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FACTORS INFLUENCING COLLABORATIVE COMMUNICATION IN VIRTUAL TEAMS

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ABSTRACT

Collaborative communication has properties different from face to face communication. For instance team can generate ideas, manage information that are beyond the skills of any single team member. In this paper we examine factors that can influence collaborative communication in virtual teams. To study this we used a survey method across various organizations in China. We collected data to get responses from managers and experts engaged in collaborative efforts for product design developments in virtual environments. We conducted factor analysis and used the mean value of factors to test our hypothesis. We found that in the Chinese context, the significant factors were: constructs of team collaboration; information technology support and training; clear descriptions of team objectives and of tasks to be accomplished. Our results show that collaborative communication in collaborative virtual team environment is guided both by the global competition as well as indigenous and institutional pressures. Managers view decision making as a business issue in a globally competitive environment.

Keywords: Collaborative communication, collaborative environment, virtual teams

INTRODUCTION

Communication dynamics are diverse in virtual team collaborative environments, and factors contributing to communication in virtual spaces are not similar to face to face conversational environments [1] [2]. By the term virtual team we refer to groups of geographically and organizationally dispersed co-workers that are assembled using a combination of telecommunications and information technologies to accomplish a common organizational task [3]. Virtual project teams can quickly be formed and disbanded and there are opportunities to select expertise and exploit organizational competencies regardless of an expert"s location [4]. Participants" collaboration, learning, interaction and knowledge management are different in virtual settings compared to co-located environments, and these differences influence team decision making efficiencies [2]. In this paper we examine the factors which may influence virtual team decision making.

Research across disciplines has focused on decision making at the individual level using multiple theoretical frameworks and research settings. Collaborative decision making has properties different from individual decision making, such as the ability of a team to generate ideas that are beyond the skills of any single team member. It requires coordination between several members and stakeholders [5]. Decision making research at the collaborative virtual team level specifically in developing market contexts like China is still nascent phenomenon (see [6] [7]) and being an emerging area of research, theoretical models have yet to be established [8]. Collaboration across various departments to enable efficient and timely decision making remains a constant challenge for organizations. Efficient management of collaboration can improve organizational competitiveness [9]. Decision making is the main link between team collaboration, technology support and task description for virtual teams in any organization [10] [11]. An increasing number of organizational units are becoming collaborative and distributed, but little is known about their processes and performance structures [12]. Data collection issues further impede research in this field in developing markets like China. Recent studies (see [13] [14] [15]) show that IT and related technology adoption in organizations and in general is becoming an integral part of routine commercial and non-commercial activities. It is widely used for supporting team collaboration and decision making in product design [11] and our study is motivated by these developments.

In this paper we study collaborative team decision making with an objective to understand what factors contribute to decision making in virtual teams. To achieve this we used a survey method across various organizations engaged in collaborative efforts for product design and developments in virtual spaces. Results of our study can benefit organizations aiming to improve their designers" efficiency we identify the most relevant issues in developing a support methodology. The paper is organized as follows: in the next section we examine relevant research to identify the items to be studied. The subsequent section presents our research methods, followed by the data results and analysis. Finally, the results are analyzed and the implications for managers and for future research are discussed.

CONCEPTUALIZATION FOR STUDY MEASURES

Several models have been employed by researchers to unfold decision making processes in collaborative virtual environments (see [16] [8], [17]). De Sanctis and Poole (1994) portray decision making in groups and virtual teams as an outcome of a process in which technology structures, tasks, organizational environments and the internal structures are major influencing factors. Later studies expanded this model by studying how an inter-organizational virtual team adapted the use of collaborative technology for decision making [8], and how a group support system (GSS) may be used to support virtual teambuilding (see

[17]). Their results highlight the importance of defining goals to foster better team collaboration and decision outcomes. In this study we examine collaborative decision making using at least three categories frequently used in related studies with variations, namely: team, technology, and task description. In the following section we discuss selected relevant research to develop our study measures.

TEAM COLLABORATION

One of the core characteristics of a virtual team is the element of collaboration, where team members work together on a common task while they are separated in time and space [3] [17]. These collaborations can be at cognitive or affective levels and are essential for knowledge and task sharing amongst the team members. This impacts the competencies and subsequent decision making of virtual team members [7]. Efficient team collaboration is needed from the quality and timeliness perspectives of decision making [5] [18]. Inefficiencies in collaboration can prevent organizations from developing innovative ideas [8] [19]. Decision makers face multiple tasks during product design, but team collaboration makes these processes clearer and simpler. In virtual team arrangements, collaboration has become more challenging because asynchronous or synchronous modes of communication are required to exchange data, information, and expertise among dispersed team members [5]. Teamwork involves interaction amongst team members. The dissemination of timely and relevant information about each person"s expertise and earlier work experiences can improve collaboration, cohesion and commitment, and thus influence decision making positively [10] [20]. The nature of the relationship between the knowledge source and the recipient facilitates team work [21]. For such collaboration, teams which are usually comprised of cross-functional members also need to be tightly integrated and strongly coordinated [11] [22].Leadership becomes important in such team environments for improved coordination of collaboration [23].

Researchers such as Tobin (1998) have expressed concern that effective knowledge share and communication may not take place in virtual teams in organizations lacking flexibility in team work. This can diminish team members" motivation and impede for instance, the communication of best practices within an organization and can affect the decision making processes negatively [25]. One solution is to introduce individual level monetary reward systems (such as profit sharing or gainsharing through bonus, employee stock options etc.) and team level reward systems based on team performance [25][26]. These incentives motivate team collaboration to work effectively and cohesively toward common goal attainment.

INFORMATION TECHNOLOGY SUPPORT

Information technology permits the dispersion of teams across space and time, while remaining a key element of their processes [16] [23]. Modern organizations, including those in emerging markets like China, are deploying information technology solutions to support collaboration in virtual arrangements [6] . Several commercial decision support tools and systems are available to product designers to enhance information acquisition and dissemination. These tools thereby support team collaboration, knowledge sharing and task definition [6] [17], and are intended to help the decision maker develop an understanding of the otherwise complex decision making environment [28]. However, the value of the resulting change depends on how well the tool is matched with the needs of the intended users [29]. Further, these support systems and tools themselves are of less value if the user is unable to exploit them to meet the defined objectives [8] [29]. Appropriateness of IT tools facilitates task interdependence and synchrony of communication in virtual teams [10] [20]. Decision makers may not act optimally because of the conflicting meanings that a system support can convey [8] [29]. Simpler configuration of IT tools and systems support can mitigate these limitations but it is equally important that team members be trained to solve encounters with unexpected problems. For example, the introduction of any tool into a collaborative environment has the potential to serve as a catalyst for positive or negative change. Appropriateness and user friendliness of IT tools can resolve such negative encounters .

TASK DESCRIPTION

Technology provides an environment for team collaboration and decision making leading to the achievements of common goals and objectives. But this achievement can occur when clear definitions of objectives and task to be completed are established. The nature of the task to be carried out influences team performance and clarity of task description enables surfacing of several inputs of decision making process which guide team members for better decision making [17] [23]. These inputs include exploitation of expertise of multi-functional teams , knowledge about the defined task and the procedures to accomplish the same, project risks and uncertainties amongst others. Unclarity about the tasks may disrupt the flow of communication and team members can experience higher cognitive loads and trade off decision accuracy [32]. While systems and IT support can limit these negative trade off effects to an extent, clarity in team and task objectives remains critical at every stage of decision making process [32].

RESEARCH DESIGN AND METHOLOGY

We developed 13 items (see Table 1) to study their relationship with our dependent variable. We measured our dependent variable on the importance of effective decision making [34]. In this study we report the results of our survey. Our intended subjects were product designers using virtual team collaboration for their task fulfillment. We randomly selected both Chinese and international organizations using business directories, personal networks and recommendations. We conducted our survey in the Shanghai area as it is the business centre of China and therefore provides an appropriate setting for empirical investigation of e-commerce and e-business issues. We approached medium to large organizations employing more than 100 people. We collected our data through a questionnaire. The research instrument was distributed through e-mails and direct contacts. In total we approached 490 team participants through e-mails and a small number of 22 through direct contact. One hundred and one responses were received in total (63 online responses and 38 email responses), with a response rate of 19 percent. We obtained

usable data from 89 respondents representing 72 organizations with a final response rate of seventeen percent. We approached seven non-respondents through telephone and found no significant difference between the respondents and non-respondents and confirm the no non-bias in our final sample. The items and the reliability of each scale are presented in Table 1.

MEASUREMENT VALIDITY AND RELIABILITY

The questionnaire design was thus based on the literature review and the interview findings. The items were measured using seven-point Likert scale. One item was used to measure our dependent variable of the importance of effective decision making. The questionnaire was translated, pilot tested and validated. An explanatory factor analysis (EFA) was conducted to examine the discriminate validity of the measurement items. 13 measurement items representing our research framework were subject to principal component factor analysis. A five-factor structure was suggested, using the criteria of eigenvalue greater than one, and the extracted factors accounted for 59.97% of the total variance. A varimax rotation was performed to gain a clear picture of the composition of the factors. The resulting factor loadings are shown in Table 1 with all factor loadings less than 0.40 suppressed. The factor loadings for all the items were higher than 0.50. The individual factor labeling and variance are shown in Table 1. Cronbach"s alphas were computed to assess the internal consistency reliability of the scales extracted. As shown in the second column of Table 1, the reliability coefficients range from 0.57 to 0.76 with overall reliability of 0.72. Other than factor five, the reliability coefficients are near 0.70 which is suggested to be the acceptable level in such studies. Our results confirm that the measurement scales are valid and reliable.

Table 1 Exploratory Factor Analysis and Reliability Results[1]

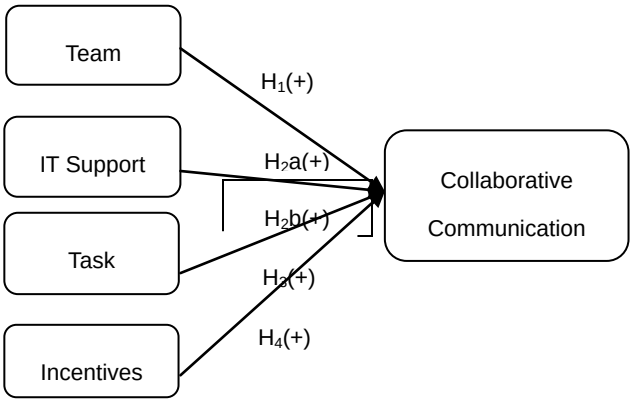
Factors	Alpha	Measures	Factors Loadings				
			1	**2**	**3**	**4**	**5**
Team Collaboration $H_1(+)$	0.676	Role of leadership for virtual team collaboration	0.625				
		Usefulness of previous task experience	0.615				
		Usefulness of Information about team members" knowledge and expertise	0.584				
IT Support H_2 a(+)	0.687	Knowledge sharing is facilitated by IT		0.766			
		Team collaboration is facilitated by IT		0.681			
		Information technology support is important		0.674			
		User-friendliness of IT tools used for decision making efficiency		0.571			
IT Training H_2b(+)	0.757	IT training is useful			0.864		
		System support is beneficial to team members			0.832		
Task $H_3(+)$	0.696	Clear definition of decision objectives				0.739	
		Clear definition of teamwork objectives is necessary				0.641	
Incentives $H_4(+)$	0.566	Flexible team organization is important					0.819
		Reward is useful for facilitating better team work					0.766
Eigenvalue			3.204	1.874	1.288	1.194	1.171

Extraction Method: Principal Component Analysis.
[1]Rotation Method: Varimax with Kaiser Normalization.

The above five factors were then used as independent variables to examine their impact on the dependent variable of the importance of effective decision making using regression analysis. Since the independent variables are factors extracted from original variables within the studied construct, there is no correlation among them. Further, the results obtained from the model offer empirical evidence for hypothesis testing. We tested the following hypotheses as shown in Figure 1:

H1: Team Collaboration is critical and positively related to decision making
H2a: IT support is positively related to decision making
H2b: IT training is positively related to decision making
H3: Clear task definition is important and we hypothesize for a positive relationship with decision making
H4: Incentives facilitate team work and this factor has a positive relationship with decision making.

Figure 1 Hypothesised Model



The regression results are shown in Table 2. As shown in Table 2, the evidence is mixed. The independent variables, labeled as Team Collaboration, IT Support, IT Training, and Task Description, are significant positively associated with the dependent variable of importance of effective decision making. Thus, H1 and H2a and H2b and H3 are supported (all p=0.00). However, the proposed positive relationship between Incentives (i.e. H_4) and the dependent variable of importance of effective decision making has no significant relationship and is not supported. It seems incentives have little impact on decision making.

Table 2 Results of Regression Analysis*

Model	Unstandardized Coefficients		Standardized Coefficients	t	P-value
	B	Std. Error	Beta		
(Constant)	6.283	0.73		86.074	.000
Team Collaboration	.399	0.73	.466	5.438	.000
IT Support	.284	0.73	.331	3.865	.000
IT Training	.176	0.73	.287	2.638	.000
Task	.117	0.73	.137	1.596	.000
Incentives	-.102	0.73	-.119	-1.390	.168

*Notes: a) p-value for F-test in Anova is =000 b) r^2 = 0.37 and Adj. r= 0.34

DISCUSSION AND CONCLUSION

Team collaboration (H1) was supported to be significant for project decision making. This may be attributed to the dynamic and multi layered processes where multi-task and multicultural teams need more collaboration to bridge communication and other work related gaps. This collaboration amongst the respondents is perceived to be significantly important for better decision making outcomes. Task complexities also require team collaboration and the role of leadership gains importance. Availability of information about cross-team expertise, experiences and knowledge is significant for team collaboration in multi-task and multicultural teams. These are also necessary components for collaborative decision making. Further insights and explanation can be derived from cultural and social structures in China where people work more cohesively in every aspect of life. Relationships constitute and important element of Chinese work and management style. These attitudes expand to the workplace and future research can benefit by focusing on cross-cultural issues in virtual team collaboration in the global context.

Our hypothesis that IT training (H2a) and IT support (H2b) has a positive relationship with decision making was supported. This indicates that the managers in China value and require IT tools, systems support, and related training to facilitate their project and team work. The use of IT tools and system support is not yet prevalent in China being an emerging market, therefore young managers and project team participants require continuous training. Compared to international markets China is technology adoption rate is low, and extensive IT and systems support and training will be necessary to sustain competitiveness. A large number of multi-national corporations have their regional units in China for cost and strategic benefits. IT training is considered to be important for communication on project and task fulfillment through knowledge management in these organizations. However, several IT tools are developed at headquarters located outside China, and many of these IT tools are in English language. These tools are not necessarily developed to exclusively serve the local needs. And often standardized tools are employed for cost considerations. Subsequently, team members and parent organizations invest more on training and support systems to carry out headquarters tasks as face to face communication is neither feasible nor possible at all stages of decision making processes. Global IT markets are converging rapidly and new tools are constantly being employed to respond to short project fulfillment periods. Virtual team members invest in training to mitigate the impact of advance technological development

and to remain competitive in the world market. Task complexities and tools incompatibilities can be addressed by training and support systems. Researchers and practitioners can focus on improving the compatibility of various tools to engage the project workers better. Future research can focus on the Chinese user behavior, and on how IT Tools and support can help improve their usability, and team members" decision making efficiencies. Longitudinal research methods can be applied to study the impact of IT support and training on decision making.

Our hypothesis that a clear task description improves decision making (H3) was supported. This shows that since most projects are defined in subsections and operationalised across various departments making collaboration and clear task description are necessary. Teams are responsible for developing selected segments of the projects and team objectives can not be achieved without clear task definitions. By understanding the full context of the project, team members develop cognitive as well as affective associations with the task to be completed and become more efficient. IT facilitates knowledge and expertise sharing and the user friendliness of tools contributes to this. Many projects carried out in China are from multinationals and the headquarters use English language to write and communicate the essentials. Language differences can enhance miscommunication in multi task and multilayer expert teams comprised of novices to experts, but better task description can address these problems. Further research investigating the issues, such as- how task complexities and communications can be improved by clearer task definitions and descriptions across cross-functional, cross-organization, and multi-expertise virtual teams- can contribute to our knowledge in this field.

Our hypothesis for incentives as a positive indicator was not supported (H4). One explanation may be in cultural difference because monetary incentives are not always evaluated to be positive in China and awards and honors are important. Monetary rewards like bonuses are perceived to be a component of the regular salary payments. Another possible explanation is that respondents may have understood the term "reward", as used in our survey instrument essentially in monetary terms. This indicates that semantic sensitivity would be needed in future research to capture the intended meaning better. In China"s rigid hierarchical social structure power and authority are more important than monetary gains. Team members are more likely to forsake short term monetary benefits for long term job related awards like promotion and better placements in the hierarchical management structure. Furthermore, in a collective culture like China, team based rewards are more likely to be accepted than individual rewards. Further studies could benefit by adding some cultural variables to investigate how effective reward mechanisms for teams or team members may be established.

Our study suffers from several limitation and results should be interpreted and viewed accordingly. Our study is limited to more developed medium and large organizations and our model"s ability to explain temporal dynamics is also limited. Despite these limitations, our findings have both theoretical and practical implications. Theoretically it shows the significance of team and non-team related factors. The study shows that decision making is largely influenced by team and technology related factors. It shows to practitioners that China"s drive to integrate into the global market and follow the global management style when the team working environment is global. But findings also suggest that factors related to information technology and team collaboration are not the only perceived driving force for the effective decision making. These dynamics are influenced by the local cultural norms and future studies could benefit by examining them. International and local managers could include these aspects in their communication and strategies to create efficient and collaborative work environment.

Future research might identify points when team collaboration becomes less or more effective, and examine how information technology influences the decision making over-time. More research is needed at the organizational level in cross-cultural contexts to determine the efficiency factors of team work decision making. Empirical studies may be conducted with larger sample population and other research settings in virtual space like communities and forum. Longitudinal analysis investigating how the determinants change over time and how they interact to influence team and organizational decisions would contribute to our theoretical knowledge.

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