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Train to Work Effectively in Virtual Environments: A Framework of Virtual Team Competency

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Abstract

Due to increasing industry demand for personnel who work effectively in virtual/distributed teams, MIS students should undergo training to improve their competence in virtual teamwork. This conceptual paper proposes a four-dimension framework for virtual teamwork training: Goal, Process, People and Technology. Purposes for these dimensions are identified, activities that team members need to engage in to achieve the purposes are explained, information technologies that can be used to facilitate these activities are listed, and teaching tips for each dimension are discussed.

Keywords

Virtual teams, distributed teams, virtual team competency, virtual team training, virtual project, distributed project

Introduction

Virtual teams and virtual teamwork are pervasive organization phenomenon nowadays, due to the globalization of business and advancement of information technology (e.g., Cohen and Gibson, 2003; Powell, Piccoli and Ives 2004). Whereas a team is a group of people who work toward a common goal, teamwork is the process that a team employs (including both individual and group activities that team members engage in) to achieve that goal. A virtual team refers to a team that relies heavily on computer-mediated communication (CMC) and typically has members who are dispersed geographically (Cohen and Gibson, 2003). In this paper, we use the term “virtual teamwork” to refer to teamwork that is conducted via CMC regardless of team members’ geographical locations.

Among the potential advantages of virtual teamwork are the possibilities of securing resources from multiple locations, generating synergy among team members with diverse backgrounds, and reducing costs by employing cost-effective labor wherever it may be located. As a result, deployment of virtual teams and virtual teamwork is a burgeoning trend (Cohen and Gibson, 2003; Powell, et al. 2004). In fact, virtual teamwork is becoming the norm and not the exception (Willmore, 2003, p. 5). A report from Project Management Institute, in which a salary survey of project management professionals indicated that 21% of the respondents worked on a project involving multiple states or provinces, and 15% worked on a project involving multiple continents, provides support for this claim (Project Management Fact Book, 2001; Rad and Levin, 2003, p. 7). Therefore, the ability to work effectively in a virtual environment has become an important job skill for both IT professionals and knowledge workers in general. However, difficulties involved in both communication and coordination make the process of actually engaging in virtual teamwork a demanding exercise (Bourgault, Lefebvre, Lefebvre, Pellerin and Elia 2002; Jonsson, Novosel, Lillieskold and Eriksson 2001; Powell et al., 2004). To prepare MIS graduates for current job market demands, we need to incorporate virtual teamwork training into MIS curriculum to increase their competence in performing virtual teamwork.

Unfortunately, current virtual teamwork training in MIS curriculum is largely an ad hoc approach. Although a number of MIS instructors have incorporated virtual projects into their classes (e.g., Jarvenpaa and Leidner, 1999; Massey, Montoya-Weiss and Hung 2002; Weisband, 2002; Paul, Seetharaman, Samarah and Mykytyn, 2005; Qureshi, Liu and Vogel, 2005; Sarker and Grewal, 2002; Sutanto, Phang, Kuan, Kankanhalli and Tan, 2005; Beranek and Martz, 2005), MIS curriculum rarely contain a formal virtual teamwork component. Much of the current literature describing classes that have incorporated a virtual teamwork component are problematic in that the classes have been explicitly designed for research. In other words, the researchers or instructors required students to engage in virtual projects as part of the course primarily because they wanted to investigate the phenomenon of virtual teamwork itself. Providing the students with training in virtual teamwork was not the objective, or at least not the primary objective. Thus instructors may very likely have implemented virtual projects without the explicit objective of teaching students how to perform effectively in a virtual environment. Student learning in many of these scenarios may have only been marginal due to inadequate structure and insufficient guidance from their instructors. Even if MIS instructors want to incorporate virtual teamwork training into their classes, they may not be comfortable doing so due to limited experience performing virtual teamwork and a lack of textbooks which cover virtual teamwork training.

Powell and his colleagues found through meta-analysis of early research that nearly any type of virtual teamwork training benefits the team (Powell et al., 2004). Furthermore, the authors state that “little is understood in terms of what constitute appropriate training.” Consequently, the authors call for research to prioritize training topics so that a greater return on investment can be gained by teaching programs which are invariably faced with time and resource constraints. While we agree in principal with this call for research, we believe that a general framework of virtual teamwork competency should be developed first before researchers engage in prioritizing virtual team training topics.

One problem with prioritizing training topics without a framework for guidance is that different researchers may employ widely varying levels of abstraction. For example, a broad topic may be decomposed into a variety of narrower topics to an arbitrary depth, in which case the task of identifying which training topics are more useful than others would more resemble an ad hoc search rather than a systematic exploration. Therefore, our response to the research call of Powell and his colleagues is the development of a general training framework of virtual teamwork competency. We believe that such a framework will provide some initial guidance for instructors who would like to incorporate virtual teamwork training in their classes.

Because training involves more than selecting appropriate topics, our approach to developing the training framework is to categorize virtual teamwork into major dimensions in a holistic yet parsimonious manner. For each dimension, we identify intended purposes, specify team activities and project deliverables, list information technologies that can be used to facilitate these activities, and provide teaching tips.

The balance of this paper is structured as follows: section 2 describes the training framework of virtual team competency, section 3 explains how the framework can be used for virtual teamwork training, and section 4 discusses future research directions.

A Framework of Virtual Team Competency Training

Regardless of team projects domain, four major dimensions of teamwork – Goal, Process, People, and Technology - can be derived from existing literature. These dimensions are repeatedly mentioned by different authors in their definition of team.

A team is “a collection of individuals who are interdependent in their tasks, share responsibility for outcomes, see themselves and are viewed by others as an intact social unit embedded in one or more social systems, and collectively manage their relationships across organizational boundaries (Hackman, 1987; Alderfer, 1977)” (Cohen and Gibson 2003). In this definition, “a collection of individuals” are People, “tasks” and “outcomes” are Goal related, and “manage” is one aspect of Process.

Parker (1994) defines a team as a group of people with a high degree of interdependence geared toward the achievement of a goal or the completion of a task. In this definition, even though Process is not explicitly mentioned, the word “achievement” and “completion” implies “doing” or “working” on something.

A team is “a small number of people with complementary skills who are committed to a common purpose, performance goals, and approach for which they hold themselves mutually accountable” (Katzenbach and Smith 2003, p.45). In this definition, all three dimensions are readily apparent, since “approach” can be another word for Process.

Even though not every definition of team quoted above explicitly mentions the dimension of Process, we content that Process is an integral component of teamwork, since “the team’s process is the life blood of its performance.” (Syer and Connolly, 1996, p.29).

A defining dimension of a virtual team, missing from our example definitions of an ordinary team, is Technology. Technology use has become a way of life. In industrialized countries, it is difficult to imagine how a team can conduct any nontrivial project without using communication technology such as telephones, email, and the Internet. In fact, three of the four dimensions that we identified (i.e. people, process, and technology) have been discussed in research areas such as software engineering (Khodabandeh and Palazzi, 1994), customer relationship management (Goldenberg, 2002), and risk management (Noyes, 2004). However, researchers in these different areas define these dimensions differently. In this paper, we define these dimensions in the context of teamwork and, more particularly, virtual teamwork. In sum: Goal refers to team objectives and their context; Process is the approach used to achieve the team’s goals; People encompasses team composition and the negotiation and separation of duties; and Technology, as illustrated by Figure 1, provides a platform or environment supporting the three other dimensions.

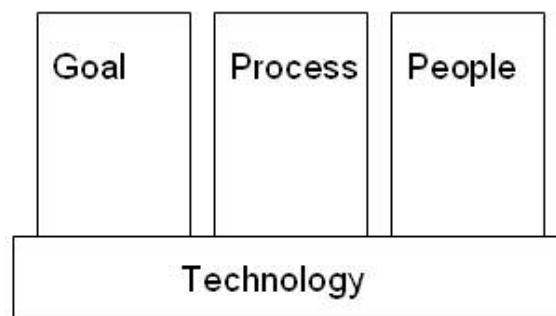


Figure 1: Four Dimensions of Virtual Teamwork

Goal

If we compare engaging in a team project to going on a journey, a team goal is like the destination of the journey. Without a clearly defined destination (e.g. a physical address), getting to the desired destination is unlikely. Similarly, without a clearly-defined, commonly-acknowledged, and well-understood team goal, the possibility that team effort will lead to a desired outcomes is slim. Teams may spend valuable time and resources engaging in unnecessary tasks and therefore leaving fewer resources for important tasks. As a consequence, teams may experience time and budget overruns, poor quality of deliverables, or even cancellation of the project itself. In fact, clear articulation of the team goal is regarded as the most important characteristics of a high performance team (e.g., Wheelan, 1999 p. 39; Katzenbach and Smith, 2003 p. 49). The importance of a clearly defined and commonly agreed goal is more pronounced for virtual teams, since team members may

be from different national or organizational cultures and may not have a history of working together. Lack of a common frame of reference can easily lead to a misunderstanding of the team goals or to different priorities being observed among several goals. As a result, team effort may be misdirected or wasted entirely.

If a project is small and involves only one or two stake holders, it may be easy to define the project goal. However, if the project is large and involves multiple stake holders, a strategy or formal procedure for goal identification may be needed. A project charter is very useful here. A project charter describes what needs to be achieved and provides contextual information. It includes commonly acknowledged objectives, identifies project stakeholders and their priorities, and lists major driving forces and obstacles. Without the contextual information, both the definition and understanding of project goals remains incomplete. For example, if project stakeholders have different priorities, or the project lacks important drivers or obstacles out-weigh drivers, the chance of achieving the project goal is severely diminished. Increasing clarity surrounding team goals increases congruence among and between the team members and the various stakeholders. This shared understanding is crucial for the success of any team effort (Briggs 1994). For any non-trivial project, definition of team goals and associated contextual information should be the first and most important thing the team does before engaging in other project activities.

In the journey analogy, contextual information for the goals might be a description of the physical landscape of the destination: is the destination on the top of a mountain, deep in a valley, or across a big river? A clear idea of the physical landscape helps team members to estimate how likely they are to reach their destination given the available resources, how much effort should be expected, what the risks might be, and what kind of tools and strategies will be needed.

Communication technologies (e.g., email, Web conferencing) are needed here. Software that can support group decision making, such as Groupware or Group Support Systems (GSS), are particularly useful for facilitating the definition of the project charter. GSS allow participants to engage in divergent thinking (e.g., idea generation and issue exploration) and convergent thinking (e.g., idea organization and consensus polling), which are necessary for group decision making. Therefore, project members and in conjunction with project stake holders can use GSS to surface hidden agendas, negotiate priorities among goals, and identify factors that may facilitate or impede the project success. Since all project stake holders can be involved in the process of defining the project charter, it is likely that every party's needs are considered and accommodated. This greatly increases commitment to the project goals from all stake holders.

The focus of training for the Goal dimension is to encourage students to clearly define the team goal by going through a formal decision making process: generating ideas, organizing ideas, ranking and discussing ideas, and selecting promising ideas as the solution. Meanwhile, instructors may want students to use Groupware or a GSS such as GSII to support the group decision making process, namely, defining the project charter for a class project or for some hypothetical project. Instructors can provide a sample project charter for students to use as a template.

Process

After the destination is clearly defined, a map is needed to get the team from the starting point to the destination. This map is the project plan. It includes at least the following things: breaking the project into manageable tasks and milestones, identifying resources (e.g., human resources, time, and budget), and allocating resources to the various tasks (e.g. team members' assignment, scheduling, and budgeting). Armed with a well-defined destination and a detailed map, the team can move with confidence toward their destination. Process herein refers to the common approach that the team adopts in order to achieve the team goals. It has been suggested that team members should invest "just as much time and effort crafting their working approach as shaping their purpose" (Katzenbach and Smith, 2003, p. 56). The purpose of formally defining the group process is to increase process visibility so that team members have a better understanding of what is going on, what needs to be done next, and who is accountable for what. In addition, clear processes allow mistakes to be detected and corrected early and helps insure that risks and changes are constantly monitored and controlled. In virtual teams, process management is more important and yet more difficult to conduct due to the fact that face-to-face communication is greatly reduced or even eliminated and team managers can not adopt a traditional "manage-by-watching" technique.

To effectively manage process, team members need to develop team norms and establish ground rules concerning the team's approach to communication, project management (PM), and document management. Without established norms and ground rules in these areas, team members will be uncertain of what to expect from others and whether or not their own behavior meets others' expectations. As a result, team collaboration and performance will suffer.

Teams can form norms and ground rules by using a top-down approach or a bottom-up approach. In the top-down approach, team members identify good practices from literature and other sources then explicitly communicate and require team members to follow these practices. In the bottom-up approach, rules gradually evolve over the course of project execution. As practices evolve, the team makes the customs or rules explicit and requires all members to follow them.

Communication

Communication is essential for any team effort or collaboration. As Jones and his colleagues pointed out, “the single most critical component that makes teamwork possible is effective communication” (Jones, Oyung and Pace, 2005, p. xviii). Since virtual teams rely heavily if not entirely on CMC, CMC is an integral component of Process. The importance of CMC is highlighted by Hoefling when he states that “virtual work is supported or derailed often because of communication habits, patterns, and processes” (Hoefling, 2001, p. 103).

The communication training focus is to have students become familiar with the features of different types of CMC and be able to use appropriate CMC in different situation to achieve both efficiency and communications effectiveness. CMC technologies that allow text-based communication (such as email, electronic bulletin board, and instant messaging) are efficient and effective for simple information exchange, whereas CMC technologies that allow communication in voice (such as video conferencing and telephony) are efficient and effective for discussion, negotiation, and group consensus building. Usually, students are familiar with email, instant messaging (e.g, Yahoo Messenger), and courseware (e.g, Blackboard and WebCT). Instructors may want students to experience using other CMC technologies such as electronic message boards (e.g. Yahoo!Groups) and Web Conferencing (e.g., WebEx and freeConferenceCall.com). Yahoo!Groups allows team members to post messages, send emails, and share and achieve documents. It is easy to use and free of charge.

Web conferencing technology is both widely used in industry and is gaining in popularity. It allows individuals from different locations to share their computer desktops and applications while communicating via telephone. Web conferencing thus allows distributed persons to simultaneously attend an online presentation, participate in a real-time discussion, and work on a shared copy of a document. The advantage of using Web conferencing is that participants can communicate orally while simultaneously viewing visual aids displayed on the computer monitor. Moreover, setting up a Web conference is usually easier than setting up a traditional video conference. We recommend that student teams avoid using traditional video conferencing due to the expense and support requirements for using specialized video equipment.

In addition to learning how to use particular CMC technologies, students also need to be familiar with desirable CMC usage behaviors. Previous research has identified that frequent, predictable, timely, and substantive communication enhances communication effectiveness (e.g., Jarvenpaa & Leidner, 1999; Weisband, 2002). In predictable communication, a participant lets others know when she is available to communicate. Timely communication refers to reading and replying to messages in a timely manner; for example, a team may observe the convention that messages have to be read and answered within 24 hours. Substantive communication specifies that team members read messages thoroughly and reply to messages accordingly. If the communication technology employed is synchronous (such as Web and audio conferencing), equipment should be set up and fully tested before its scheduled use and participants should be on time to participate in the meeting.

The training focus for CMC is to allow students to use different types of CMC efficiently and effectively. Instructors can require teams to formulate a team communication agreement which specifies norms and regulations to guide their CMC practices. Instructors may also want to provide a list of useful CMC for students to explore and use.

Project Management

In addition to communication, project management (PM) is another important aspect of virtual teamwork process since “virtual teamwork is in most cases organized as project work” (Pauleen, 2004, p.150). Virtual team members need to learn basic PM techniques which can be viewed from three perspectives: 1) according to the Project Management Institute (PMI) Fact Book, PM effort can be categorized into nine PM knowledge areas: time, scope, cost, integration, quality, human resource, communication, risk, and procurement management (Project Management Fact Book, 2001); 2) PM effort can also be viewed as a project life cycle consisting of four stages: understanding the project, planning the project, tracking and controlling project execution, and closing the project (Lewis, 2001); 3) PM effort focuses on balancing three major elements: cost, scope, and quality of the project. These three elements form the project triangle: changing any elements in the project

triangle affect one or more of the other elements. Project managers and team members therefore will often need to weigh the tradeoffs among these three elements.

Among the various elements of PM, one critical success factor is tracking and controlling project execution in support of project goals and plans (Chen, Romano and Nunamaker, 2006). During project execution, progress towards task deadlines needs to be monitored while any problem that arises needs to be addressed. Whenever actions are taken to address specific problems, those corrective actions need to be monitored as well. Project progress tracking is important to ensure that there is no confusion regarding project tasks and priorities and that tasks are handed off smoothly from one team member to the next (Chen et al., 2006). In our journey analogy, project tracking functions like checking off physical landmarks against the road map to make sure that one is moving toward instead away from the destination. The importance of project tracking is emphasized by (Jones et al., 2005. p. 117).

Inside the team, it will be essential to have regular status meetings and checkpoints so everyone understands their responsibilities and the dependence on other team members and their deliverables are clear. Publishing an overall plan of record, or dashboard, to track these items is one way to accomplish this task. These documents also could be leveraged for communicating outside of the team.

The objective of project tracking is to increase awareness and visibility of a project's process, which in turn increases the likelihood of project success (Chen et al., 2006). The importance of project process visibility is emphasized by (Jones et al., 2005, p. 117).

One of the major challenges in managing a virtual team is ensuring that there is visibility inside the team in relation to what each member is doing, and that outside the team, sponsors and stakeholders are kept informed of status, issues, and milestones.

There is a variety of software that supports different PM functions. Products such as Microsoft ProjectTM support essential PM functions such as scheduling, budgeting, task interdependence analysis, and task progress tracking. When a team consists of more than two or three members, a group calendaring tool or service is very useful for scheduling group activities. For example, Google Group Calendar provides a free service, and OfficeCalendar allows users to extend Microsoft Outlook to include group calendaring functions.

The training focus for PM is to encourage students to perform basic PM functions using appropriate software and to conduct regular meetings to track project status. Deliverables from team PM meetings may include meeting minutes and a periodic project progress report. Instructors may want to provide a list of PM software and a sample of meeting minutes and a project progress report.

Document Management

For a non-trivial project, document management should also be an important aspect of the Process dimension. A centralized electronic repository needs to be created to archive all project-related documents since a paper-based repository has several drawbacks including retrieval delays and misplaced documents. A complete document management solution (e.g., Documentum, Livelink) is usually Web-based and provides such functionality as uploading, downloading, document version control, key word search, full-text search, and role-based document access. However, not all teams are able to afford a full-fledged document management system. If this is the case, the team should at least create and observe a documents naming convention and learn how to archive all documents in an organized manner to facilitate easy access and safe storage. For a class project, students may use courseware (e.g., Blackboard, WebCT) and free online service such as Yahoo!Groups to store and share documents.

Since most classes are not able to afford a full-fledged document management system, the training emphasis for document management is conceptual learning. Instructors may want to require student teams to write a report on the subject of document management systems so that students learn what functions this type of software provides and what the major players are in the document management software market.

The third major dimension of teamwork is People. As emphasized by Katzenbach and Smith (2003, p. 41) “the most critical factor in the development of a high-performance team lies in the initial selection of its members”. The purpose of this dimension is to establish strong interpersonal relationships and specify an appropriate team structure. To achieve this purpose, team members can engage in activities that address four domains: team learning, interpersonal relationships, leadership, and cultural sensitivity. For a non-trivial project, team members may need to enhance the knowledge and skills that they already possess and identify individual team members’ strengths and weaknesses so that they learn new skills from one another. Team members may also need to plan the acquisition knowledge and skills that are required by the project and yet not possessed by any team members. More importantly, the team needs to develop a learning orientation, constantly observe and reflect upon the team process, and learn from its own effective and ineffective practices.

Interpersonal relationships are concerned with whether or not team members establish favorable social judgments towards each other. These judgments are often manifested in varying degrees of trust and group cohesion. Previous research has shown that teams with high levels of both trust and group cohesion are usually more committed to their project and usually produce higher quality deliverables (e.g., Jarvenpaa and Leidner, 1999; Powell et al., 2004). To develop, maintain, or enhance interpersonal relationships, self-disclosure of team members’ background information (e.g., education, working experiences, hobbies, family situation), and team building activities (e.g., watching movies, playing games, or lunching together) are necessary (Powell et al., 2004). From our literature review, we have found that nearly all team building activities are designed for face-to-face teams. There is little research into activities that may serve for purposes of distributed virtual team building. In the future research, we plan to investigate this neglected area.

Leadership herein refers to the team structure and control mechanism: is there a single team leader who exercises control in a hierarchical manner or does the team have a flat or network structure in which anyone may take the leaders’ role for a particular task? In virtual teams, traditional supervision, monitoring, and hierarchical control gives way to team self-management. Therefore, virtual team members need to be more highly self-motivated and more proactive than collocated teams. It is often more effective for a team to have a flat structure in which team members actively take initiative and take over the leader’s role for tasks for which they are both competent and confident. As stated by Blackburn, Furst and Rosen (2003) “a skill set critical for virtual team membership includes abilities to behave proactively and manage themselves”. When team members are self-motivated and self-managing, a dedicated team leader can function more like a coordinator rather than a dictatorial decision maker (Chen et al., 2006).

Cultural sensitivity refers to awareness of and appropriate behavior in regards to culture-related issues. Differences in language, organizational culture, and national culture may lead to miscommunication, misunderstanding, and conflict. Team participants need to understand what differences might be encountered and what impacts these may have on teamwork in order to proactively minimize the potential negative impacts of these differences. Organizational culture includes such organizational conventions as reward systems, working habits, and collaboration norms. To understand differences in national cultures, Hofstede’s taxonomy is very helpful (Hofstede, 1980). By acquiring insights into different national cultures, team members may develop tolerance to different behaviors and may resolve conflict more effectively or with greater ease. Table 1 on next page summarizes our training framework.

Using the Framework for Training

Currently, training in virtual teamwork in MIS curricula is still largely an ad hoc approach instead of a systematic approach. There are a variety of books and articles about virtual teamwork, but there are few books or articles on the subject of virtual teamwork training. Recently, Chen et al. (Chen, Sager, Corbitt, and Gardiner, in press) proposed a teaching model of virtual teamwork that consists of two stages: introduction and project execution. In the introduction stage, instructors teach students basic concepts of virtual teamwork. Students learn by reading books or articles about virtual teamwork, listening to lectures, and discussing their understanding of virtual teamwork based on their readings, the lectures, and their personal experiences. In the project execution stage, students engage in virtual team projects over a course of several weeks. During this stage, students learn by engaging in the project, and reflecting upon their practices. However, the paper discussed little about what virtual teamwork topics should be covered in the introduction stage. In this paper, we propose a general framework for virtual teamwork training in order to provide guidance for instructors in choosing lecture topics and searching for and organize teaching materials. The framework may also facilitate students reflection upon their virtual teamwork experiences. For example, the instructor may want to discuss the framework with students before students engage in virtual projects. The instructor might also ask students to periodically revisit the framework during project execution and write down their

experiences related to the concepts that are outlined. At the end of project, the instructor might ask students to write a group report about their virtual teamwork experiences as feedback on the class. A group report based on the framework would not only provide an opportunity for students to learn by reflecting upon their experience, but would provide feedback to help the instructor to improve teaching methods for subsequent classes.

A careful reader may question the usefulness of the framework, since many components of this framework are already addressed by current curriculum. For example, team projects are often an integral part of many classes, and project management is also taught in many programs. The additional value of using the framework is to allow students to develop a deeper appreciation of virtual teamwork, understanding the challenges associated with each dimension and the tactics available to address those challenges. Instructors may put varying emphasis on the four dimensions over a range of different virtual projects.

Discussion

Our framework of virtual team competency is simple, consisting of only the three major dimensions (Goal, Process, and People) and a supporting dimension (Technology). Purposes, activities, deliverables, and information technologies are identified for each dimension. Teaching tips for each dimension are also provided. The next step of research is to investigate validity of this framework. We plan to ask a group of virtual team members from real organizations to evaluate validity and usefulness of this framework. It may be necessary to modify the framework based on the feedback received. We then plan to employ the framework in the classroom and observe its usefulness.

There are primary two limitations of the framework. First, supporting theory for the framework is sparse. Second, there have been no measurements developed for use with the framework. As a result, investigating the utility of the framework may need to be performed using a qualitative (e.g., case study) rather than a quantitative (experimental) approach.

Dimensions	Purposes	Activities	Technologies
Goal	To clearly define commonly agreed goals	To define a project charter for their own project or an imaginary project Deliverable: project charter	Software that facilitates group decision making, groupware or Group Support Systems such as GSII
Process	To increase project process visibility so that mistakes can be easily detected and corrected, risks and changes are monitored and controlled	<p>Communication</p> <ul style="list-style-type: none"> • Be familiar with a variety of CMC and use a combination of them to achieve comm. efficiency and effectiveness <p>Deliverable: team agreement of rules and norms of communication</p> <p>Project Management</p> <ul style="list-style-type: none"> • Understand that PM effort can be viewed from three perspectives: <ul style="list-style-type: none"> ○ PM knowledge areas ○ Project life cycle ○ PM triangle • Define project plan • Conduct project process management with a focus on project status tracking <p>Deliverables: project plan, project meeting minutes, and project progress report</p> <p>Document Management</p> <ul style="list-style-type: none"> • Understand functions of document management system <ul style="list-style-type: none"> ○ Web-based ○ Uploading, downloading ○ Version control ○ Key work search and full text search ○ Role-based access control <p>Deliverables: a report to describe document management systems</p>	<p>CMC</p> <ul style="list-style-type: none"> • Email • Electronic bulletin board (e.g., Yahoo!Groups) • Telephone call • Audio conferencing • Video conferencing • Web conferencing (e.g., WebEx, FreeConferenceCall.com) • Course ware (e.g., blackboard, WebCT) <p>Project Management</p> <ul style="list-style-type: none"> • Software that supports basic PM functions (e.g., Microsoft Project) • Group calendaring (e.g., Google Group Calendar, OfficeCalendar) <p>Document Management</p> <p>Full-fledged document management system such as Documentum and Livelink</p>
People	To build strong interpersonal relationship, and to specify appropriate team structure	<p>Team learning</p> <ul style="list-style-type: none"> • Learn from each other and from team practices <p>Leadership</p> <ul style="list-style-type: none"> • Flat, self-management team structure <p>Interpersonal relationships</p> <ul style="list-style-type: none"> • Engage in self-disclosure and team building activities to achieve high trust and group cohesiveness <p>Culture-sensitivity</p> <ul style="list-style-type: none"> • Learn to be patient and tolerant to differences in language, organizational culture, and national culture 	CMC technologies

Table 1: Dimensions of Virtual Teamwork Competency

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