). "It's About, Time." Paper for PMI New Zealand.

Grisham, T. and Walker, D. (2005). Communities of Practice: Techniques for the International Construction Industry. Information & Knowledge Management in a Global Economy, Lisbon.

Jarvenpaa, S. L., and Leidner, D. E. (1998). "Communication and trust in global virtual teams." Journal of Computer-Mediated Communication ***3****(4).*

Koh, J. and Y.-G. Kim (2003). Sense of Virtual Community: A Conceptual Framework and Empirical Validation. International Journal of Electronic Commerce, M.E. Sharpe Inc. ***8****: 75-93.*

McMillan, D. (1996). "Sense of Cummunity." Journal of Community Psychology.

Schwen, T. M. and N. Hara (2003). Community of Practice: A Metaphor for Online Design? Information Society, Taylor & Francis Ltd. ***19****: 257.*

Zaleznik, A. (1998). Managers and Leaders Are They Different. Harvard Business Review on Leadership. H. B. Review. Boston, MA, Harvard Business School Publishing: 61-66.