Distance Matters: How Employee Geographical Dispersion Affects the Dissemination of Time-Sensitive Data in Virtual Teams

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Abstract

In our ever-increasingly connected world, companies are, more than ever before, hiring employees to work remotely. Workers are now free to live anywhere around the world. With online communication technology, an employee's location is irrelevant. In fact, when employees need to collaborate with co-workers, they tend to do so through computer-mediated communication (CMC) technologies, such as email. As part of their job, it is often the case that employees need to share time-sensitive data with co-workers before it decays and becomes useless. Typically, CMC technologies allow for the dissemination of data to others before it decays. However, when considering the geographic dispersion of employees, it may not be as simple. Employees may be scattered around the planet. Therefore, the sender of time-sensitive data may not be able to effectively communicate with a recipient(s) before that data decays. With this issue in mind, our research explores how geographic dispersion of employees collaborating in virtual teams effectively disseminates time-sensitive data using CMC technologies. We pursue this research topic by investigating virtual teams that have geographic proximity versus teams that are geographically dispersed by using surveys to players in a popular online game called Travian. Travian has over ten-million players globally collaborating in virtual teams to win the game. Surveys were administered over a 30-day period through the game's forums. Surprisingly, the results of this study showed employees that have geographic proximity have more difficulty in successfully sharing time-sensitive data as compared to those teams that are geographically dispersed.

Keywords — *Information Quality, Virtual Teams*

I. INTRODUCTION

Research in how virtual teams succeed and fail has become a popular area of study over the past decade. Projects exploring trust in leadership, communication patterns between team members and conflict resolution are prime examples of popular areas of study [1], [3], and [4]. This is being driven by the business world's ever-growing usage of virtual employees who rarely, if ever, need to go to an office to perform their job. With employees working remotely, operational costs for a business are far lower. Indeed, it is often the case that when an employee is given some task to perform, the time spent completing it is up to that worker [1] and [3]. To accomplish that task, employees typically need to collaborate with co-workers using computer-mediated communication (CMC) technologies, such as email. By working together remotely on a given project, employees join what is known as a virtual team [1], [3], and [6].

CMC is a popular area of research where studies have provided a wealth of information about how people use technology to share information with others [3] and [6]. For virtual team research, CMC plays an important role in better understanding how these teams communicate and collaborate with each other using online technologies, such as email. Concurrently, globalization has become popular in business with employers hiring people around the world to work on joint projects. Instead of hiring someone locally, or willing to relocate, companies can hire anyone, anywhere. This global hiring scheme is advantageous to employers seeking to develop and market products to worldwide audience.

In business, it is often the case that information needs to be disseminated to the stakeholders so that some action can be taken. If that data is not received in time, then it could decay and become useless. This can lead to lost opportunity and/or revenue for the business. Therefore, the effective dissemination of time sensitive data within virtual teams is an important topic for study and needs to be addressed. In this research, the need to understand what role CMC plays in the successful sharing of time-sensitive data is investigated in virtual team members that are both globally dispersed and local. In the next section, the background is discussed for this study.

II. BACKGROUND

In 1987, Daft and Lengel developed the idea of media richness which has been defined in the literature as the quality of communication between people ranging from face-to-face, the highest form of

richness, to a written letter, the lowest form of richness [3], [5], and [6]. This definition comes from the concept that the higher the interactivity in communication between people, the higher the richness level [3], [5], and [6]. For CMC technologies, the concept of media richness is directly applicable. The richness of CMC technologies has been shown in the literature to have a strong positive correlation with the success of a team [1], [2], and [6]. Research has also shown that teams using higher richness technologies to collaborate typically succeeded more often than teams that did not [1], [2], and [6]. More recent research applied this concept to virtual teams with similar results [1], [2], and [6]. Those CMC technologies include: Voice over Internet Protocol (VoIP) both with and without video, instant messaging, discussion boards, and email. From the literature, a topology of CMC technologies has been developed which depict the level of richness for each media type along with a brief definition of each, see table 1. In the next section, the project goals are discussed.

III. PROJECT GOALS

In the extant literature, the ability to effectively share time-sensitive data with others has been shown to be positively correlated with the success of a team – both virtual and traditional [2] and [4]. Being able to share time-sensitive data before it decays is essential in business as decisions typically need to be based on the most recent data available. If their data decays, then their decisions could lead to disastrous results [2], [3], and [6]. Within virtual teams, the need to effectively share such data is often required as teams need to collaborate to reach a desired goal. With the ever-growing usage of geographically dispersed employees working remotely, the need to understand how they effectively share time-sensitive data before it decays is self-evident.

Therefore, this research explores the relationship, if any exists, between the geographic dispersion of an employee and the computer-mediated communication technologies used to successfully share data within virtual teams. This relationship is stated formally below as a null and alternate hypothesis:

H10: There is no relationship between a team's geographic dispersion and the richness of online communication media technology selection for the sharing of time-sensitive data between members of a virtual team.

H1A: There is a relationship between a team's geographic dispersion and the richness of online communication media technology selection for the sharing of time-sensitive data between members of a virtual team.

Communication Media	Richness	Definition
VoIP (with video)	Highest	a conference in real-time between two or more participants in different locations using video with audio or audio-only through a communication transmission technology
VoIP (audio only)	High	See above
Instant Messaging And SMS	Medium	Instant messaging (IM) is defined as any information technology that allows near-synchronous text-based communication between two or more people through CMC
Discussion Boards, Forums, and Blogs	Low	An online discussion board (DB) has been defined as a forum, both public and private, where topics with individual postings from an online community of participants may share ideas, make comments, or otherwise communicate with others
Email	Lowest	Messages distributed by electronic means from one computer user to one or more recipients via a network.

Table 1: Media Richness of Online Communication Technologies. Adapted from "The Role of Gender in Computer-Mediated Communication Technology Selection to Disseminate Time-Sensitive Data within Virtual Teams," by J. Wood, 2017, *International Journal on Recent and Innovation Trends in Computing and Communication.* Retrieved June 10, 2019, from https://ijritcc.com/index.php/ijritcc/article/view/1063. Copyright 2017.

IV. METHODOLOGY

This research goal is pursued by using a survey for players in the online browser game Travian to complete. Travian is an online strategy game where over 10-million players worldwide compete within groups of virtual teams to win the game. A link to the survey was placed in the game's forum section. Players often go there for information about the game or to post their in-game accomplishments. Although players can play solo, it is more often the case where they join groups of other players where a team can consist of hundreds of people. All of the players in the team must work together to win the game. To win, players must complete an enormous task which requires considerable effort among all team members over a lengthy period-of-time. Successful collaboration among team members is required to complete the game winning task. A survey was the best option to get the usage of CMC technologies by those players.

The link to the survey remained on the Travian forums for a 30-day period. Survey participants were asked whether players in their team were geographically dispersed or not and were also asked to rate their experience in successfully sharing time-sensitive data using each type of CMC technology. The communication usage survey questions utilized a five-point Likert Scale style answer format to rate the success of each CMC technology on a scale from (1) "Very Poor" to (5)

"Very Good." In the next section, the results of this survey are shown.

Survey Question: *Rank the success of sharing time-sensitive data within your team when using VoIP (Audio Only)*				
Teams Dispersion	**Geographically Dispersed - Yes**		**Geographically Dispersed - No**	
Group	**Count**	**% Within Group**	**Count**	**% Within Group**
Very Poor	14	15.91%	12	16.22%
Poor	11	12.50%	16	21.62%
Fair	9	10.23%	22	29.73%
Good	28	31.82%	13	17.57%
Very Good	26	29.55%	11	14.87%
Total	88	100.00%	74	100.00%
P-Value	0.000638, p<0.05			
Chi Square	17.0175			

Table 2: Percentage distribution of responses and association of the VoIP (with Video) computer-mediated communication technology usage using chi-square test

V. RESULTS

The survey was placed on the Travian forums where an average of 1,100 players visited the forums each week while the survey link was active. The link to the survey remained active for 30 days and garnered 704 views during that time. When the survey period ended, there were 524 attempted surveys with 162 usable. The majority of rejected surveys were from drop outs due to age restrictions (below 18) or not being part of a virtual team (a solo player). The survey had 100 male participants (61.73%) and 62 female participants (38.27%).

Survey Question: *Rank the success of sharing time-sensitive data within your team when using VoIP (with Video)*				
Teams Dispersion	**Geographically Dispersed - Yes**		**Geographically Dispersed - No**	
Group	**Count**	**% Within Group**	**Count**	**% Within Group**
Very Poor	8	9.09%	19	25.68%
Poor	13	14.77%	17	22.97%
Fair	9	10.23%	14	18.92%
Good	27	30.68%	13	17.57%
Very Good	31	35.22%	11	14.87%
Total	88	100.00%	74	100.00%
P-Value	0.000638, p<0.05			
Chi Square	19.461			

Table 3: Percentage distribution of responses and association of the VoIP (Audio Only) computer-mediated communication technology usage using chi-square test

As expected, the younger generation was predominant in participating in the survey since it was an online game. The median age of the participants was 24.6. Participants that indicated they were in geographically dispersed teams were 88 (54.32%) and non-geographically dispersed (near each other) were at 74 (45.68%). We used Microsoft Excel to perform a statistical analysis using Chi Square, see Tables 2 – 6.

Survey Question: *Rank the success of sharing time-sensitive data within your team when using Instant Messaging/SMS*				
Teams Dispersion	**Geographically Dispersed - Yes**		**Geographically Dispersed - No**	
Group	**Count**	**% Within Group**	**Count**	**% Within Group**
Very Poor	9	10.23%	18	24.32%
Poor	14	15.91%	19	25.68%
Fair	16	18.18%	13	17.57%
Good	26	29.55%	14	19.92%
Very Good	22	25.00%	10	13.51%
Total	88	100.00%	74	100.00%
P-Value	0.024497, p<0.05			
Chi Square	11.1912			

Table 4: Percentage distribution of responses and association of Instant Messaging/SMS computer-mediated communication technology usage using chi-square test

Survey Question: *Rank the success of sharing time-sensitive data within your team when using Blogs, Discussion Boards, and Forums*				
Teams Dispersion	**Geographically Dispersed - Yes**		**Geographically Dispersed - No**	
Group	**Count**	**% Within Group**	**Count**	**% Within Group**
Very Poor	41	46.56%	19	25.68%
Poor	23	26.14%	12	16.22%
Fair	14	15.91%	19	25.68%
Good	8	9.09%	15	20.27%
Very Good	2	2.27%	9	12.16%
Total	88	100.00%	74	100.00%
P-Value	0.001357, p<0.05			
Chi Square	17.7893			

Table 5: Percentage distribution of responses and association of Blogs, Discussion Boards, and forums computer-mediated communication technology usage using chi-square test

Survey Question: *Rank the success of sharing time-sensitive data within your team when using Email*				
Teams Dispersion	**Geographically Dispersed - Yes**		**Geographically Dispersed - No**	
Group	**Count**	**% Within Group**	**Count**	**% Within Group**
Very Poor	36	40.91%	11	14.87%
Poor	25	28.41%	8	10.81%
Fair	14	15.91%	29	39.19%
Good	4	4.55%	15	20.27%
Very Good	9	10.23%	11	14.87%
Total	88	100.00%	74	100.00%
P-Value	0.00001, p<0.05			
Chi Square	32.8922			

Table 6: Percentage distribution of responses and association of Email in computer-mediated communication technology usage using chi-square test

VI. CONCLUSIONS

In each of the above tables 2 – 6, a significant association ($p<0.05$) was shown between a virtual team's geographic dispersion and computer-mediated communication (CMC) technologies used to successfully share time-sensitive data. From the literature, it was expected that participants, irrespective of their team's geographic dispersion, would have a greater level of success when using CMC technologies that are high in media richness [1], [2], and [4]. However, as the above results clearly show, there is a distinct difference between the two groups of participants. For each CMC technology

survey question, participants in globally dispersed virtual teams consistently selected higher richness media as being successful in sharing time-sensitive data. This is in opposition to participants in a homogeneous geographic area which selected lower richness media. In a stark contrast between the groups, geographically dispersed participants had high success using VoIP (with video), the highest richness CMC technology, with ratings of good (30.68%) or very good (35.22%) while local groups indicated ratings of good (17.57%) or very good (14.87%) success in using this technology.

Another contrast between the groups is with email, the CMC technology with the lowest level of richness. Participants in geographically dispersed groups overwhelmingly selected very poor (40.91%) or poor (28.41%) in their success rate in sharing time-sensitive data as opposed to local teams indicating a success rate of very poor (14.87%) or poor (10.81%). This result would indicate local teams may have some other mechanism for ensuring email is read by the intended recipient(s) before the data decays, such as calling them or sending an instant message.

The above differences show that distance does matter in CMC technology selection to successfully share time-sensitive data. The null hypothesis stated there would be no relationship between a virtual team's geographic dispersion and the richness of online communication media usage to successfully share time-sensitive data. With p-values of less than 0.05 ($p < 0.05$) for all CMC technology survey questions, the null hypothesis is rejected, and the alternate hypothesis is accepted. This result indicates there is a relationship between a virtual team's geographic dispersion and the selection of CMC technologies to successfully share time-sensitive data within virtual teams.

In conclusion, this research tends to raise more questions than answers. Questions such as why do virtual team members that are in proximity to each other have such difficulty in sharing time-sensitive data using high richness CMC technologies while those that are spread out do not? This question deserves further attention in a follow-up study that may yield answers. If nothing else, this research does show the need for further training of employees to better use CMC technologies to consistently and effectively share time-sensitive data within a virtual team to help prevent data decay and promote successful outcomes for the organization. Additionally, focusing on local teams could be the best place to start with such training. With the ever-increasing usage of virtual teams in business, further research into this area is warranted to ensure its continued growth and success. In the end, the results from this research, and others, may serve as a component for building a best-practices model to improve virtual team communication and data sharing among their members.

VII. REFERENCES

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