Trust Development in Globally Distributed Collaboration: A Case Study in China

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Abstract

With the widespread use of virtual teams in learning and work, more attention has been drawn to trust in the team. Risk, benefits, utility value, effort, power, and interest are six factors that influence individual trust development. We have conducted a case study to investigate trust development in global virtual teams with Chinese students. This research takes the perspective of individual trust and aims to explore the trust development trend and new trust factors. We have collected data using survey, interview and documentation in the case study. We have validated the trust trend and found that the risk factor is the obvious change factor. Furthermore, three trust sub-factors, i.e., time zone difference, language and culture barriers, communication technology were found to help evaluate trust development. Afterwards, we put forward solutions to mitigate these risk factors.

1. Introduction

With the rapid development of technology for communication and online collaboration, many organizations, including schools and companies, choose collaborative work in virtual teams to improve work efficiency. Trust, as one of the factors influencing collaboration, has played an increasingly significant role in teams. Handy [1] has suggested that virtual teams not only need the support of information technology, but also that the level of trust in the team can be the key to the team’s success. On the one hand, if team members lack trust in collaboration, they will waste more time and have to make more effort to collaborate[10]. On the other hand, if team members trust each other, they can improve the efficiency of collaboration[17]. Therefore, in order to enhance collaboration, it’s necessary to explore the development of trust and the factors affecting this trust.

As to the study of trust trends and influencing trust factors of virtual teams, most scholars focus on student virtual teams[4][40] and business virtual teams [41]. Among them, in trust development, some scholars propose six factors of trust in virtual collaboration teams and an individual trust development model [2][3]. In the study of the development of trust factors, some scholars have proposed that other factors may also affect virtual team trust, including reputation [4], ability [4], and attitude [5]. Some scholars have investigated trust development by comparing teams with different country backgrounds[39], however, there is a lack of research focusing on the mixed global virtual collaboration team, especially in the context of Chinese student teams using the latest information communication technology. Therefore, we would like to explore what and why trust trends and trust factors are important in global virtual teams in the above context. In other words, we attempt to answer the following questions:

Question 1: How trust develops and what factors change the most in global virtual teams?
Question 2: What sub-factors affect the key change factor and what solutions exist for this factor?

For our research, we present an explanatory case study which examines individual trust in teams relying on face-to-face interaction and virtual interaction[43][44], qualitative data were used to help explain and clarify survey results. First, the research gives an introduction to prior literature in the field of trust in global virtual teams and trust factors. Then we describe our case study and analysis. Next, we discuss sub-factors of risk and propose some solutions. Last, we draw conclusion about research and future work.

2. Background

In the following, we present the related literature background of our research.

2.1. Trust in virtual teams
The concept of trust has been mentioned in many areas. Mayer et al. [6] defines trust as the willingness of a party who is vulnerable to the actions of another party on the basis of the expectation that the other perform a specific action important to trustor irrespective of the ability to monitor or control the other party. Currall and Judge [7] proposed that “Trust is on behalf of the other positive behaviors’ confident expectation”. Through this two definition, although they describe trust from various perspective, the major shared concept they emphasized is the belief that the other party will perform positive actions irrespective of the potential risk.

With the development of emerging communication technology, we live and work in an increasingly global virtual environment [1]. There are many researchers conducting research based on the virtual team background of trust. Jarvenpaa et al. [8] used the case study to research the issue of trust in a multinational virtual team. Piccoli and Ives [9] evaluated the change of trust as time goes in student virtual teams. In addition, Nolan et al. [3] proposed a continuing follow-up survey for trust of online business teams. They suggested that the risks, benefits, utility value, effort, power, and interests have a greater impact on development of trust in virtual teams [3]. Recently, in the research of trust development, some scholars start to focus on investigating the new factors that influence the trust development in detailed context[4].

2.2. Trust factors

A factor-analytic study, proposed by Hoy & Tschannen-Moran [12], demonstrated that different aspects covary together to form a coherent construct of trust. In addition, many researchers present other trust factors in the virtual team field [4][9][10].

Previous research has deconstructed individual trust into six component parts [3]. Nolan et al. further proposed [3] that each factor is evaluated by individuals which are in relation to one or more of the others. The “balance” between them indicates an individual’s readiness for collaborative behavior. Among these six factors, scholars have suggested that the higher the utility value, benefit, interest, and power and the lower the risk and effort, the higher the degree of trust [38]. It could help investigate each factor’s development in the different stages and different teams. As this is an action research in online community from the perspective of mutual interaction, it’s analogue to the research background of our research, so we adopt these six trust factors as our research model to conduct the following researches.

3. Case study

Feagin et al. [36] proposed that a case study can be an ideal method when requiring a holistic, in-depth investigation. The case study method is usually used to answer research questions of “how” and “why” [11]. Additionally, after considering the approach used in other similar studies [9][10][11][3], we chose the case study method for this study. We selected survey, documentation, and interview as the main data collection techniques for the case study. There are many researchers using surveys to measure trust, including questionnaires and interviews [11][12][13]. Therefore, one method for measuring trust is experimental measurement of trust. The other method is a survey of trust. For the purpose of this case, Nolan et al.’s [3] six individual trust factors have been used to design interviews.

We conducted a nine-week case study for this research. For holistic, we measured many facets of trust in the research process and observed their collaboration behaviors. For in-depth, we conducted in-depth interview to further understand the thoughts of the participants.

The case study included 42 students with a balanced ratio of men to women. We chose a class from a Chinese university through a distance education course with students from other countries. Almost all the students are in their early twenties and have shared study experience the project required. They were divided randomly into nine hybrid groups to do a team project for nine weeks. Students from different countries communicate with each other in English, for all the Chinese students have English courses and have a basic grasp of English. Each of the groups consisted of about four or five Chinese students. During the nine weeks the students were asked to collaborate to evaluate an e-business website, do group decision makings to explore its problems and finally to come up with decisions with solutions and recommendations for improving the business website.

We conducted case study from the perspective of Chinese students. They were allowed to collaborate face-to-face with Chinese teammates and the whole team via the Internet. During the collaboration, students used several software tools to support their collaboration, such as Skype and WeChat group, which is a popular Chinese group chatting software that is analogue to Line and Whatsapp. They can leave text and voice messages, instant chatting, video chatting and even view the team members’ social pages. students also used mobile phones and e-mail to communicate with each other.

4. Data Collection

For the data collection of the case study, we used three approaches: survey, interview, and documentation.
4.1. Survey

We used survey designed by prior research [2]. We have conducted the survey three times to track the development of individual trust throughout the whole project [4]. The whole period was divided into three nearly equal stages: initial stage, intermediate stage, and final stage. The questions were presented in the form of several statements. There are 37 statements that determine the participant’s position on the six factors [11]. Each participant was required to respond to each statement on a scale of one (1) to five (5). Among them, one represents strongest disagreement and five represents strongest agreement. The collected data was valued according to the level of agreement and disagreement.

4.2. Interview

At the end of the project, we successfully interviewed 22 students individually. Semi-structured audio-taped interviews were used in the data collection. Two or three members from each group were asked to participate in the interviews. Interview questions were designed based on the individual trust factors [4]. Each interview took between half an hour and an hour depending on the participants’ responses. For Chinese interviewees, although the interview process was conducted in Chinese, two of the members in our research team have translated transcripts into English texts, compared and corrected their errors in the translation process. The interview data helped capture trust development trends and the reasons for the changes. Some important trust factors were found in this case.

4.3. Documentation

Because of the large proportion of interview data are Chinese participants, documentation was gathered concerning their cognitive results from the hybrid collaboration of different groups. The documentation contains the homework regarding to the experience of working together, what they learned, what kinds of obstacles they’ve encountered and the changed opinions towards others. The documentation was collected at the end of the project.

5. Results

In terms of data analysis, we used qualitative and quantitative analysis. For the quantitative analysis, we analyzed the general trust development trend. Then we analyzed the basis of the trend through interviews. Documentation is provided as the third supplementary data evidence.

5.1. General trust development trend

All the participants were required to complete the questionnaires at the three stages during the project, the initial, the middle and the end. We calculated the arithmetic mean value of all the trust factors of each group at each stage, and then calculated mean values of every group; thus we obtained mean values for six factors at three stages for all individuals.

Figure 1. Change of trust factors

Figure 1 shows the individual trust values for all nine groups at the three stages of the collaboration project. It can be seen from Figure 1, the risk factor decreased from 2.02 to 1.83; benefit increased from 4.27 to 4.34; utility value increased from 4.03 to 4.11; effort increased from 4.15 to 4.25; power increased from 3.18 to 3.28. The most obvious change factor is the risk factor. As a preliminary study we focused on the most obvious change factor “risk” and conducted further analysis.

5.2. Sub-factors of risk in a hybrid global virtual team

We successfully conducted 22 in-depth interviews. Each interview took about half an hour to one hour. Among all 17 interview questions are questions designed for risk factors, for example, “Were there any problems in your team, and if so, what were they? How were they solved?”

The interview data was transcribed and coded and we analyzed the data manually. Then, we captured keywords from the transcribed texts and summarized them as sub-factors linked with main trust factors. The frequency of those keywords was coded as indicators of the importance of a certain factor. The frequency of a keyword above 60% is seen as a main sub-factor.

In this case, the three main sub-factors of risk were time difference, language and cultural barriers, and communication tools as indicated by frequency of keywords in the interviews. See Table 1.

5.2.1. Time zone difference
Time differences are a natural problem when many people work across continents [14]. Teams may face more complexity when members work across multiple time zones, in large part because there are increased difficulties in scheduling and coordinating work activities [15][16][17].

By using interviews and documentation, we identified negative effects that increasing risk and affecting trust, collaboration. First, it increases the difficulty in communicating and scheduling work.

<table>
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<th>Table 1. Risk and its sub-factors’ interview comments</th>
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<td><strong>Main factors</strong></td>
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<td><strong>Risk</strong></td>
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<td><strong>Language and culture barriers</strong></td>
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<td><strong>Communication technology</strong></td>
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For most students, there were at least 10 time zones differences from each other. The time zone difference is obvious and difficult to coordinate. For example, there is a comment in the documentation “They would have most conversations after 11pm because that was day for them.” Second, acquiring information will be postponed. Due to different time zones, there are always problems in acquiring information. A common situation: one sends information about the project and expects a response, but the receiver in another country has fallen asleep. He can only reply to the sender when he sees it. In this way, there is several hours’ delay between each other. Another comment reveals the effect of the delay “Inevitably there are questions that don’t get answered until the following day because of the time difference.” Delayed responses to communications are a barrier to developing “familiarity” among participants and an impediment to developing trust [18][19]. Third, it is a barrier to in-depth discussion. Determining an exact time when everyone in the team is free is usually difficult, especially in global virtual teams. There is a comment: “The time difference did make it a bit difficult to have real lengthy discussions, however, so often we would post and they would answer much later and vice verse.” Most collaboration discussions cannot be organized for a long time such as over two hours. Thus, too many short collaboration sessions will reduce efficiency and slow the project schedule. As problems arise, time zone difference increases the risk in virtual teams, thus affecting collaboration trust.

5.2.2. Language and culture barriers

It is more likely for virtual teaming environments to include members who represent different cultures than teams with colocated members [16]. Culture is a set of values shared by a group of people and used to distinguish one group from another [17]. Cultural values act as a filter reflecting the surrounding environment and guiding people’s behavior in decision-making [20] and social interaction [21]. Language as a cultural characteristic is particularly
relevant in mediated virtual teams [17]. The most evident aspects of miscommunication are reduced accuracy in communication, slower speech, and translation problems [22].

In our case, we identified some problems in language and culture barriers. First, differences in language proficiency among distributed team members created barriers to effective communication and collaboration. Generally, team members with less proficient language skills may lack confidence in their communication. They may infrequently issue opinions and misunderstand the language expressed by others. A Chinese student made the following comment, “It was difficult at times to get an idea across to them, possibly only because we weren’t sure how to express the idea in a manner they would understand.” Creating common understanding is difficult because of differing national contexts. Assumptions about commonly available software tools can be quite different in different counties. For example, some communication tools like Google+ and Facebook are not available in China, they found it inconvenient and not very useful. But students from western countries didn’t understand this situation thoroughly.

In addition, we can explain culture barriers from seven dimensions of culture perspectives. Trompenaars and Turner [37] have identified seven dimensions of culture: universalism versus particularism; individualism versus communitarianism; specific versus diffuse; neutral versus emotional; achievement versus ascription; sequential time versus synchronous time and internal direction versus outer direction. In our case, individualism versus communitarianism is the most obvious. Besides, Hofstede [42] proposed five dimension on a theory of culture in management, which are power distance, individualism, masculinity, uncertainty avoidance and long term orientation respectively. Results in this case also cater to the dimension of individualism. Students in a western university value personal freedom and achievement more and are more task-oriented. But Chinese students may believe the group is more important than the individual and value good relationships with others more. Some comments like “we try to keep friendly relationship with foreign students”; “they (Students from other countries) always issue their ideas individually, but we (China) always discuss within the Chinese group and have a common idea to issue.”

5.2.3. Communication technology

Virtual team environments are made possible by information and communication technologies (ICT), so technology is a key factor [17]. It affects interactions if you choose different ICT across members [16][23]. Virtual teams heavily depend on computer-mediated communication technology which allows members separated by time and space to engage in collaboration [24]. In our case, the most frequent communication tools student chose were wechat group and e-mail. One problem of communication technology is delay or lag. When someone sends a message it sometimes takes a long time to get a response. We don’t know if the message has been fully received. Especially for e-mail, some people check e-mail infrequently. This causes information communication delay, affecting collaboration effectiveness and trust. Another problem is that it is not easy for users to integrate information. Everyone in the team presents information in separate pieces and it is difficult to capture key points. Especially for later information classification, it creates extra work. There are some comments like “I made lots of efforts to integrate information and it is too scattered.”

6. Advice for solutions

In our case, after the data analysis, we found that some sub-factors of risk can be handled or mitigated through communication, leadership and deadlines. In order to better understanding the relationships between risk, its sub-factors, and solutions in our case study, we use the cognitive mapping [29]. Risk factor and its sub-factors in figure 1 are positive correlated; sub-factors and solutions are negative correlated.

Figure 2. Cognitive map of risk, sub-factors and solutions

First, leadership is a key solution for time differences in a global virtual team. Trusting relationships between team members and leaders help the team focus on the task and maximize contribution [26][27]. The effectiveness of inter-group leadership can be understood in terms of collaborative performance [28][30]. Leaders are considered as innovators and risk takers [16]. The fair behavior of team leaders and the empowerment of team members create trust [27]. An effective solution employed by teams in the case was to choose a leader in each subgroup within a hybrid team. Team leaders facilitate effective cross-cultural communication and understanding, ensure that there is a collective sense of belonging,
and facilitate task assignment and planning. In addition, leaders help build intra-team participation, ensure that all ideas are heard, and monitor participation rates [34]. The two leaders communicate with each other, arrange schedules in advance, and inform others. Generally, the leader in teams is active. In this way, the leader directs discussion and makes the collaboration more efficient and organized. Leadership can relieve the time difference barrier by more efficient work.

Second, frequency of communication can help to relieve language and culture barriers. Although there are often problems in communication among members who share the same culture, these become exacerbated in teams of different culture backgrounds. Communication can provide the foundations for cohesive and productive relationships in collaboration [32]. Individuals from different cultures have different group behaviors and communication styles [33]. It is important to understand the communication and behavior of particular cultures [34]. Noll et al.[35] indicated that the most common approach to handle cultural differences is developing understanding of different cultures through interaction with team members by visits or face-to-face meetings using video-conferencing.

From the interviews, we find that it is necessary for students to know more about each other’s culture and style. More frequent communication and interaction is useful to understand each other better and eliminate certain language and culture barriers. Once high frequency of communication is developed among students, trust is maintained and increased by actions that are highly dynamic, active, and enthusiastic thus risk is decreased.

Third, deadlines raise work efficiency and collaboration effectiveness. In our case, the project deadline was a special factor that indirectly affected the risk factor. Participants were under pressure and stress when the task got closer to the deadline. The deadline, creating a tension, drives participants to devote more effort to the task and communicate more frequently. Barriers in language, culture and collaboration can be broken down, thereby decreasing risk.

7. Conclusions and Future Research

Individual trust development is vital to a globally distributed team. This study focused on the risk factor, one of the trust influence factors, in global virtual team collaboration. Further studies are planned to explore this factor and others as part of the trust construct through the case study of Chinese students.

This research put forward new insights in risk factors through exploratory research in global virtual collaboration. The development trend of risk factors was confirmed in this case study and confirms other trust development research. We also found new sub-factors of risk and key solution factors in this study. This has extended the perspective of trust factors in global virtual collaboration situations. For practical implication, the group behavior and outcomes provide insights for effective management of a team. Relating to the sub-factors, it also offers clues for daily team management, such as setting deadlines, recruiting powerful leaders, etc.

In this research, we draw three primary conclusions based on the questions we posed at the beginning of this study. For the first research question, on the whole, risk and interest declined, and benefit, utility value, effort, and power increased. But risk factors presented an obvious downward trend. For the second research question, we found three main sub-factors affecting risk: time zone difference, language and culture barriers, and communication technology. We also found some risk could be relieved or mitigated through deadlines, frequency of communication, and leadership. These factors reduced risk and built trust.

As with all research, there are some limitations. First, this study only researched the risk factor of trust. We did not explore in depth other factors of trust. Future research will measure other trust factors. Second, some data was incomplete. Two students did not fill in the survey in the second stage. There are certain defects in data integrity. Third, a comparative study could be considered in future research. It will be meaningful to see if there are differences in trust development between individuals in different countries. And it may be interesting that from a dis-aggregated view broken down by team and by sub-team of globally distributed students for comparative purposes. Further, this study is context specific and it may not yield the same results in other contexts.

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