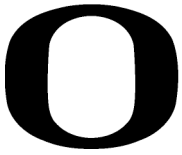

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Selected Collaboration Tools that Address the Communication Challenges Faced by Virtual Team Leaders

CAPSTONE REPORT

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Abstract

Communication is considered a key factor for effective project management and project success. This literature review examines information published between 1994 and 2007, about the communication challenges faced by project managers, when leading virtual teams. Results reveal three types of collaboration tools (information management, conferencing, and project management) that can be used to address three larger kinds of typical communication challenges. Research indicates that establishing trust and addressing information overload are two additional key elements.

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Literature Review Introduction

Topic Sentence

A survey of methodologies that purport to increase the likelihood of success of global virtual projects, in particular a selected set of collaboration tools intended to help project managers communicate and facilitate projects (Zakaria, Amelinckx & Wilemon, 2004) and adopt practices designed to enhance virtual communication (Brandel, 2006).

Research Problem

Dube and Pare (2001) note that one of the major downsides of global virtual teams is "the lack of physical interactions, nonverbal cues, and synergies that often accompany face to face communications" (p. 73). When analyzing the problem, McFall (2006) suggests that a key to success for project stakeholders (including project managers) in virtual project teams may have to do with the access to and expertise with electronic communication and collaboration technology.

During the last decade, globalization and technological advances have led to the increased use of virtual teams (Furst, Reeves, Rosen, & Blackburn, 2004). According to Furst et al., (2004), recent estimates suggest that as many as 8.4 million employees in the U.S. belong to one or more irtual team. This growth is based on the belief that virtual project teams allow enterprises to gather the skills and experience of employees regardless of their location (Furst et al., 2004).

Audience & Significance

As noted by McFall (2006), project managers are responsible for defining and communicating expectations, tasks, deadlines and ramifications to the project team, which includes clear communication of the initial project plan during the forming stage and, if possible, arranging an initial face to face meeting. When managing virtual teams, project managers have to deal with the fact that "project teams and key decision-makers are dispersed throughout the world, time frames for completion are compressed because of heightened competition" (Brandel, 2006, p. 6). Brandel (2006) states that new project managers should be great communicators and be able to use tools and adopt practices that support collaboration. The project manager of a global virtual team should "establish and manage an electronic workplace based on a variety of telecommunication and collaborative systems and tools that support the team's specific needs (Dube & Pare, 2001, p. 73).

McLean (2007) defines a global virtual team as the collection of individuals who work together, regardless of their geographical and physical location. He states that the concept of global virtual teams has been described as a new phenomenon and its use is a growing trend. Therefore, it is important for project managers to be familiar with the challenges that they face when dealing with virtual teams. According to organizational leaders, virtual teams are seen as a model for the present and the future (McLean, 2007). This study provides this audience a review of literature concerning the communication challenges in virtual teams and the collaboration tools that can address these issues, as they learn to become more effective virtual communicators.

Research Limitations

The search process to gather relevant literature to complete this review has been limited as follows:

- As a way to frame the larger problem context, literature is selected that examines the proposed benefits of global virtual teams to a company. In this case, the concept of 'benefit' is defined as "the ability to efficiently connect people and enable greater levels of productivity" (Townsend, DeMarie, & Hendrickson, 1998, p. 27).

- To support examination of the specific topic, literature is selected that describes key communication challenges faced by project managers of virtual teams. In this case, the concept of 'communication challenge' is defined as anything that impedes development of a shared understanding (Roebuck, Brock & Moodie, 2004) and anything described as a roadblock to communication exchange and interpretation (Chinowsky & Rojas, 2003).

- Literature is also selected that promotes specific collaboration tools, that offer the promise to address these global virtual team management challenges. The criterion to decide what collaboration tools are addressed is determined by the number of times the tools are mentioned in the selected literature. The collaboration tools are included in the review of literature if they are mentioned in at least two publications.

- Furst et al., (2004) state that virtual team usage has increased during the last decade as a result of globalization and technological advances. Taking this into consideration, the literature is collected from sources published after 1994.

- As described in the search strategy, the literature is primarily obtained from the Business Source Premier database and publications from the Project Management Institute. This database is selected because it includes publications from other sources and it provides a variety of search features. The Project Management Institute (PMI) is the leading membership association for the project management profession. PMI is actively engaged in advocacy for the profession, setting professional standards, conducting research and providing access to a wealth of information and resources (About PMI, n.d.).
- Project managers are chosen as the audience of this literature review. According to Brandel (2006), the project managers' role has changed tremendously in the last few years. He states, "The perspective, the knowledge base, the skill set and the methods traditionally employed by the project manager must change to accommodate the demands of project management" (Brandel, 2006, p 45).

Introduction to the Writing Plan

The thematic organizational pattern is selected as the model to structure the writing plan for this literature review. As described by the Writing Center at the University of North Carolina, the thematic pattern is organized around a topic or issue (n.d.). According to the writing plan, the body of the literature review is organized by the following themes:

- Theme 1: The problem context is explored through an examination of ***benefits of global virtual teams*** to a company. A benefit is defined as "the ability to efficiently connect people and enable greater levels of productivity" (Townsend, DeMarie, & Hendrickson, 1998, p. 27). For example, McLean (2007) states that one of the benefits offered by virtual team is

the opportunity to gather wide and diverse range of knowledge and expertise without relocating resources.

- Theme 2: Before a selection of specific collaboration tools can be conducted, the ***key communication challenges*** faced by project managers of virtual teams, and to be addressed by the selected tools, must be identified. For example, Roebuck et al., (2004), proposes that the first challenge is to compensate for the lack of face –to-face interaction. Virtual teams do not have verbal cues and can fail without communication strategies (Roebuck et al., 2004).

- Theme 3: Once a set of specific communication challenges is identified, then ***selected virtual collaboration tools*** are examined, with focus on those that offer the promise to address these global virtual team communication challenges, in support of the needs of the virtual project team manager. For example, Chinowsky and Rojas (2003) mentions that the lack of informal communication in virtual teams results in a reduction in opportunities to informally discuss project solutions. Conferencing technologies assist virtual team members to exchange ideas and information in real time. Collaboration tools are classified in the three major areas: information management, conferencing and project management (Chinowsky & Rojas, 2003).

Definitions

Collaboration tools: tools that include group calendaring, scheduling, project management, instant messaging, and other group communication utilities (Smallwood, 2005).

Global virtual team: The collection of individuals who work together, regardless of their geographical and physical location (McLean, 2007).

Knowledge management: A process by which information is captured, organized, stored, retrieved and transmitted (Zakaria, et al., 2004).

Project initiation: Launching a process that can result in the authorization and scope definition of a new project (Project Management Institute, 2004).

Project life cycle: Phases in which organizations and project managers divide projects. These phases are intended to provide better management control (Project Management Institute, 2004).

Project management: It is the application of knowledge, skills, tools and techniques to project activities to meet project requirements (Project Management Institute, 2004).

Project manager: The person responsible for managing the project (Project Management Institute, 2004).

Project stakeholders: Individuals and organizations that are actively involved in the project or whose interests may be affected as a result of project execution or project completion (Project Management Institute, 2004).

Project success: a project is successful when it meets or exceeds key stakeholders' expectations by delivering the expecting benefits in terms of value (time/cost/scope), within acceptable risk profile while maintaining effective relationships with key stakeholders (Weaver, 2007).

Project team members: The group that is performing the work of the project (Project Management Institute, 2004).

Shared understanding: A collective way of organizing relevant knowledge which can influence the ability of teams to coordinate work and perform well (Zakaria, et al., 2004).

Virtual communication: The common medium for work and shared meaning enabled by information and communication technologies (Zakaria, et al., 2004).

Virtual communication tools: Technologies that form an informational infrastructure within which virtual teams can match or even surpass the effectiveness of face-to face teams. They provide the foundation for virtual teamwork (Townsend. et al., 1998).

Research Parameters

Information presented in Research Parameters describes the methods and procedures used to develop the inquiry, designed as a literature review (Leedy and Ormrod (2005). The process implemented to obtain relevant literature is based on the development of the topic, subtopics and research problem. This section includes the key search terms which were identified and grouped based on the previous components. Literature is researched from selected databases and journals. The methodology to assess the search results is documented in the enclosed table. Evaluation criteria used to select the literature to determine literature credibility and quality is provided. Finally, the way in which the review of the literature is organized conceptually (the Writing Plan) is described.

Search Strategy Report

The literature was selected from different sources such as research databases, search engines, specialized journals and research papers. Primarily, publications were obtained from the Business Source Premier database, the Project Management Institute's Project Management Journal and research papers reviewed during the Project Management Institute 2007 Global Congress in Atlanta, Georgia.

In addition, relevant lectures and materials from the Project Management course offered by the AIM Program were reviewed and selected. Key project management definitions were obtained from the Project Management Body of Knowledge guide (PMBOK guide) which is the sum of knowledge within the profession of project management (Project Management Institute, 2004).

The Project Management Institute uses this guide for its foundational project management references for its professional development programs (Project Management Institute, 2004).

Key Search Terms

Advantage

Benefits

Collaboration tools

Communication

Global

Globalization

Global projects

Information management

Project management

Project management

Processes

Virtual teams

Subtopics Search Terms

Key communication challenges faced by project managers of virtual teams.

Challenges

Communication

Global

Problems

Project management

Teams

Virtual

Virtual teams

Collaboration tools, that offer the promise to address these communication challenges.

Collaboration

Communication

Global teams

Project management

Tools

Virtual

Table 1 below provides a summary of the search process and results. The table lists the databases and journals utilized to look for the relevant literature. It includes the different terms and combinations to search for references. The results are documented by the number and quality of the findings.

Database	Search Terms	Number	Results	Comments
Business Source Premier	Web based AND project management	*109*	*Good*	*The topic was too broad at this time. A few relevant articles were found.*
	Collaboration software AND benefits AND project management OR Portfolio management	2136	Good	
Academic Search Premier	Web based AND project management	*61*	*Good*	*The topic was too broad at this time. Some of the results were already obtained from the previous database.*
	Collaboration software AND benefits AND project management OR Portfolio management	257	Good	*Database will not be used again since the same results can be obtained when searching the previous database " Business Source Premier".*
Google scholar	Web based AND project management	*15, 500*	*Poor*	*The advanced search options were not as complete as the ones from the previous database.*
	Collaboration software AND benefits AND project management OR Portfolio management	11	Poor	The topic is too general at this time that the results obtained in this search engine were not relevant. Some of the results can not be accessed because either the PDF link is not active or the result is routed to an external

Database	Search Terms	Number	Results	Comments
				database which requires membership or payment for the article.
PM Network Magazine	*Search the table of contents and articles for the last 4 years looking for publications related to communication, virtual teams and global projects*	*0*	*Poor*	*No relevant results were found.*
Project Management Journal	*The table of contents and abstracts has been search using terms such as communication, virtual teams, global teams and collaboration tools.*	*6*	*Excellent*	*Due to the specialized nature of this journal the relevance and quality of the results are outstanding. The search process is very manual and time consuming; however it was worth it.*
Publications from the PMI Global Congress North America 2007	*Titles and abstracts have been searched for terms such as communication, virtual teams, global teams and collaboration tools*	*6*	*Excellent*	*Great results*
Business Source Premier	Global OR Globalization OR Global projects AND Virtual teams Project management AND Collaboration tools AND Communication Information management AND Project management AND Processes	*10* 29 69	*Poor* Good Poor	*The combination of these keywords obtained results that were not relevant.* Relevant articles were found Keywords are too broad
Google scholar	Global OR Globalization OR Global projects AND Virtual teams Project management AND Collaboration tools AND	*78* 232	*Poor* Poor	*Some of the results can not be accessed because either the PDF link is not active or the result is routed to an external database which requires membership or payment for the*

Database	Search Terms	Number	Results	Comments
	Communication Information management AND Project management AND Processes	24,900	Poor	*article.* It has been decided not to use the this engine for future research
Business Source Premier	Virtual teams AND benefits AND advantage	*32*	*Excellent*	*This is the first time that the search process is conducted at the main topic and subtopic level. The obtained literature is excellent.*
	Communication AND virtual teams AND problems OR challenges	34	Good	
	Communication AND teams AND project management AND global OR virtual	10	Poor	
	Collaboration AND tools AND project management	42	Good	
	Collaboration AND virtual OR global AND teams	26	Good	
	Communication AND tools AND virtual OR global AND teams	17	Good	

Table 1: Search Process and Results Summary

Evaluation criteria

The collected literature was evaluated using the relevance and quality analysis criteria suggested by Hewitt (1998). In addition, the literature was reviewed taking into account some of the reflective questions formulated by Leedy and Ormrod (2005) when evaluating research. The evaluation criteria were intended to establish literature credibility and quality.

Relevance & quality: Scan the list of references, remove duplicates and assess the relevance of the material your search produced (Hewitt, 1998).

As stated by Hewitt (1998), a publication can be judged by the journal in which it appears. Peer-review is an important stage where each article is critically reviewed prior to publication (Hewitt, 1998). According to the relevance and quality criteria, the literature was analyzed considering the following standards:

- Relationship with the problem area, main topic and subtopics
- Presence and consistency of components such as abstract, introduction, tables, conclusion and references
- Themes identification and development throughout the paper
- Description of the data collection procedures, if applicable

Evaluation through use of reflective question.

In accordance with the ideas presented by Leedy and Ormrod, (2005), the literature was evaluated considering the following questions:

- In what source did you find the research article (p. 9)?
- Does the article have a stated research question or problem (p. 9)?
- Is the article logically organized and easy to follow (p. 10)?
- If data were collected, can you describe how they were collected and how they were analyzed (p. 10)?
- Do you agree with the interpretation of the results (p. 10)?

Writing Plan

As discussed by Leedy and Ormrod (2005), planning and organization are required when writing a literature review. The thematic organizational pattern is the selected model to structure this writing plan. As described by the Writing Center at the University of North Carolina, the thematic pattern is organized around a topic or issue and it can have subtopics that relate to the theme or issue (n.d.).

A writing plan outline is selected to serve as the roadmap to guide the elaboration of the review of the literature. This outline contains three main sections covering the main themes identified for this review. Each section is broken in different topics which address their corresponding theme. The last level of the outline is intended to support the topics within the themes.

Writing plan outline.

1. Key definitions and the examination of benefits of global virtual teams to a company.

The primary goal of this section is to provide the selected audience, project managers, with the key concepts and foundation to explore the review of the literature. This section introduces the research problem and prepares the audience to examine the communication challenges in virtual teams and the collaboration tools that can minimize these challenges.

- 1.1 Virtual teams overview
  - 1.1.1 Definitions
  - 1.1.2 Trends
  - 1.1.3 Purported benefits
  - 1.1.4 Purported challenges
- 1.2 The role of the team project manager
  - 1.2.1 Definition
  - 1.2.2 Context and expectations
- 1.3 Project success and communication
  - 1.3.1 Communication technologies

2. Key communication challenges faced by project managers of virtual teams.

The goal of the second section is to present the key communication challenges experienced by project managers of virtual teams. In the previous area, the audience is introduced to the overall challenges encountered when dealing with virtual teams. In this section, project

managers are presented specifically with the key communication challenges. The literature examined in this part allows the audience the opportunity to think about the communication challenges before reviewing some of the collaboration tools that can address these incidents.

2.1 Communication challenges in virtual teams

2.1.1 Communication process

2.1.2 Synchronous and asynchronous communication

2.1.3 Communication challenges for project managers

2.1.3.1 Compensating for face to face interaction

2.1.3.2 Building relationships

2.1.3.3 Accessing and leveraging knowledge

2.1.3.4 Other communication challenges

3. Selected virtual collaboration tools that offer the promise to address these global virtual team communication challenges

The objective of the final section is to formulate the collaboration tools that address the communication challenges explored in the previous area. The audience of this review can evaluate the promised benefits offered by the tools keeping in mind the communication challenges introduced in part two and even challenges experienced when managing virtual teams.

3.1 Virtual interaction technologies

3.1.1 Collaboration technologies

3.1.1.1 Information management technologies

3.1.1.2 Conferencing technologies

3.1.1.3 Project management technologies

Review of the Literature Bibliography

This section lists the 29 key references used to write the review of the literature. The selected literature are grouped into three different categories. The first category gathers 9 references describing the problem area; the second collects 15 references addressing communication challenges and the last one groups 5 references promoting collaboration tools. Each entry lists the author, publication title, journal name, abstract and the database from which the article was retrieved. Abstracts are those published with the article.

Category 1: Selected references that address the problem area for the inquiry, including the key definitions, material(s) that describe the audience and their needs, and references that examine theme 1 -- the proposed benefits of global virtual teams to a company.

To a larger extend, this category is intended to present to the audience the current trend to move towards the virtual team adoption, the potential advantages offered by virtual teams and other challenges beside communication. From the project management stand point, this section addresses the importance of communication and its relation to project success.

Badir, Y., Remi, F., Strcker, C., & Bourquin, V. (2003). Management of Global Large-Scale Projects Through a Federation of Multiple Web-Based Workflow Management Systems. *Project Management Journal, 34, 40-48.* Retrieved October 28, 2007 from http://www.pmi.org/Resources/Pages/Members/Publications-Online-Library.aspx

Abstract: With globalization and the networked world of today, there is a dire need for a reliable and efficient model to manage, monitor, and control global large-scale projects (GLSPs), which contain thousands of workflows and hundreds of organizations located at different sites. Companies are faced with an increasingly competitive and hostile environment. The terms

"information exchange, " "compatibility," and " interoperability" have become ubiquitous in this environment. To survive, companies will have to constantly develop newer and better methods for managing and controlling the execution of GLSPs. Those projects cannot be managed efficiently and effectively without Web-based models that automate the business processes and extend them beyond the organization, and fill the information needs of project parties at all levels, from individual team members to high-level managers.

Discenza, R. & Forman, J. (2007). *Seven Causes of Project Failure: How to Recognize them and How to Initiate Project Recovery.* Paper presented at the annual North American meeting of the Project Management Institute, Atlanta, GA.

Abstract: Assessing and recovering a failing project can be among the most challenging work for a project manager to perform for an organization. However, the payoff can be huge, since a project brought out of failure can provide significant value to a firm. The seven factors outlined in this paper are critical for assessing a failing project's performance and planning corrective action to make the project successful. All seven factors are needed for success. When one factor turns negative and is not corrected disaster is unavoidable.

The authors' survey results on the common causes of project failure indicate that the failure factors can be grouped into three main categories. They are: (1) people factors, (2) project process factors; and (3) project communications factors.

Managing a failing project begins by assessing its real condition by the use of questionnaires, surveys, and interviews. When the assessment is complete and the project go no decision has been made by the stakeholders, the assessment team can build a plan to implement project recovery.

Furst, A., Reeves, M., Rosen, B. & Blackburn, R. (2004). Managing the Lifecycle of Virtual Teams. *Academy of Management Executive, 18, 6-20.* Retrieved November 2, 2007 from Business Source Premier.

Abstract: In the fast-paced, technology-driven 21 st century, virtual project teams represent a growing response to the need for high-quality, low-cost, rapid solutions to complex organizational problems. Virtual project teams enable organizations to pool the talents and expertise of employees (and non-employees) by eliminating time and space barriers. Yet, there is growing evidence that virtual teams fail more often than they succeed. To understand the factors that contribute to virtual team effectiveness, we tracked six virtual project teams from a large food distribution company from inception to project delivery. We identified factors at each stage of the virtual-team life cycle that affected team performance. These results provide specific examples of what managers can do, at various points in time, to increase a virtual team's chances to fully develop and contribute to firm performance.

Gale, S. (2005). Clear Channels. *PM Network, 19, 60-66.* Retrieved October 30, 2007 from Business Source Premier.:

Abstract: Those project managers who provide their project's stakeholders with clear and concise directives are those professionals most likely to garner the loyalty and support of their team members, peers, and superiors. This article discusses the advantages project managers can realize when they focus on communicating with their project's stakeholders. In doing so, it describes the communication practices that can keep all project stakeholders connected and focused in a way that is respectful to each individual. It also outlines several techniques and tools project managers can use to navigate conversations-even those that are potentially conflicts-that involve project decisions, project team goals and expectations, and project updates. It then details several methods for communicating project accomplishments to executives and explains the significance of using these communications methods to generate organizational support for one's project and to obtain executive investment in project management. Accompanying this article is a sidebar outlining three tactics that will enable project managers to communicate more effectively to their project teams.

Hardin, A., Fuller, M. & Davison, R. (2007). I Know I Can, But Can We? Culture and Efficacy Beliefs in Global Virtual Teams. *Small Group Research, 38 130-155.* Retrieved November 2, 2007 from Business Source Premier.

Abstract: Given the growing use of global virtual teams, one important factor to consider when examining team performance is the cultural backgrounds of the dispersed team members. Two hundred forty-three team members from universities in the United States and Hong Kong were administered three survey questionnaires during a series of virtual team projects. Results revealed that regardless of cultural background, team members reported less confidence in their ability to work in virtual team environments than traditional face-to-face environments and that team members from individualistic cultures reported higher self-efficacy beliefs (both group self-efficacy and virtual team self-efficacy) than team members from collectivist cultures. Furthermore, when the reference for efficacy beliefs changed from the individual to the group, the magnitude of change was greater for the collectivist versus individualistic team members. Implications and future research are also discussed.

Hyvari. I. (2006). Success of Projects in Different Organizational Conditions. *Project Management Journal, 37, 31-41.* Retrieved November 2, 2007 from Business Source Premier.

Abstract: The main purpose of this study is to evaluate the critical success/failure factors in project management and to examine the relationships between critical success factors and organizational background variables. This study also aims to gain an understanding of how project clients, owners, and sponsors present their needs and expectations to ensure project success. On the basis of the survey responses received, it is possible to identify critical success factors in project management that are significantly related to company/organization size, *project* size, organization type, and project managers' work experience. The *project* implementation profile is also analyzed on average and by phases. The results indicate the importance of *project* communication that is related to company size, however. In contrast to some prior studies, communication was ranked highest in most *project* phases.

McLean, J. (2007). Managing Global Virtual Teams. *British Journal of Administrative Management.59, 16-17.* Retrieved November 16, 2007 from Business Source Premier.

Abstract: In this article the author discusses the formation and management of teams of employees who work together but are not located in the same place, assisted only by sophisticated information technology and telecommunications systems. The advantages of such an arrangement include a high degree of organizational flexibility, a significant reduction of overhead and labor costs, the absence of relocation expenses and the creation of a diverse collection of knowledge and work skills. Disadvantages and problems arising from cultural differences, the difficulty of promoting trust among team members and the possibility of language barriers.

Sarker, S. & Sahay, S. (2003). Understanding Virtual Team Development: An Interpretive Study. *Journal of the Association for Information Systems, 4, 1-36.* Retrieved November 2, 2007 from Business Source Premier.

Abstract: In this paper, we develop an understanding of how virtual teams develop over time by inductively studying communication transactions of 12 United States-Canadian student virtual teams involved in ISD. Our analysis is based upon two influential streams of social science research: (1) interaction analysis, which aided in the examination of the micro-processes of communication among members of a virtual team, and (2) structuration theory, which provided a meta-framework to help link the microlevel communication patterns with the more macro-structures representing the environmental context as well as the characteristics of teams over time. Based on our interpretation of the communication patterns in the virtual teams, we propose a theoretical model to describe how virtual teams develop over the life of a project, and also attempt to clarify how the concepts of communication, virtual team development, and collaboration are related.

Townsend, A., DeMarie, S. & Hendrickson, A. (1998). Virtual Teams: Technology and the Workplace of the Future. *Academy of Management Executive. 12, 17-29.* Retrieved November 14, 2007 from Business Source Premier.

Abstract: Managers are challenged to develop strategically flexible organizations in response to increasingly competitive marketplaces. Fortunately, a new generation of information and telecommunications technology provides the foundation for resilient new organizational forms that would have not been feasible only a decade ago. One of the most exciting of these new forms, the virtual team, will enable organizations to become more flexible by providing the impressive productivity of team-based designs in environments where teamwork would have once been impossible. Virtual teams, which are linked primarily through advanced computer and telecommunications technologies, provide a potent response to the challenges associated with today's downsized and lean organizations, and to the resulting geographical dispersion of essential employees. Virtual teams also address new workforce demographics, where the best employees may be located anywhere the world, and where workers demand increasing technological sophistication and personal flexibility. With virtual teams, organizations can build teams with optimum membership while retaining the advantages of flat organizational structure. Additionally, firms benefit from virtual teams through access to previously unavailable expertise, enhanced cross-functional interaction, and the use of systems that improve the quality of the virtual team's work.

Zakaria, N., Amelinckx, A & Wilemon, D. (2004). Working Together Apart? Building a knowledge-Sharing Culture for Global Virtual Teams. *Creativity and Innovation Management, 13, 15-29.* Retrieved October 30, 2007 from Business Source Premier.

Abstract: A new impetus for greater knowledge-sharing among team members needs to be emphasized due to the emergence of a significant new form of working known as ‘global virtual teams’. As information and communication technologies permeate every aspect of organizational life and impact the way teams communicate, work and structure relationships, global virtual teams require innovative communication and learning capabilities for different team members to effectively work together across cultural, organizational and geographical boundaries. Whereas information technology-facilitated communication processes rely on technologically advanced systems to succeed, the ability to create a knowledge-sharing culture within a global virtual team

rests on the existence (and maintenance) of intra-team respect, mutual trust, reciprocity and positive individual and group relationships. Thus, some of the inherent questions we address in our paper are: (1) what are the cross-cultural challenges faced by global virtual teams?; (2) how do organizations develop a knowledge sharing culture to promote effective organizational learning among culturally-diverse team members? and; (3) what are some of the practices that can help maximize the performance of global virtual teams? We conclude by examining ways that global virtual teams can be more effectively managed in order to reach their potential in this new interconnected world and put forward suggestions for further research.

Category 2: Selected references that describe communication challenges in virtual teams, in particular references that examine theme 2 -- key communication challenges faced by managers of virtual teams.

The low trust levels among virtual team members are related with the lack of face to face interaction present in the virtual setting. The lack of trust also represents a challenge for project managers of virtual teams. The language barrier can also be a communication challenge within global virtual teams.

Beranek, P., Broder, J., Reinig, B., Romano N. & Sump, S. (2005). Management of Virtual Project Teams: Guidelines for Team Leaders. *Communications of AIS, 16, 247-259.* Retrieved November 2, 2007 from Business Source Premier.

Abstract: This article offers a set of guidelines to assist project leaders when managing virtual project teams. The guidelines were developed as a result of a panel at the celebration of the 30th anniversary of the founding of the MIS department at the University of Arizona. These guidelines include recommendations for addressing challenges that occur over the virtual team project life cycle, including identifying appropriate team members, establishing conventions and norms, and creating shared awareness. We also give practical advice on how to highlight

successes and learn from mistakes to ensure ongoing development of leadership and participation skills that will enable project leaders to manage virtual teams successfully.

Brandel, M. (2006). The New Project Manager. *Computerworld.* Retrieved October 31, 2007 from http://www.computerworld.com/action/article.do?command=viewArticleBasic&articleId=110268

Abstract: Being a project manager today is a lot different from playing that role a few years ago. Just ask Brenda Dunn, a project manager/business analyst at Long & Foster Real Estate Inc. in Fairfax, Va. She recently headed up a project to build a critical relocation system for the privately owned realty firm.

Chiocchio, F. (2007). Project Team Performance: A Study of Electronic Task and Coordination Communication. *Project Management Journal, 38, 97-109.* Retrieved November 2, 2007 from Business Source Premier.

Abstract: Communication is a key factor in team performance, successful project *completion and* effective project management. Collective asynchronous electronic messages on task and coordination send among members of 34 teams were analyzed using time-series analysis. Results suggest that compared to low-performing teams, high-performing teams exchanged more messages, modified their exchanges around milestones, and were more prone to self-organize prior to project completion. Also, high-performing teams started to coordinate themselves later but maintaining higher levels of coronation afterward. Project managers could benefit from monitoring the amount and the way their team members discuss task and coordination in order to ensure high team and project performance.

Dube, L. & Pare, G. (2001). Global Virtual Teams. *Communications of the ICM. 44, 71-73.* Retrieved November 04, 2007 from Business Source Premier.

Abstract: An interview was conducted with global virtual teams (GVT) leaders. GVT leaders gave advice regarding the challenges and coping strategies for collaborating on a global scale. GVTs confront significant challenges over and above more localized virtual teams. Indeed, the principal challenges facing organizations in deploying GVTs involve people and technology. Cultural diversity represents enormous challenges for GVTs but also offers potential richness. In a GVT, cultures and management styles often clash. Communication styles may also differ. It was recommended by one of the respondents that all members of a GVT be given cultural training at the beginning of a project. According to authors, team leaders should be mindful of cultural differences, communication, and language barriers, and discrepancies in technological proficiency among team participants and how these make a difference in team effectiveness.

Goodbody, J. (2005). Critical Success Factors for Global Virtual Teams. *Strategic Communication Management, 9, 18-21.* Retrieved November 2, 2007 from Business Source Premier.

Abstract: PGS, the engineering division of the BOC Group, a worldwide industrial gases, vacuum technologies and distribution services company, is one of BOC's three global lines of business. For multinational companies, virtual teams operating across boundaries of time and geography are necessities of everyday working life. In this article, the author seeks to examine what makes a dispersed global team work well together. With global project teams now a reality of everyday business, and given that so many global communication functions operate as virtual teams, this article provides some interesting pointers on how to improve the performance of teams working together remotely.

Grosse, C. (2002). Managing Communication within Virtual Intercultural. *Business Communication Quarterly, 65, 22-38.* Retrieved November 2, 2007 from Business Source Premier.

Abstract: As global companies increasingly rely on virtual teams to conduct short- and long-term projects, business students need to he prepared to manage the communication of intercultural teams. Communicating across cultures using technology can be a difficult task. It requires understanding the advantages and limitation of technology and how to build relationships via technology. Virtual team members need to choose an appropriate communication channel for their purposes and be sure to balance distance work with face-to-face communication. Team leaders should encourage open communication and brainstorming, and avoid assignment of blame. Other strategies for success include: 1) develop a network of good relationships built on trust and understanding, 2) show respect for other cultures and languages, and 3) understand how diversity strengthens the team.

Guss, C. (1998). Virtual Project Management: Tools and the Trade. *Project Management Journal, 29, 22-31.* Retrieved November 2, 2007 from Business Source Premier.

Abstract: Focuses on four related areas of virtual project management organizations and their project teams. Brief history about approaches to project management theory and practice; Identification of challenges concerning communication and technology for virtual project organizations; Introduction of a model that is capable of educating practitioners about the importance of people-centered project management tools.

Kayworth, T. & Leidner, D. (2002). Leadership Effectiveness in Global Virtual Teams. *Journal of Management Information Systems, 18, 7-34.* Retrieved November 2, 2007 from Business Source Premier.

Abstract: The trend toward physically dispersed work groups has necessitated a fresh inquiry into the role and nature of team leadership in virtual settings. To accomplish this, we assembled thirteen culturally diverse global teams from locations in Europe, Mexico, and the United States, assigning each team a project leader and task to complete. The findings suggest that effective

team leaders demonstrate the capability to deal with paradox and contradiction by performing multiple leadership roles simultaneously (behavioral complexity). Specifically, we discovered that highly effective virtual team leaders act in a mentoring role and exhibit a high degree of understanding (empathy) toward other team members. At the same time, effective leaders are also able to assert their authority without being perceived as overbearing or inflexible. Finally, effective leaders are found to be extremely effective at providing regular, detailed, and prompt communication with their peers and in articulating role relationships (responsibilities) among the virtual team members. This study provides useful insights for managers interested in developing global virtual teams, as well as for academics interested in pursuing virtual team research.

Kirkman, B., Rosen, B., Gibson, C., Tesluk, P. & McPherson, S. (2002). Five Challenges to Virtual Team Success. *Academy of Management Executive, 16, 67-79.* Retrieved November 16, 2007 from Business Source Premier.

Abstract: Advances in communications and information technology create new opportunities for organizations to build and manage *virtual teams*. Such *teams* are composed of employees with unique skills, located at a distance from each other, who must collaborate to accomplish important organizational tasks. Based on a comprehensive set of interviews with a subset of team members, team leaders, general managers, and executives on 65 *virtual teams* at Sabre, Inc.—an innovative organization in the travel industry—we identify five challenges that organizations can expect to encounter in establishing, maintaining, and supporting *virtual teams*, e.g., building trust, cohesion, and team identity, and overcoming isolation among *virtual* team members. Both leaders and members of *virtual teams* face particular difficulties in selecting team members who have the balance of technical and interpersonal skills and abilities required to work virtually and in evaluating the performance of individuals and *teams* working in *virtual* space. Examination of Sabre's strategies for coping with each challenge should be instructive to other organizations using or considering *virtual teams*.

Majchrzak, A., Malhotra, A., Stamps, J. & Lipnack, J. (2004). Can Absence Make a Team Grow Stronger? *Harvard Business Review, 82, 131-137.* Retrieved November 2, 2007 from Business Source Premier.

Abstract: Some projects have such diverse requirements that they need a variety of specialists to work on them. But often the best-qualified specialists are scattered around the globe, perhaps at several companies. Remarkably, an extensive benchmarking study reveals, it isn't necessary to bring team members together to get their best work. in fact, they can be even more productive if they stay separated and do all their collaborating virtually. The scores of successful virtual teams the authors examined didn't have many of the psychological and practical obstacles that plagued their more traditional, face-to-face counterparts. Team members felt freer to contribute--especially outside their established areas of expertise. The fact that such groups could not assemble easily actually made their projects go faster, as people did not wait for meetings to make decisions, and individuals, in the comfort of their own offices, had full access to their files and the complementary knowledge of their local colleagues. Reaping those advantages, though, demanded shrewd management of a virtual team's work processes and social dynamics. Rather than depend on videoconferencing or e-mail, which could be unwieldy or exclusionary, successful virtual teams made extensive use of sophisticated online team rooms, where everyone could easily see the state of the work in progress, talk about the work in ongoing threaded discussions, and be reminded of decisions, rationales, and commitments. Differences were most effectively hashed out in teleconferences, which team leaders also used to foster group identity and solidarity. When carefully managed in this way, the clash of perspectives led not to acrimony but, rather, to fundamental solutions, turning distance and diversity into competitive advantage.

Malhotra, A., Majchrzak, A. & Rosen, B. (2007). Leading Virtual Teams. *Academy of Management Perspectives. 21, 60-70.* Retrieved November 14, 2007 from Business Source Premier.:

Abstract: Virtual teams, whose members are geographically dispersed and cross-functional yet work on highly interdependent tasks, present unique leadership challenges. Based on our observations, interviews, and survey data, we identify six leadership practices of effective leaders of *virtual teams*. Specifically, we elaborate how leaders of successful *virtual teams*: 1) establish and maintain trust through the use of communication technology; 2) ensure that distributed diversity is understood and appreciated; 3) manage *virtual* work-life cycle (meetings); 4) monitor team progress using technology; 5) enhance visibility of *virtual* members within the team and outside in the organization; and 6) enable individual members of the *virtual* team to benefit from the team. These practices of *virtual* team leaders can be used to establish a foundation for training and developing future *virtual* team leaders.

Matassa, P. (2007). *Bringing Your Project Communications into the 21st Century Marshall McLuhan was right, " The Medium is the Message".* Paper presented at the annual North American meeting of the Project Management Institute, Atlanta, GA.

Abstract: Excellent project communications can serve as catalyst for transforming stakeholder perceptions of a project from good to very successfully. Conversely, poor project communications can transform stakeholder perceptions of a project from excellent to mediocre.

Historically project managers have emphasized hard skills of project management; issues such us developing better project metrics to control the project and creating more sophisticated work breakdown structures to track the project. However, in spite of implemented continuous improvement for project hard skills, often project stakeholders are not still satisfied with the product delivered. A key contributor to this lack of satisfaction is that project communications have not demonstrated the same level of continuous improvement.

Pitagorsky, G. (2007). *Managing Virtual Teams for High Performance*. Paper presented at the annual North American meeting of the Project Management Institute, Atlanta, GA.

Abstract: High-performing teams are a must in this world of high competition and higher expectations. Virtual teams are a fact of life. They are increasingly common in all organizations, given the common use of shared resources, increasing number of cross-organizational projects, partnering, and outsourcing, and the increase in the number of people who telecommute or have flexible hours.

Virtual teams are a challenge. Members cross cultures, time zones, and organizations and often communicate over significant distances using electronic means. We will explore how to manage virtual teams by addressing issues of cultural and personal diversity, communication, and coordination issues. People, processes, and tools must be addressed.

The essential elements for team effectiveness are as critical for virtual teams as they are for any team-clear objectives, well –defined roles and responsibilities with matching capabilities, effective communications, respect for diversity, conscious relationship management, and commitment to working together to get the job done within pre-established, agreed-upon rational constraints.

The challenge is to actively address the issues that arise when people communicate via the web, work on multiple projects simultaneously, never or rarely meet face- to- face, and often work for a variety of organizations, using electronic tools and meet synchronously (present at the same time) and asynchronously (not present simultaneously)

Our theme is high-performance virtual teams. Let's first explore performance, then focus on teams and best practices for managing them.

Roebuck, D., Brock, S. & Moodie, D. (2004). Using Simulation to Explore the Challenges of Communicating in a Virtual Team. *Business Communication Quarterly. 67, 359-367.* Retrieved November 14, 2007 from Business Source Premier.

Abstract: This article discusses the *communication challenges* faced by *virtual teams* in business settings. *Virtual teams* have become an integral part of many organizations because of an increase in corporate restructuring, competition and globalization. A *virtual* team is defined as one that conducts its work almost entirely through electronic technology. *Virtual teams*, who are typically dispersed both geographically and organizationally, rarely meet face to face while relying on technology for task-related *communication*. Because *communication* is often seen as the most important factor in coordinating work among team members, effective *communication* is vital for *virtual teams*. However, *communication* in a *virtual* team poses some *challenges* for its members. The first challenge is compensating for the lack of face-to-face interaction, i.e., the lack of nonverbal elements in *communication* such as voice levels, smiles and raised eyebrows. A second *communication* challenge for *virtual teams* is building relationships through technological interaction alone. The third challenge is accessing and leveraging the unique knowledge of each member to successfully achieve the *team's* goal. The rest of the article describes an exercise that will help prepare students to meet the *challenges* of *virtual* teamwork

Weaver, P. (2007*). Getting the "Soft Stuff" Right: Effective Communication is the Key to Successful Project Outcomes!* Paper presented at the annual North American meeting of the Project Management Institute, Atlanta, GA.

Abstract: Effective communication with senior managers is not a one-off effort by an individual project manager. Rather, it's an ongoing collegiate effort by all project practitioners in the organization, designed to inform, educate, and influence senior managers so that "sensible" project decisions become the norm. This effort is significantly helped by the presence of an effective project management office (PMO) structure, but simply generating accurate project data does not inform senior managers or help them make wise decisions.

Wise decisions making requires relevant information at the right time. In this context, "relevant" has two components; the information needs to be " usable, " (pertinent, accurate, and

understandable) and it needs to be " used" (the recipient believes the information is credible and important to the decision).

Category 3: Selected references that promote collaboration tools that address the communication challenges in virtual teams in particular references that examine theme 3 -- specific collaboration tools, that offer the promise to address the global virtual team communication challenges faced by team managers. It is important to identify the appropriate collaboration tools that address the specific communication challenges in virtual teams. In addition, the assessment of the available technology also plays a relevant role in the communication among team members.

Bharadwaj, S. & Saxena, K. (2006). Impacting the Process of Global Software Team: A Communication Technology Perspective. *Vision. 10, 63-75.* Retrieved November 16, 2007 from Business Source Premier.

Abstract: This paper discusses how communication is managed and how communication tools are used among the global software teams. The paper identifies the actors, the *tools*, media and contents that impact the formal and informal communication in the *global* software teams. It further illustrates the impact of the *communication* technology in managing requirements, project status and project experiential knowledge and processes to manage these knowledge areas. Managing the requirements knowledge is a critical process of *global* teams. The very nature of requirements and the different domain specializations of players involved in capturing the requirements result in equivocal and uncertain *communication*. The paper also explores the nature of project status knowledge and project experiential knowledge and how the same is impacted by *communication* technology.

Chinowsky, P. & Rojas, E. (2003). Virtual Teams: Guide to Successful Implementation. *Journal of Management in Engineering.* 19, 98-107. Retrieved November 14, 2007 from Business Source Premier.

Abstract: The successful initiation and execution of a *virtual* team is gaining increasing attention in the design and construction community. From opportunities to integrate international and multidisciplinary *teams* to the opportunity to leverage the best resources in an organization on a given project, *virtual teams* can transform the concept of project planning and execution. However, potential barriers exist in several areas to the successful implementation of virtual teams. The needs of increased management emphasis, social and cultural understanding, and emphasis on common goals are only a few of the nontechnical factors that can turn successful *virtual* teaming into *virtual* frustration. When combined with traditional technical challenges including compatibility of systems, security, and the selection of appropriate technologies, the line between leveraging *virtual* technologies for enhanced solutions and introducing additional complications into the project process is one that can be easily crossed. This paper presents the findings of research that addresses the opportunities and potential barriers to successful *virtual teams* in the engineering, procurement, and construction industry. Combining results from current research, industry practices, and early results from nonconstruction industries, the research findings provide an initial path to successful *virtual* team implementation.

Pickering, C. & Wynn, E. (2004). An Architecture and Business Process Framework for Global Team Collaboration. *Intel Technology Journal. 8, 373-382.* Retrieved November 16, 2007 from Business Source Premier.

Abstract: Tools for remote team collaboration within businesses have been available since the mid-1980s. Two opposing trends cause complete collaboration solutions to remain elusive. On the one hand, core tool capabilities are developed as point solutions, and then extra functions are added. These added functions may not integrate well with or be as fully developed as the core functionality. On the other hand, enterprises are rapidly globalizing and becoming more dependent on comprehensive collaboration applications to coordinate distributed teams. This means that overall productivity is affected by how well tools, processes, and capabilities are integrated; the tools should not be just a collection of separate features/functions. An audit of

collaboration tools used at Intel showed both overlaps and gaps between remote tools and day-to-day activities of workers. When an employee has so many tools to choose from and furthermore, works on multiple teams, the choices become overwhelming and confusing.

Setzer, S. & Bonafair, M. (2004). Project Management Software Comes of Age. *EC&M Electrical Construction & Maintenance, 4, 16-22*. Retrieved November 03, 2007 from Business Source Premier.

Abstract: Presents *project management software* for the construction industry. Factors in preparing for the advance of Internet-based *project management* systems; Effect of a centralized *project* record on *project communications* and efficiency; Use of pay modules that allow subcontractors to enter pay information electronically on standardized forms; Factors driving for more widespread implementation of collaborative *project management* systems. INSET: Application Service Providers.

Review of the Literature

The purpose of this Review of Literature is to provide a survey of methodologies that purport to increase the likelihood of success of global virtual projects, in particular a selected set of collaboration tools intended to help project managers communicate and facilitate projects (Zakaria, et al., 2004) and adopt practices designed to enhance virtual communication (Brandel, 2006). The review is divided into three main sections which include (1) an overview of the key issues presented in the entire Review of Literature; (2) a focused examination of the communication challenges faced by project team managers; and (3) presentation of selected collaboration tools designed to minimize the communication challenges that frequently occur in global virtual teams.

Part 1: Virtual Teams Overview

The primary goal of this section is to provide the selected audience, project managers, with the key concepts and foundation necessary to explore the focus of the review of the literature, i.e., definitions and key concepts concerning virtual teams, project managers and project communications.

Definitions.

The selected references include a variety of definitions of the term 'virtual team', which share a common understanding, addressing the geographical dispersion of the team members. Two of the most frequently cited definitions are:

- Virtual teams are groups of people who work interdependently with shared purpose across space, time, and organization boundaries using technology to communicate and collaborate (Kirkman, Rosen, Gibson, Tesluk, & McPherson, 2002); and
- Virtual teams are the collection of individuals who work together, regardless of their geographical and physical location (McLean, 2007).

Another definition from Sarker & Sahay (2003) puts emphasis on the factor of time, and states that:

- Virtual teams can be viewed as temporary work groups consisting of geographically dispersed members who primarily interact using different information and communication technologies (Sarker & Sahay, 2003).

According to Zakaria, et al. (2004), virtual team characteristics can be summarized in three main areas. First, they are functioning teams in the sense that they have interdependency in task management and share responsibility for outcomes. Second, team members are geographically dispersed. And third, members rely on technology mediated communications to accomplish their tasks rather than face to face interactions.

Zakaria, et al. (2004) provide a scenario of a typical contemporary virtual team process, in which team members are encouraged to engage in a regular and frequent reciprocal cross cultural exchange of ideas and the creation of new team solutions. The difficulties encountered in this type of scenario are apparent when noting that members may be located across a country or across the world and often include members from different cultures (Kirkman et al., 2002) and that global virtual team members are brought together to work on a common task with the expectation that they have the necessary specialized skills and competencies.

Trends.

As a response to the present global and competitive business environment, many organizations have adopted emergent team-based and geographically distributed structures known as virtual teams (Bharadwaj & Saxena, 2006). Virtual teams are increasingly popular given the common use of share resources, increasing number of cross organizational projects, partnering and outsourcing (Pitagorsky, 2007). Hardin, Fuller, & Davison (2007) note that "Today's organizations continue to use virtual teams to accomplish work objectives and this trend is predicted to continue" (p.130).

New information and communication technologies play an important role in all aspects of global business relations (Zakaria, et al., 2004). According to Discenza and Forman (2007), companies have more projects with dispersed team members as a result of globalization and the trend toward decentralized teams. The continued improvements in the technology used to support distributed work have also contributed to promote communication within virtual teams (Hardin, et al., 2007). Virtual teams enable people to work in different parts of the world assisted by information and communication technology (Hardin, et al., 2007).

According to McLean (2007), 60% of organizations rely on global virtual teams to undertake tasks. These organizations agree that this work setting leads to new product and service innovation. Project leaders often find that the expertise needed for a project is collocated among multiple sites (Beranek, Broder, Reinig, Romano & Sump, 2005). Brandel (2006) agrees that team members and key decision makers are dispersed throughout the world.

Purported benefits.

Throughout the selected references, authors describe a variety of benefits that companies may obtain from virtual teams. According to McLean (2007), virtual teams enable organizational and individual task flexibility by allowing project managers to select resources regardless of their geographical location. Also, McLean (2007) believes that they facilitate a reduction in overhead, labor cost and improve resource utilization. In addition, virtual teams allow the access to a wide and diverse knowledge and perspectives without relocating resources (McLean, 2007). This virtual global work setting reduces travel cost and improves synergies by using the best talent regardless of their location (Hardin, et al., 2007).

The explored literature suggests that virtual teams provide the context in which multiple perspectives about a problem may be generated, because global virtual teams include members from different countries, thus incorporating the factor of cultural diversity (McLean, 2007). Global virtual teams foster creative and problem solving capabilities which emerge from their cultural knowledge structure and base (Zakaria, et al., 2004). Zakaria (2004) notes that much of the existing virtual team research is focused on the drawbacks of its multicultural nature and the lack of physical interaction. This author states that further research is needed to explore the knowledge generated by its cross cultural nature.

The communication within virtual teams is enabled by using information and communication technologies which foster interdependence between less and more powerful team members. Skillful application of these technologies can promote equality, participation, reduce organizational hierarchy and enhance member participation in virtual meetings (Zakaria, et al.,

2004). However. The same authors, Zakaria et al., notes that the "human component in the virtual environment facilitates or hinder the development of a shared knowledge culture and organizational learning" (p. 15).

Zakaria, et al. (2004) report that (perhaps surprisingly), virtual teams' lack of social and physical presence can motivate positive intra-team coalitions and improve working relations which would be less likely to obtain in collocated teams. According to the authors, Zakaria, et al, virtual teams can provide a competitive advantage for multinational companies, they can "create culturally synergistic solutions, enhance creativity and cohesiveness among team members and promote a greater acceptance of new ideas" (p. 17).

Other potential benefits introduced by global virtual teams include promoting synergistic solutions, enhancing creativity, improving cohesiveness among team members and increasing greater acceptance of new ideas (Zakaria, et al., 2004).

Purported challenges.

The potential management and communication challenges related to global virtual teams are many. Managers of virtual teams should anticipate the need to learn how to efficiently and effectively control the project as well as gather and distribute project information (Discenza, et al., 2007).

The use of communication technology to link dispersed team members comes with advantages and disadvantages for global virtual teams (Hardin, et al., 2007). Miscommunication can be common among team members since communication media may differ in their ability to convey social presence, facial expressions, voice inflection and gestures (Kayworth & Leidner, 2002). Important information such as social status or level of expertise may be lost in virtual team settings characterized by high levels of anonymity (Kayworth & Leidner, 2002).

When miscommunication and misunderstanding occur, team members can experience stress and conflicts which are more difficult to handle (Zakaria, et al., 2004). The diversity factor brings a potential for improvement for these teams; however, it can create issues and even project failure (Hardin, et al., 2007). Cultural, individual and personality differences create their own set of tensions (McLean, 2007).

According to Zakaria, et al. (2004), the making decision process is a complex task which tends to consume more time for global virtual teams. The absence of visual cues adds complexity to this process.

Authors agree that trust can be difficult to build, because of the geographical dispersion and lack of physical interaction (McLean, 2007). Language barriers can have a negative impact on interpersonal relationships, trust and the overall work culture within the team (McLean, 2007). As a result, team members are likely to experience information overload, social isolation and uneven power distribution (Zakaria, et al., 2004).

Leadership challenges can be exacerbated in virtual teams (Kayworth & Leidner, 2002). The selected literature also makes reference to other challenges such as scheduling meetings across different time zones and team members' attitude towards technology (Kayworth & Leidner, 2002). Virtual teams tend to experience a heavy dependence on technology which requires a compromise from the users to gain proficiency with new information technologies (Kayworth & Leidner, 2002). And while virtual teams have the ability to efficiently connect people and enable greater levels of productivity, it might result in employees being assigned to multiple projects creating a complex and potentially stressful work setting (Townsend, et al.,1998).

The role of the team project manager.

According to the Project Management Institute (2004), the project manager is the person responsible for managing the project. Beranek et al. (2005) define virtual team leaders as the people who "must actively manage the combination of team member knowledge, background and work process familiarity to ensure project success" (p. 250). The primary role of project managers is to establish and manage an electronic workplace based on a variety of communication and collaborative tools that support their teams (Dube & Pare, 2001). Virtual team leaders, like collocated project managers, enforce norms, motivate and mentor team members; however, some of these duties are difficult to perform without the physical presence (Malhotra, Majchrzak & Rosen, 2007). It is emphasized that the main leadership characteristics of an effective project manager include being a good communicator, motivator and being decisive (Hyvari, 2006).

According to the selected literature, project managers face unique challenges when leading virtual teams. They often struggle to manage these teams successfully (Beranek, et al., 2005). Project managers driving virtual teams have the opportunity to access a wider array of talent and view points since they can choose members from outside of their immediate work setting (Beranek, et al., 2005).

One of the first obstacles encountered by virtual team leaders is the ineffective use of technology in support of communication (Beranek, et al., 2005). Project leaders are likely to face technological challenges such as system incompatibilities, unreliability or unavailability, particularly when connecting members in developing countries (Dube & Pare, 2001). It is estimated that less than 38% of business technology executives have a formal plan to deploy collaborative technologies (Beranek, et al., 2005). Even organizations implementing a formal plan encounter miscommunication resulting from the loss of nonverbal cues that occur in face to face environments (Beranek, et al., 2005). Guss (1998) argues that human resistance may be the most significant barrier to effective communication in virtual project communications.

Virtual team leaders should be chosen according to their ability to communicate and develop relationships with team members. These skills enable leaders to respond to the demands placed on virtual teams (Chinowsky & Rojas, 2003). It is estimated that project managers spend 90% of their time communicating (Hyvari, 2006). Hyvari emphasizes that project managers should be able to communicate and articulate project progress and resource needs (2006). Additionally, some authors assure that the ability to communicate globally can determine the success or failure of the project (Krishnasamy, 2007).

In some instances, project management professionals are responsible for determining what communication tools work best for their project teams (Guss, 1998). In addition, they have to continually seek better tools and techniques to minimize communication limitations and inefficiencies (Guss, 1998). Project managers should monitor how communication technologies are used and offer coaching and training for members who do not fully utilize the communication and collaboration tools (Malhotra, et al., 2007). Brandel (2006) states that "project managers have to be absolutely confident that they understand both the technology and the business and can translate between the two" (p. 46). It is important that at the early stages of the project, virtual project managers communicate the expectations of each team member during the project life cycle (Chinowsky & Rojas, 2003).

In contrast to traditional project teams, virtual team leaders are given a broader pool from which they can choose team members (Beranek, et al., 2005). Even though project managers have a broader resource pool to choose from, they encounter the challenge to recruit, select and retain team members who have a balance of technical and interpersonal skills (Kirkman, et al., 2002). Project managers should manage the mixture among team member knowledge, background and work process in order to ensure project success (Beranek, et al., 2005).

Virtual project leaders should motivate and support individual team members on a regular basis to encourage participating during the critical project states (Beranek, et al., 2005). According to Dube and Pare (2001), project managers should review and discuss issues with open mind taking into consideration that they manage multicultural teams.

Project success and communication.

Communication is considered a key factor for project success and effective project management. Moreover, communication is a competency that project leaders should master (Brandel, 2006). The review of the selected references identified a consensus among authors regarding the importance of communication in project success. Biggs states that the root of most project failures has to do with the lack of communication in one form or another (2000). Bharadwaj and Saxena (2006) emphasize the importance of remote communications to ensure collaboration in global virtual teams. Townsend et al (1998) state that team success depends on effective communications and knowledge sharing among members.

The Project Management Institute (2004) states that the three types of communications found in projects are internal, external and change management. In addition, it defines project communications as "the knowledge area that employs the processes required to ensure timely and appropriate generations, collection, distribution, storage, retrieval and ultimate disposition of project information" (p. 221). Effective project communication includes designing the right message, selecting the correct medium and messenger (Weaver, 2007).

According to Gale (2005), project teams should prepare a formal communication strategy documenting their goals, expectations and communication strategies. Team members should participate in team meetings taking responsibility for being heard and understood. Continuous and early communication is essential to reduce the effort to coordinate tasks and resources (Beranek, et al., 2005).

Goodbody highlights three important factors critical to maintain effective communication within virtual teams. The first factor is to select the appropriate technology for the tasks being undertaken and the infrastructure available to all members. The second factor has to do with sharing information proactively which is very helpful where members do not all speak the same first language. The final factor to maintain effective communication is facilitating team meetings, meetings can be dominated by one or two individuals without facilitation (Goodbody, 2005).

Communication technologies.

In a virtual communication environment, virtual teams rely on information and communication technologies to facilitate knowledge exchange, transfer and sharing (Zakaria, et al., 2004). Information technologies are considered indispensable tools for multinational corporations that decide to implement dispersed teams and build a virtual workplace (Zakaria, et al., 2004). Communication technologies have the capacity to minimize cultural challenges present in virtual teams by introducing a share framework and virtual work setting which foster team interaction. They can be considered functional tools that facilitate cross cultural collaboration and communication (Zakaria, et al., 2004)

A common finding within the selected references suggests that communication technology is not the critical factor to succeed in virtual environments. It requires elements such as trust, relational bonds, learning capabilities, team interaction and good leadership to foster a collaborative permissive space (Zakaria, et al., 2004). It is also important for the project team to establish norms describing the frequency and rules to access the communication tools (Chinowsky &

Rojas, 2003). In general terms, communication technologies provide the opportunity for frequent, easy, and low cost communication; however, they can introduce issues that impact collaboration (Grosse, 2002).

Part 2: Communication Challenges in Virtual Teams

The objective of the second section is to present the key communication challenges faced by project managers of virtual teams. This section allows project managers to become familiar with specific communication challenges such as compensating for the lack of face to face interaction and building trust.

Communication process.

The number of communication channels increases as virtual teams incorporate more team members (Krishnasamy, 2007). According to Zakaria, et al. (2004), the process of communicating is dynamic, multifaceted and complex. Cultural conditioning affects the evaluation of experience and the means by which information and knowledge is conveyed.

Zakaria, et al. (2004) state that miscommunication happens due to the sender's inability to shape the information in an appropriate and understandable form for the receiver. The previous statement is particularly true in a cross-cultural setting.

The communication process is often enabled by the transmission of information using multiple dimensions such as visual cues and voice modulations. These dimensions can be misleading in cross cultural teams or completely omitted in a virtual environment (Zakaria, et al., 2004).

According to Zakaria et al. (2004), members from different cultures do not share the same perceptions; therefore, they understand and describe team objectives and activities in different terms. It is important that team leaders are aware of this situation and anticipate any potential issues (Zakaria, et al., 2004).

Synchronous and asynchronous communication.

Synchronous communications enable team interaction real time (Bharadwaj & Saxena, 2006). According to Pitagorsky (2007), synchronous meetings streamline communications and foster effective discussion of complex issues.

Asynchronous communications facilitate delayed interaction among team members (Bharadwaj & Saxena, 2006). Pitagorsky (2007) emphasizes that participants should respond in a timely manner to keep communication and progress constantly moving ahead (Beranek, et al., 2005). Asynchronous meetings require writing which promotes greater precision and accuracy. This type of communication facilitates scheduling meetings across different time zones (Pitagorsky, 2007).

According to Pitagorsky (2007), virtual teams should determine when to work synchronously and asynchronously. Some groups prefer to reserve synchronous communications for complex issues and checkpoint meetings (Pitagorsky, 2007).

Communication challenges for project managers.

The selected literature provides extensive information about the communication challenges present in virtual teams and faced by project managers. After reviewing the collected references and identifying common patterns, Roebuck et al. (2004) presents an inclusive approach to present these challenges.

According to Roebuck et al. (2004), the first communication challenge is compensating for the lack of face to face interaction. When communicating in a traditional collocated environment, team members depend upon nonverbal cues to determine if their message is understood (Roebuck et al., 2004). As described in previous sections, virtual teams interact in a non traditional environment where members are unable to rely on cues such as voice levels, smiles and raised eyebrows to ensure that communication is clear (Roebuck et al., 2004). In addition, the absence of the nonverbal cues poses difficulties for members whose cultures depend heavily on body language, facial expressions and proximity (Zakaria, et al., 2004) Zakaria, et al. (2004) exemplify their argument by stating that people from high context cultures appreciate subtle and indirect speech when communicating.

Even though communication is not the only factor that impacts collaboration, it is considered important for effective team collaboration (Zakaria, et al., 2004). According to Roebuck et al.

(2004), virtual teams can fail without communication strategies to compensate for the lack of face to face interaction.

The second communication challenge is building relationships. Roebuck et al. (2004) note that trust is an important component to establish relationships and it is difficult to build without face to face interaction. Virtual teams face the challenge of building trust through technological interaction alone (Roebuck et al., 2004).

A third communication challenge according to Roebuck et al., (2004) is "accessing and leveraging the unique knowledge of each team member to successfully achieve the team's goal" (p. 360). Each team member is responsible for completing a separate piece of a project; therefore, members are likely to encounter information irrelevant to their specific tasks. Without a formal system for sharing knowledge and information, team members can oversee and lose critical data (Roebuck et al., 2004). Roebuck et al. (2004) state that the main issue to be addressed is the importance of sharing information to ensure that nothing relevant is lost.

Other challenges can develop as a result of the communication tools being used. For example, team members can not use electronic mail as a collective means of communication because they can select to whom they send messages leaving key project stakeholders uninformed (Chiocchio, 2007). Team members may experience difficulty identifying how messages fit within the overall context of group communication (Kayworth & Leidner, 2002).

According to Kayworth and Leidner (2002), information overload represents a challenge for team members interacting in asynchronous environments. Members tend to send longer and more crafted messages which take longer time to decipher and respond (Kayworth & Leidner, 2002). Chinowsky and Rojas (2003), note that the amount of electronic communication increases for every member of the team. Also, they state that virtual teams have fewer opportunities to informally discuss project solutions which increase the risk of exponential communication growth.

According to Dube and Pare (2001), cultural diversity represents a challenge for global virtual teams despite of the potential richness that they offer. People from different cultures have diverse communication styles and languages which foster communication barriers. The fact that one or more team members have to speak in a foreign language can cause miscommunication and jeopardize team performance (Dube & Pare, 2001). Team members tend to filter information through inherent cultural biases which can generate communication distortions (Kayworth & Leidner, 2002).

Part 3: Virtual Interaction Technologies

The goal of the third and final section is to formulate the interaction technology tools that address some of the communication challenges faced by virtual teams. The communication challenges introduced in part two include compensating for the lack of face to face interaction, building relationships, accessing and leveraging the unique knowledge of each team member, uninformed project stakeholders and information overload. The audience for this review, project

managers, should evaluate the promised benefits offered by the tools, keeping in mind the communication challenges introduced in part two.

According to Chinowsky and Rojas (2003), collaboration tools have the capability to enable synchronous, real time manipulation of common project data from a central location. Team members can visually and orally communicate as well as manipulate shared data exchange (Chinowsky & Rojas, 2003).

Collaboration Technologies

Chinowsky and Rojas (2003) explain that collaboration tools can be classified in three major areas: information management, conferencing and project management.

Information management technologies.

Chinowsky and Rojas (2003) affirm that information management tools assist virtual team members to exchange and manage data. These tools can be used to address the communication challenge related to uninformed project stakeholders.

Some of the exchange tools include electronic mail, file transfer protocol or FTP and portable document format or PDF. These tools are popular because they support asynchronous communications (Chinowsky & Rojas, 2003). Data management tools include systems such as document management, database management and workflow automation tools. Chinowsky and Rojas (2003) note that data management tools do not perform well in a virtual environment when

members from different organizations have to share data. Organizations may support different applications and interoperability issues might arise (Chinowsky & Rojas, 2003).

According to Grosse (2002), it is estimated that virtual teams communicate 75 to 80 percent via electronic mail. It presents advantages for team members from different language and cultural backgrounds, because it allows time for people to compose and process messages (Grosse, 2002).

Conferencing technologies.

Chinowsky and Rojas (2003) suggest that conferencing technologies help virtual team members to meet in virtual environments and discuss ideas synchronously. Some conferencing tools include chat rooms, instant messaging, whiteboards and videoconference. According to Chinowsky and Rojas (2003), these tools work well for informal meetings, however the lack of tracking documentation makes their implementation difficult for formal meetings.

Dube and Pare (2001) state that videoconference may help alleviate the lack of physical interaction present in virtual teams. Using a videoconference in an initial meeting enables team members to be introduced on a more personal level.

Matassa (2007) explains that instant messaging promotes immediate communication among people who share a network. A person can carry out a number of diverse conversations simultaneously without leaving their location.

As previously stated by Chinowsky and Rojas (2003), conferencing tools nurture informal communications which compensate for the lack of face to face interactions and assist building relationships.

Project management technologies.

Project management technologies help virtual team members create their own collaborative work environments (Chinowsky & Rojas, 2003) According to Chinowsky and Rojas (2003), these tools have been designed to overcome the interoperability limitations and the lack of documentation encountered by information management and conferencing technologies.

These technologies consolidate a variety of tools in a unified environment supporting electronic mail, FTP, PDF, application viewers, document management, data management, work flow automation, instant messaging, chat rooms, whiteboards and video conferencing (Chinowsky & Rojas, 2003). Mattson (2005) notes that project management technologies are communication and collaboration tools that create a central location for the data generated during the project duration. According to Matassa (2007), project management technologies are used to track, document and report on project performance.

Project management technologies contain features that promise to address most of the communication challenges presented in part two. According to Chinowsky and Rojas (2003), these technologies foster collaborative environments which assist virtual teams compensating for the lack of face to face interaction, building relationships, managing information overload and

accessing and leveraging team members' skills to ensure that knowledge and information is not lost.

Conclusions

The main goal of this study is to provide a Review of Literature concerning the communication challenges faced by project managers in virtual teams and the collaboration tools that can address these challenges.

As a response to the present global and competitive business environment, many organizations have adopted emergent team-based and geographically distributed structures known as virtual teams (Bharadwaj & Saxena, 2006). Virtual teams are groups of people who work interdependently with shared purpose across space, time, and organization boundaries using technology to communicate and collaborate (Kirkman et.al., 2002). Virtual teams are increasingly popular given the common use of share resources, increasing number of cross organizational projects, partnering and outsourcing (Pitagorsky, 2007).

Throughout the selected references, authors describe a variety of benefits that companies may obtain from virtual teams. According to McLean (2007), virtual teams enable organizational and individual task flexibility by allowing project managers to select resources regardless of their geographical location. Also, McLean (2007) believes that they facilitate a reduction in overhead, labor cost and improve resource utilization. In addition, virtual teams allow the access to a wide and diverse knowledge and perspectives without relocating resources (McLean, 2007).

Beranek et al. (2005) define virtual team leaders as the people who "must actively manage the combination of team member knowledge, background and work process familiarity to ensure project success" (p. 250). The primary role of project managers is to establish and manage an

electronic workplace based on a variety of communication and collaborative tools that support their teams (Dube & Pare, 2001). Even though project managers have a broader resource pool to choose from, they encounter the challenge to recruit, select and retain team members who have a balance of technical and interpersonal skills (Kirkman, et al., 2002).

Communication is considered a key factor for project success and effective project management. Moreover, communication is a competency that project leaders should master (Brandel, 2006). A common finding within the selected references suggests that communication technology is not the critical factor to succeed in virtual environments. It requires elements such as trust, relational bonds, learning capabilities, team interaction and good leadership to foster a collaborative permissive space (Zakaria, et al., 2004).

The communication process is often enabled by the transmission of information using multiple dimensions such as visual cues and voice modulations. These dimensions can be misleading in cross cultural teams or completely omitted in a virtual environment (Zakaria, et al., 2004). The communication within virtual teams is enabled by using virtual interaction technologies which foster interdependence between team members. Skillful application of these technologies can promote equality, participation, reduce organizational hierarchy and enhance member participation in virtual meetings (Zakaria, et al., 2004). However, the same authors, Zakaria et al., note that the "human component in the virtual environment facilitates or hinders the development of a shared knowledge culture and organizational learning" (p. 15). Table 2 provides a summary of the collaboration tools identified from the selected references, aligned with the communication challenges being addressed by these technologies.

Collaboration technologies have the capability to enable synchronous, real time manipulation of common project data from a central location. Chinowsky and Rojas (2003) explain that collaboration tools can be classified in three major areas: information management, conferencing and project management. The table is designed to provide project managers the opportunity to evaluate the benefits offered by the tools, keeping in mind the communication challenges introduced in part two.

Collaboration Tool	***Description***	***Communication Challenges***
Information Management Technologies	Enable virtual team members to exchange and manage data. Some tools include electronic mail, file transfer protocol and portable document format. Tools support asynchronous communications and allow time to compose and process messages.	• Uninformed project stakeholders
Conferencing Technologies	Assist virtual team members to meet in virtual environments and discuss ideas synchronously. Some conferencing tools include chat rooms, instant messaging, whiteboards and videoconference. Tools work well for informal meetings.	• Compensate for the lack of face to face interaction • Assist building relationships • Manage information overload
Project Management Technologies	Enable virtual team members to create their own collaborative environments. These tools overcome the limitations encountered by information management and conferencing technologies.	• Compensate for the lack of face to face interaction • Assist building relationships • Manage information overload

Collaboration Tool	Description	Communication Challenges
	These tools consolidate a variety of tools in a unified environment supporting electronic mail, FTP, PDF, application viewers, document management, data management, work flow automation, instant messaging, chat rooms, whiteboards and video conferencing	• Access and leverage members' skills to ensure that knowledge and information is not lost

Table 2: Collaboration Tools and the Communication Challenges They Address

According to Roebuck et al. (2004), the first communication challenge is compensating for the lack of face to face interaction. When communicating in a traditional collocated environment, team members depend upon nonverbal cues to determine if their message is understood (Roebuck et al., 2004). The second communication challenge is building relationships. Roebuck et al. (2004) note that trust is an important component to establish relationships and it is difficult to build without face to face interaction. Virtual teams face the challenge of building trust through technological interaction alone (Roebuck et al., 2004). A third communication challenge according to Roebuck et al., (2004) is "accessing and leveraging the unique knowledge of each team member to successfully achieve the team's goal" (p. 360). Without a formal system for sharing knowledge and information, team members can oversee and lose critical data (Roebuck et al., 2004).

Two additional elements come into play. First, according to Kayworth and Leidner (2002), information overload represents a challenge for team members interacting in asynchronous environments. Members tend to send longer and more crafted messages which take longer time to decipher and respond (Kayworth & Leidner, 2002). According to Dube and Pare (2001),

cultural diversity represents a challenge for global virtual teams despite of the potential richness that they offer. People from different cultures have diverse communication styles and languages which foster communication barriers.

Finally, authors agree that trust can be difficult to build, because of the geographical dispersion and lack of physical interaction (McLean, 2007). Language barriers can have a negative impact on interpersonal relationships, trust and the overall work culture within the team (McLean, 2007). As a result, team members are likely to experience information overload, social isolation and uneven power distribution (Zakaria, et al., 2004).

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