

## Sharing Knowledge in Global Virtual Teams

*How Do Chinese Team Members Perceive the Impact of National Cultural Differences on Knowledge Sharing?*

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**Abstract.** Virtual teams have been seen as a promising way of organizing work for organizations to cope with the current rapidly changing business environment. Issues concerning virtual teams have received considerable attention in both the academic and practical world. In this paper, a case study approach was used to explore Chinese perceptions of the impact of national cultural difference (China vs. U.S.) on knowledge sharing activities in global virtual teams. Four cultural dimensions (language, education, technology and material culture, and attitudes and values) were identified. The final results show that language has the most salient impact on an individual's knowledge sharing activities, followed by education, attitudes and values, and technology and material culture. Individual characteristics, organizational culture, time zone problems and leadership style all have a mediated impact on knowledge sharing activities.

### 1 Introduction

Knowledge sharing has been treated as a key process in knowledge management practices [1-4]. Recent research on knowledge sharing has identified a variety of factors that lead to effective knowledge sharing, such as motivation [5] and culture [4], but few studies have focused on addressing knowledge sharing activities in different team settings [6]. These challenges become more pronounced in virtual teams, which have been considered as one of the most promising ways of working in the future [7, 8].

Virtual teams are defined as teams that are composed of geographically and/or organizationally dispersed coworkers who are assembled together, mainly by information and communication technologies (ICT), to accomplish one or more organizational tasks [7]. By organizing virtual teams through available ICT (such as email, Internet, videoconferencing, and groupware), organizations can take advantage of the particular skills and expertise of employees without the cost and trouble of traveling and relocating employees [9]. As such, issues concerning virtual teams have received considerable attentions in both the academic and practical world.

Knowledge sharing in virtual teams is different from traditional face-to-face teams. By using ICT, virtual teams can facilitate knowledge sharing in terms of easily organizing diverse backgrounds of the knowledge workers and increasing accessibility to information and knowledge [10, 11]. On the other hand, the geographic, temporal, organizational, and/or cultural discontinuities [12] that may exist in virtual teams can create problems that can hinder knowledge sharing among team members. For example, studies have shown that virtual team settings can create task coordination and communication difficulties [13], dehumanization and social isolation [14], inflexibility of organizational ties [6], etc.. Although knowledge sharing has many challenges in virtual environments, it has been treated as one of the determinant factors of achieving virtual team effectiveness [8, 15].

A number of factors that can affect knowledge sharing have been examined, such as motivation [5, 16], transactive memory [17], boundary spanning [18, 19], technology infrastructure [20, 21], communication norms [22], trust [23], and learning [24]. Some factors become more prominent for knowledge sharing in virtual teams, such as national culture [4, 25], which is the interest of this paper.

This study investigates individuals' perceptions of national cultural differences on knowledge sharing activities in global virtual teams. Specifically, Chinese team members' perceptions of the cultural differences between China (mainland) and the U.S. are studied. The remainder of this paper is organized into four sections. Section 2 provides a literature review, which is based on three areas: national culture, distributed work and knowledge sharing. The research method is illustrated in section 3. Section 4 provides the results of the study, which is followed by a discussion in section 5. Section 6 concludes the paper.

## **2 Literature Review**

### **2.1 Knowledge and Knowledge Sharing**

Although the concept of knowledge sharing is used frequently in many studies [10, 26], exploring and defining what it exactly means remains difficult due to different opinions about what knowledge is. The perspective of knowledge that one holds underlies the conceptualization of knowledge sharing activities [3]. A review of the literature reveals that the epistemological perspective of knowledge is

understood quite differently among scholars. Basically, there are two perspectives: the static perspective and the practice-based perspective.

The static perspective treats knowledge either as a separate, static object that can be easily stored and manipulated or a static state of mind that is difficult to articulate [27]. One of the well-known definitions of knowledge in the static perspective is explicit knowledge and tacit knowledge [28]. The practice-based view posits knowledge as knowing in practice [3, 27] or situated performance [29]. In this perspective, knowledge is enacted in people's everyday practices and is inseparable from daily activities. Knowledge is a situated knowing, constituted and reconstituted in everyday practice.

This paper adopts Alavi and Leidner's [20] definition of knowledge as "personalized information (which may or may not be new, unique, useful, or accurate) related to facts, procedures, concepts, interpretations, ideas, observations, and judgments" (p.109). Knowledge sharing is defined as the exchange of task-related information, know how, and feedback regarding a product or procedure [30].

Knowledge sharing practices are often discussed in traditional collocated environments. Traditionally, knowledge sharing practices have occurred through various means such as personal communication (formal or informal), mentoring, training, job rotation, and staff development [31]. As stated above, a number of factors that can affect knowledge sharing have been examined, but few studies have focused on addressing knowledge sharing activities in different team settings [6]. These challenges are even more pronounced in virtual team settings due to their geographical, organizational, and/or temporal distances and because they mainly rely on ICT to communicate.

## 2.2 Culture and National Culture

There is no unifying definition of the concept of culture, and it is described in very different ways in the literature: ideas and cognition, symbols and meanings, values and ideologies, rules and norms, behavior patterns, structures and practices, etc [32-34]. This paper has adopted Terpstra and Sarathy's [35] definition of culture:

Culture is the integrated sum total of learned behavioral traits that are shared by members of a society." One fundamental is that culture is a total pattern of behavior that is consistent and compatible in its components. It is not a collection of random behaviors, but behaviors that are related and integrated. A second fundamental is culture is learned behavior it is not biologically transmitted. It depends on environment, not heredity. It can be called the man-made part of our environment. The third fundamental is that culture is behavior that is shared by a group of people, a society. It can be considered as the distinctive way of life of a people. (p. 90)

There are also different levels of culture, ranging from supranational (regional, ethnic, religious, linguistic), national, professional, organizational level to group level [36], which may shape members' knowledge sharing behavior simultaneously.

The two most frequently studied level of cultures in the literature are national culture and organizational culture [37]. This research will focus on national culture.

### 2.3 Dimensions of National Culture

The dimensions of national culture identified by Terpstra and Sarathy [35] are used as the basis forming the cultural frame of reference in this paper. Eight dimensions were identified from their research: technology and material culture, language, aesthetics, education, religion, attitudes and values, social organization, and political life. Table 1 lists the definition of each dimension. Although Hofstede's [38] five dimensions (individualism vs. collectivism, power distance, uncertainty avoidance, masculinity vs. femininity, and long-term vs. short-term orientation) are identified as the most popular ones used in IS research [37], Terpstra and Sarathy's dimensions are preferred in this study because they not only include a value-based dimension (which is the focus of Hofstede's dimensions), but also include other important dimensions such as language [4].

**Table 1.** Dimensions of Natural Culture [35]

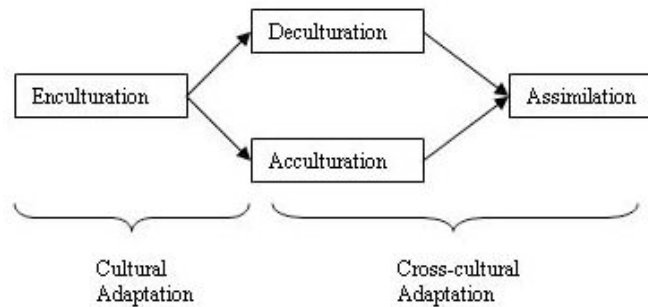
Dimension	Definition
Technology and Material Culture	Material culture includes the tools and artifacts in a society. Technology refers to the techniques or methods of making and using those things.
Language	The native language one speaks
Aesthetics	The ideas in a culture concerning beauty and good taste, as expressed in the arts and the appreciation of color and form.
Education	The process of transmitting skills, ideas, and attitudes, as well as training in particular disciplines
Religion	The religion one holds
Attitudes and values	The belief one holds to help determine what is right, important, desirable, etc.
Social organization	It refers to the way people relate to other people. The primary kind of social organization is based on kinship.
Political life	The political environment around a person

### 2.4 Theory of Cross Cultural Adaptation

In Figure 1, Gudykunst and Kim's theory of cross cultural adaptation process describes how strangers adapt to a new and unfamiliar cultural environment and how their communication activities influence their adaptation [39]. Enculturation takes place in early childhood when the forms for expressing and comprehending basic social behaviors are internalized by socialization with others. When strangers interact with a new culture, the process of resocialization, or acculturation occurs. Strangers begin to detect similarities and differences between the two cultures and make necessary changes to adapt to it. Sometimes they need to unlearn old cultural habits,

which is called deculturation. Through the interaction of acculturation and deculturation, strangers reach assimilation: a high degree of acculturation into the new culture and a high degree of deculturation of the original culture [39].

Though the theory of cross-cultural adaptation is usually used in traditional communication settings, it can be extended to virtual team settings. Communication is important in this study because it entails knowledge sharing activities between team members among cultures. In global virtual team settings, team members are from different cultural backgrounds. When they work together, their diverse cultural backgrounds may affect their understanding of others' behavior, which in turn will influence the overall team performance. So it is not surprising to expect that team members need to understand others culture, realize the difference between the cultures, and make adaptations if necessary to work together effectively.



**Figure 1.** Cross Cultural Adaptation Process [39]

But not all people from the same culture hold the same values and behave in the same way. So it is important to understand individual's perceptions of certain cultural values and how their perceptions of cultural differences influence their behavior, which is the focus of this paper.

### 3 Research Design

#### 3.1 The Research Setting

An embedded case study approach was used to examine individuals' perceptions of national cultural differences on knowledge sharing activities in global virtual teams [40]. To be specific, the cultural differences between China (mainland) and the U.S. were selected mainly for convenience reasons because the researcher is of Chinese nationality and she is a Ph.D. student in a U.S. university. The case study was conducted in a Chinese site of a knowledge-intensive global organization. A survey conducted in this organization revealed that employees are generally dissatisfied with cross-cultural collaboration. With the help of a senior manager from the site, a technology support engineer working team located in the site was selected for the study. The selected team has 15 employees (and other than two American

senior managers, all are Chinese). Most of the Chinese engage in a lot of collaborative work with U.S. colleagues. These Chinese were the research subjects of this study. By focusing on a single organization and a single profession, organizational culture and professional culture variations are controlled, allowing a focus on national cultural differences.

The organization is a global manufacturer of semiconductor chips, servers, and other high-tech products with 80,000 employees worldwide. It has different sites all over the world including the U.S. Russia, Israel, China, India, Malaysia, etc. The working language is English. Beyond being geographically distributed, the organization is also functionally distributed. Coworkers are spread globally, especially in the service areas of finance, information technology, and human resource. The selected work team is from an IT department. The mission of the department is to deliver innovative IT solutions for the product groups in the organization. To provide these services, the work team needs to collaborate closely with other colleagues worldwide.

### **3.2 Data Collection and Analysis**

The data was collected during a period of three months from June 2006 to September 2006 when the researcher worked as an intern at the site. Semi-structured interviews were taken as the primary data collection technique. The interviews were used to collect data on team members' perceptions of the impact of national cultural differences on their knowledge sharing activities with U.S. colleagues. Beyond interview techniques, some secondary methods were also applied to collect supplementary data. First, data about the organization and the team was mainly collected by interviewing the team leaders, attending new employee orientations, and documentation review. The purpose was to understand the organizational culture and team environment in general. On-site observation (chatting with the team members, attending their meetings, and email list observation) was also used to understand the team working style and to develop the interview protocol. The triangulation of various data collection techniques provides richness and depth on the investigated issue [40]. Content analysis [41] was used to analyze the interview data.

The cultural dimensions used in the interview questions were developed by combining previously identified cultural dimensions from the literature [35, 42], results from previous internal research on distributed work in the organization, and informal interviews with the team members. As a result, four cultural dimensions were identified. The definition of each dimension is illustrated in Table 2. Concern for face emphasizes three face concerns: concerns for one's own image, concerns for other's image, and concerns for both parties' images [42]. Concern for face is very deep rooted and influential in China, so here it was chosen as the indicator of attitudes and values. The question "Do you think there are other cultural aspects that influence your knowledge sharing?" was created to capture more cultural attitudes and values that may affect knowledge sharing activities.

**Table 2.** National Cultural Dimensions Used in the Research

<b>Dimensions</b>	<b>Definitions</b>	<b>Indicators in this research</b>
Technology and Material culture	The techniques or methods of making and using technology tools and artifacts	Technology infrastructure and its use
Language	The native language one speaks	Chinese vs. English
Education	The process of transmitting skills, ideas, and attitudes, as well as training in particular disciplines	Technical knowledge one holds
Attitudes and Values	The belief one holds to help determine what is right, important, desirable, etc.	Concern for face

From the previous research conducted in the organization, time zone differences were identified as an important factor that influences distributed collaborations. So it was added to the interview protocol to explore its effect on knowledge sharing activities. A total of 16 questions around these five issues were developed to guide the interviews. The average time for each interview was about 40 minutes. All interviews were recorded in Chinese and transcribed into English text files. The researcher's native Chinese proficiency enabled her to translate Chinese into English without missing important details. After each interview a simple survey was emailed to the interviewee to collect demographic information and basic communication patterns with U.S. colleagues. It was emailed in English and took less than 2 minutes in general to finish. In total, 10 members accepted the interviews (8 male, 2 female). On average, within the total time they spent on collaboration with their U.S. colleagues, only less than 5% was spent in face-to-face communication (some never met face-to-face), around 17% was spent in teleconferencing, 18% in 1 on 1 phone meetings, and more than 60% of the time was spent in communicating through email and IM tools. The demographic information was listed in Table 3.

**Table 3.** Demographic Information

	<b>Range</b>	<b>Mean</b>
<b>Tenure in the organization (Months)</b>	8-72	28
<b>Age</b>	27-36	30
<b>Tenure in the position in the team (Months)</b>	6-45	19
<b>Education level</b>	5 Bachelor degrees; 5 Master degrees	
<b>Position held in the team</b>	3 Managers, 7 engineers	

## 4 Results

This section presents the results of the analysis. First the individuals' perceptions of the importance of each cultural dimension is discussed. Each interviewee's

ranking of the four dimensions and the average rank of each dimension are shown in Table 4.

**Table 4.** Rank of Cultural Dimensions

Cultural Dimensions	Interviewees (No.)										Average
	1	2	3	4	5	6	7	8	9	10	
language	2	1	1	1	2	1	1	1	1	1	1.2
technical knowledge	3	2	3	3	1	3	2	2	3	2	2.4
technology infrastructure	4	4	4	4	3	4	4	3	4	4	3.8
concern for face	1	3	2	2	4	2	3	4	1	3	2.5

From the table we can see that “language,” “technology knowledge,” and “technology infrastructure” were ranked relatively consistently across interviewees. Language was seen as the most important cultural dimension that affected knowledge sharing between Chinese and U.S. members. This was followed by technical knowledge. Technology infrastructure was treated as the least important factor that affected knowledge sharing. It is interesting to notice “concern for face,” which is seen as deeply rooted in Chinese culture, was ranked diversely by different interviewees. It was ranked as the 3rd on average, close to technical knowledge.

**Language.** It is not surprising to find that language is the No. 1 factor that impacts knowledge sharing activities between China and U.S. coworkers. Language problems influence knowledge sharing in two ways. First, it affects sharing task-related knowledge. One interviewee complained about not being able to use English to fully express his idea, “In Chinese, I can fully express what I think. But in English, I can only express 70% of what I want. For example, during a meeting, I have 7 points to make, but I only know how to express 4 of them in English. So I would just skip the rest. It is a knowledge loss, right?” Another member made comments regarding meetings in English:

Sometimes when you are in a meeting, you may think about other things and don’t focus on what people are talking about. It is easy in Chinese to return back to the context by listening for a short while. But it is so difficult in English. Once you are lost, you are kind of lost forever. Then it is very impossible for you to jump in and make contributions to the discussion.



More interviewees expressed concern for limitations of using English to exchange social knowledge. One stated that,

Sharing technical knowledge isn't a very big problem for me. Since we are both doing the same thing, he [the U.S. colleague] will understand me even if I am not using the correct grammar and sentence. But it is really difficult for me to make social conversation with them. I don't know how to make jokes with them. By the way, I am pretty good at it in Chinese. I don't know how to create a relaxed meeting environment. It makes the meeting very dry and boring, which indeed impacts our communication.

So because of this language problem, the team members prefer text communications, through email and IM tools, which help them express their opinions clearly.

**Technical Knowledge.** "Technical knowledge" was usually ranked 2 or 3 by the interviewees. The major finding here is that technical knowledge determines the direction of knowledge flow. A majority of the interviewees thought that their U.S. colleagues were in control of the core knowledge in their field and that the Chinese side had only relatively periphery knowledge, so the direction of knowledge flow is usually from the U.S. side to the Chinese side:

There are two situations when communicating with U.S. colleagues. The first is that the U.S. site is the headquarters of a global team or it is in charge of a core technique. In contrary, we are working as a division of the global team or are implementing this technique. Under this situation, we are seeking instructions, consulting, and learning from them. Of course we also provide feedback for them to judge. The other situation is that we are in a peer relationship, working on a same project. Under this situation, we exchange experience. But the percentage of these two situations, I would guess is 95% to 5%. Usually we are in the first situation.

The inequality of knowledge distribution directly influences knowledge sharing activities. Some members mentioned that their U.S. colleagues, "don't want to share knowledge with us" and also that, "sometimes I don't want to ask them questions because I think which may makes me look stupid." Another problem caused by inequality of knowledge distribution is that those on the Chinese site do not know the knowledge map on the U.S. side; that is, they do not know who is good at what, "Even I have a problem and want to ask the other site (U.S. side), I don't know who to ask for. I know exactly who knows what in my site, but not theirs."

**Concerns for Face.** It is surprising to find that concern for face was ranked so differently by different members. This may indicate that it is a factor that is mostly mediated by individual characteristics. For example, when asking the question "will you ask your U.S. colleagues to repeat what they just said if you don't understand them well?" one interview replied, "No, it will make me stupid and they will think I'm not focusing. I would rather look at the meeting minutes later." While another interviewee stated, "Why not? They are open and direct and I should be too."

**Technology Infrastructure.** Technology infrastructure was consistently ranked as the last or the second to the last. Most interviewees thought that there were not large differences between their work site and the U.S. site. One interviewee even said, "There is really no difference (regarding the technology infrastructure). We really have very good quality here. You can even get rid of this item from your research. Totally no difference."

One possible reason for this is that in this organization, major international sites mirror the size of the U.S. sites with their large campuses of multiple buildings, and the architecture is standard from building to building.

**Time Zone.** The issue of different time zones was added to explore the impact of time discontinuities on knowledge sharing activities. Data revealed that time zone differences influence knowledge sharing in three ways. The first is a direct influence in terms of effecting team meeting set up time. As one member said, "It is difficult to set up a meeting with U.S. colleagues. It is usually set up either at their night time or our night time. Nobody wants the night time because you will feel very tired after a whole day's work and don't want to speak."

The second way is through aggravating language problem, "I really don't like meeting at our night time. I feel my listening and oral English are worse at night, maybe because I'm tired?"

The third way is through influencing knowledge sharing channels:

Because of language problems and time zone issues, I prefer to use email and IM to communicate with my U.S. colleagues. It can allow me to think logically and to express clearly. And since we have 15-hour time difference, it is difficult to just pick up the phone and make calls. If it is not urgent, I will just send the email out and do some other work while waiting for the reply.

## 5 Discussions

From the above results, we can see that national cultural differences do play an important role in knowledge sharing activities in global virtual teams. Besides these direct influences, the data also reveals some other interesting results, which will be discussed below.

First, the four national cultural dimensions are not independent of each other, especially for "language," "technical knowledge," and "concern for face." They are related to each other to some extent, as noted in the following:

I think language and concern for face are closely related. I would rank them both first. It's not very helpful to take English courses to improve your English. Even sometime you can understand very well, you still don't want to speak in a meeting because you don't want to make mistakes.

Another member related technical knowledge and concern for face together for the similar reasons. Most previous research has treated cultural dimensions

independently. How do different cultural dimensions work together to influence one's knowledge sharing activities in global virtual teams? It is hard to generalize from this case study. Further research is needed to work on this question.

Secondly, the relationships between cultural dimensions and knowledge sharing activities are mediated by individual characteristics, time zone differences, organizational culture, and leadership style. The first two have been illustrated in the results section. Here I will focus on the latter two. The results reveal that organizational culture has a large influence on the knowledge sharing activities of individuals. Almost all the interviewees made comments such as:

Since you are at XXX [the organization name], you are supposed to behave in its way” and “I have changed a lot since I entered XXX. This corporate environment needs you to be open, to be aggressive, so you either change to adapt to it, or you leave.

From these quotations, we can clearly see the importance of organizational culture over national culture in their working life. A trend is also found between tenure in the organization and the rank of the four cultural dimensions. The longer the time in the organization, the lower “concern for face” was ranked. This result confirms the proposition posed by Karahanna et al. [36] about the relative influence of the different levels of culture on individual behavior. They propose that for behaviors that include a strong social component or include terminal and moral values, supranational and national cultures might have a predominant effect; for behaviors with a strong task component or for those involving competence values or practices, organizational and professional cultures may dominate.

Team leadership style was also found to influence individual behavior. In the team studied, the first line managers are all Chinese. Some interviewees made comments such as, “the current leader himself is aggressive and he required us to behave in that way. So I changed a lot since he became my manager.” One interviewee compared the current leader with the previous one, “you know, our previous manager worked in a more traditional Chinese way. I was used to it. But now, our new manager works in a U.S. way and he is also pushing us to work in that way.” So there are both negative and positive remarks regarding to the manager's leadership style. Generally, new people made more positive comments while those who had been with the team longer made more negative ones. As a result, we can see that leadership style has a quick influence on the attitudes and values one holds especially for new comers to the team.

Furthermore, the results illustrate how deculturation and acculturation [39] happen in cross-cultural interactions. When team members first had interactions with U.S. colleagues (usually it was a short time after they entered the organization), they held more Chinese values (such as concern for face, being shy, and conservative). But influenced by organizational culture and team leadership style, over time, they learned that some of the values were not suitable to the situation of interacting with U.S. colleagues, especially in virtual team environments, so they are making necessary changes, such as, unlearning some of the old values (deculturation), in order to adapt to the new working environments (acculturation). It is through this

interplay between acculturation and deculturation that a person progresses toward assimilation, which makes work more effective. The following comment of one interviewee indicates this cross cultural adaptation:

I didn't know how to express disagreement before [when communicating with U.S. colleagues]. But now I know how and I don't hesitate to express it. When I collaborated with them before, I didn't push them because of concern for face. But now I realized it would be my responsibility if the project fails, especially when I am the project manager. So I learned how to push others, and how to be open with them. Anyway, it is also the culture of this organization, right? You need to learn this and adapt to it.

## 6 Conclusions

A case study approach was used to explore the impact of national cultural differences on knowledge sharing activities in global virtual teams from the individual perspective. Using Terpstra and Sarathy's [35] cultural dimensions as the basis, four cultural dimensions (language, education, technology and material culture, and attitudes and values) were identified. Final results show that language has the most salient impact on individuals' knowledge sharing activities, followed by education, attitudes and values, and technology and material culture. Individual characteristics, organizational culture, time zone differences, and leadership style all have a mediated impact on the knowledge sharing activities.

Theoretically, this research is expected to bridge the gap between the literature on culture and on knowledge sharing in virtual teams. The results will also have practical implications for managers. Understanding knowledge sharing activities in a virtual team environment is important to improve the team's effectiveness. Research has also found that though managers have realized the importance of culture, they find it is difficult or even impossible to "articulate the culture-knowledge relationship in ways that lead to action" [43]. The results of this study can therefore provide guidelines for managers and virtual team members to manage culture and technology to foster knowledge sharing activities in virtual settings.

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