

Review Article

# COVID-19: The Pandemic's Impact on the Dissemination of Data in Virtual Teams using Computer-Mediated Communication Technology

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**Abstract** - With the ongoing pandemic, organizations are more than ever using globally dislocated employees, or virtual teams, to collaborate on projects. Team members often need to communicate with each other electronically. Additionally, they need to carefully choose communication media to disseminate data within their virtual team effectively. Computer-mediated communication (CMC) technologies, such as Email, are used to accomplish this task. However, the pandemic has added many people to the virtual workforce that may not have worked in this capacity previously. This research explores the effect of that surge by administering surveys to players in an online game called Travian. Travian has over ten-million players globally collaborating in virtual teams. Surveys were administered over 30 days through the game's forums. This study showed a strong relationship between COVID-19, CMC technology, and the effective dissemination of data within virtual teams.

**Keywords** - Virtual teams, computer-mediated communication, media richness theory, information quality

## I. INTRODUCTION

Since it began in November 2019, COVID-19 has spread to more than 120 countries and regions worldwide and infected more than 71 million people with nearly 1.6 million deaths (Brammer, S. et al., 2020; Funk et al., 2020). In the USA, this virus has caused unprecedented changes to our very way of life. With over 200,000 cases in the USA alone, the virus continues to grow rapidly (Brammer et al., 2020; Funk et al., 2020). Although the news that a vaccine will be available soon, it will take time before life can begin to return to some sense of normalcy. In the meantime, businesses ask employees to work from home in record numbers (Brammer et al., 2020). For many, this sea change in conducting business has been difficult. Employees must find ways to continue to perform their required tasks but do so virtually. Fortunately, research on virtual teams and how

they function has been a popular area of study for several years and has provided a long list of best practices for organizations to adopt (Cathro, 2020; Chhay & Kleiner, 2013; Nyström & Asproth, 2013; Malone, 2004). This research was driven by great enthusiasm for companies to think and act globally to reach potential customers while consolidating resources to save money and improve market share (Cathro, 2020; Chhay & Kleiner, 2013; Nyström & Asproth, 2013). With COVID-19, a major paradigm shift in the business world occurred, pushing more employees than ever to work from home in virtual teams. This is typically done via computer-mediated communication that may become the new normal even with a vaccine (Cathro, 2020; Khincha et al., 2020). Although COVID-19 is relatively new, online communication media is not.

Communication between employees within a virtual team typically utilized computer-mediated communication (CMC) technologies, which include: Email, Voice over Internet Protocol (VoIP) – both with and without video, instant messaging, and others (Cathro, 2020; Chhay & Kleiner, 2013; Nyström & Asproth, 2013; Malone, 2004). For decades, communication researchers have explored various CMC technologies in traditional and virtual teams (Cathro, 2020; Chhay & Kleiner, 2013; Nyström & Asproth, 2013; Malone, 2004). Although a great deal of research has been conducted on virtual teams and CMC usage, little research currently exists that accounts for the wide-ranging effects of the ongoing pandemic and how these newly virtual employees are effectively sharing data within their organization. With the potential of this work from home phenomenon becoming the new normal, the need to better understand how these factors affect each other needs to be researched. In the next section, the background of this study is presented.

## II. BACKGROUND

In the communication literature, the idea of richness in the media technologies used to communicate with others has been established for decades and has been titled media



richness theory (Laitinen & Valo, 2018; Gajendran et al., 2012; Daft & Lengel, 1994). Media richness theory states that the highest level of richness comes from face-to-face communication, with the lowest media richness belonging to written text, such as a written letter (Cleary et al., 2019). For CMC, the higher richness of media often simulates face-to-face communication, such as video conferencing. Studies in this area have shown that when people use media with higher levels of richness in electronic communication, such as video conferencing, to convey information, they have a greater potential for promoting understanding when compared to those people using less rich media, such as Email (Cheng-Jui & Chen, 2020; Byrne & LeMay, 2006; Cameron & Webster, 2005). The typology of communication media is shown in descending order of media richness in table 1 below.

**Table 1. Communication Media**

Communication Media	Richness	Speed
<b>VoIP with Video</b>	High	High
<b>VoIP Audio Only (Voice Chat)</b>	Moderate	High
<b>Instant Messaging/SMS/Text Messaging</b>	Moderate	Moderate
<b>Discussion Board/Forums/Blogs</b>	Moderate	Low
<b>Email</b>	Low	Low

Email is perhaps the quintessential medium of all Internet-based communication. Since its first use in 1971, Email has become ubiquitous in our highly connected modern world (Hudson, 2017; Olson & Olson, 2013; Maltz, 2000). In general, people have embraced Email as one of the most popular forms of computer-mediated communication (CMC). Email can be sent out to individuals or groups of people. It can have multiple attachments of documents, images, or other files, making it the workhorse of many organizations – both traditional and virtual. However, extant literature suggests email communication is low in media richness due to its written nature (Hudson, 2017; Olson & Olson, 2013; Maltz, 2000). Although Email is transmitted instantaneously, it often requires the receiver to reply or take some action. This may be delayed since the receiver may not be online or unable to check his/her Email. After the receiver has read the message, a reply may not occur for hours or days. This reduced level of interaction between sender and receiver lowers the richness and speed.

Instant messaging (IM) is defined as any information technology that allows near-synchronous text-based communication between two or more people through CMC (Hudson, 2017; Olson & Olson, 2013; Maltz, 2000). This broad definition encompasses multiple IM technologies, such as internet-relay chat (IRC) and text messaging via mobile phones. IM technologies allow people to communicate, via

written communication, at a higher level of richness than Email due to the greater amount of interactivity between sender and receiver (Hudson, 2017; Olson & Olson, 2013; Maltz, 2000). Although IM is a popular medium for communication, it is limited by the size of the messages transmitted. One of the benefits of IM is the speed of communication and interaction between users. However, it is possible the receiver may not reply to a message immediately or at all. Therefore, the speed of IM communication is moderate.

An online discussion board (DB) can be 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 (Hudson, 2017; Olson & Olson, 2013; Maltz, 2000). Discussion boards are often archived, and users may continue to make new postings for days, months, and sometimes years after the original posting was created (Hudson, 2017; Olson & Olson, 2013; Maltz, 2000). Therefore, the media richness and speed of discussion boards are low. Blogs have a similar structure, but typically one author creates a new thread, and his or her readers may choose to post comments. However, blogs can have multiple authors and can be used within a business environment to communicate relevant information to employees.

Voice over Internet Protocol (VoIP) Communication is defined as 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 (Hudson, 2017; Olson & Olson, 2013; Maltz, 2000). VoIP has become ubiquitous in business since it allows for a richness level just below face-to-face communication and is far more economically advantageous than travel costs to meet in-person. Managers often use scheduled VoIP meetings with employees to plan strategy, discuss any problems or complaints, and promote camaraderie (Hudson, 2017; Olson & Olson, 2013; Maltz, 2000). With synchronous communication, the speed of both VoIP with video and VoIP with audio-only is high. In the next section, the project goals are discussed.

### III. PROJECT GOALS

In the related literature, strategies for promoting the effective dissemination of data within a virtual team using CMC technologies have been shown in multiple studies (Hudson, 2017; Olson & Olson, 2013). However, with the pandemic, everything changed with the massive influx of work-from-home employees. Few, if any, studies exist which explore this new phenomenon and its impact on virtual team communication. With the explosive growth of work-from-home employees, there is a need to understand better the pandemic's effect on CMC technologies' usage to disseminate data with virtual teams effectively. Sharing data within a virtual team is critical since employees rely on decision-making (Hudson, 2017). Therefore, the need to

explore this area is self-evident. Hence, this research seeks to understand better the impact of COVID-19 on using CMC technologies within virtual teams to disseminate data effectively. This goal is pursued by exploring the relationship between the pandemic, CMC technologies, virtual teams, and their usage to disseminate data effectively. This relationship is stated formally below as a null and alternate hypothesis:

- H<sub>10</sub>: There is no relationship between the pandemic, the richness of online communication media technology selection, and the effective dissemination of data between virtual team members.
- H<sub>1A</sub>: There is a relationship between the richness of online communication media technology selection for effective dissemination of data between virtual team members.

**IV. METHODOLOGY**

A link to a survey was placed within the online game Travian’s forums to pursue this research. Travian is an online strategy game where over 10 million players worldwide compete within groups of virtual teams to win. Typically, the groups consist of hundreds of players. All of which must work together to win the game since it is not possible otherwise. Winning in Travian is an enormous undertaking requiring considerable effort among all team members over a lengthy period. Effective dissemination of data is essential to the successful completion of the game. Therefore, on the survey, players were asked about their experiences in effectively sharing data within their virtual team, using CMC technologies to accomplish this task, and the impact of COVID-19 on that usage. The link to the survey remained on the Travian forums for 30 days. Examples of those questions include players being asked about their usage habits for effectively sharing data using each type of CMC technology (i.e., “After COVID-19 began, I used Video Chat to share data with my teammates more than before effectively.”). The survey questions utilized a five-point Likert Scale style answer format to record responses on a scale from (1) “Strongly Disagree” to (5) “Strongly Agree.”

Travian was used in this study because players' actions closely mirror that of employees in a business. Both must collaborate to be successful. In Travian, collaboration may consist of sharing various types of data critical to winning the game. This is analogous to employees sharing data within their virtual team to complete a project in their organization. The usage of online games in research has been a popular option for many years due to their similarities to the business world (Loucks & Ozogul, 2020; Hudson, 2017). Players now prominently place their game leadership experience on resumes to show they gained those skills by working within virtual teams (Loucks & Ozogul, 2020; Hudson, 2017).

**V. RESULTS**

The survey was placed on the Travian forums, where an average of 2,200 players visited the forums each week while

the survey link was active. The link to the survey remained active for 30 days and garnered 1,601 total views during that period. When the survey period ended, there were 874 attempted surveys with 647 usable. The majority of rejected surveys were from dropouts due to age restrictions (below 18) or not being part of a virtual team (a solo player). The survey had 436 male participants (67.39%) and 211 female (32.61%). 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 23.8 years old. The predominant country in which players reside was in the USA with 498. The rest were primarily in European countries. The data was compiled into an Excel Spreadsheet, cleaned, and then imported into R for statistical analysis. In addition to descriptive statistics, Fisher’s Exact Test was used to test for significance of the survey results. In table 2 below, the results are shown.

**Table 2: Survey Questions on CMC Usage and Statistical Results**

<b>Impact of COVID-19 on CMC Usage to Share Data in Virtual Teams</b>			
<b>Survey Questions on CMC Usage</b>	<b>Mean</b>	<b>STD Dev</b>	<b>P-Value</b>
After COVID-19 began, I used Video Chat to share data with my teammates more than before, effectively	1.62	1.03	0.003
After COVID-19 began, I used VoIP – Audio Chat to share data with my teammates more than before, effectively	1.78	1.44	0.0141
After COVID-19 began, I used Instant Messaging to share data with my teammates more than before, effectively	4.64	0.83	0.024
After COVID-19 began, I used Blogs/Forums to share data with my teammates more than before, effectively	1.06	0.67	0.816
After COVID-19 began, I used Email to share data with my teammates more than before, effectively	4.33	1.75	0.001

**VI. CONCLUSION**

In the literature, CMC technologies with high richness levels typically result in higher effective communication within a virtual team (Olson & Olson, 2013; Peters & Manz, 2007; Maltz, 2000). Not surprisingly, this study reveals that players did not change their communication habits greatly

with high richness CMC technologies. Player's using video chat, which has the highest media richness, did not change their usage habits after the pandemic broke out. The same can be said about audio chat. Players recognize these technologies as being the most useful to communicate with each other.

A profound change is with instant messaging. In the literature, this technology predominates with the younger generation and is used for almost all communication (Williams et al., 2011). In this research, instant messaging usage is higher during the pandemic. Based on the literature, it was likely players used instant messaging a great deal. SO, to say they used it more during the pandemic is remarkable.

The literature also suggests blogs and forums are not nearly as popular with virtual teams due to their low richness (Olson & Olson, 2013; Peters & Manz, 2007; Maltz, 2000). These results support those conclusions as players did not change their usage habits after the pandemic occurred. The biggest surprise in this study was with email usage. Multiple studies have shown newer generations of shunning Email (Olson & Olson, 2013; Peters & Manz, 2007; Maltz, 2000). It is viewed as passé because they view it as their parent's technology (Olson & Olson, 2013; Peters & Manz, 2007; Maltz, 2000). This research shows a large change in its usage after the pandemic broke out. It appears players are using it more often to share data than before COVID-19.

The null hypothesis stated there would be no relationship between the pandemic, the richness of online communication media technology selection, and the effective dissemination of data between virtual team members. With p-values of less than 0.05 ( $p < 0.05$ ) for all but blogs and forums, the null hypothesis is rejected, and the alternate hypothesis is accepted. This result indicates a relationship between the pandemic, the richness of CMC technology usage, and the effective dissemination of data within virtual teams.

In conclusion, this research shows the pandemic has affected CMC technology usage within virtual teams. With the explosive growth of work-from-employees, the need for further training on CMC technologies is warranted to ensure consistent and effective sharing of data within virtual teams. Although most people are familiar with these technologies already due to their longevity, training on which technology is best suited for particular tasks may promote successful organizational outcomes. With the usage of work-from-home employees unlikely to end quickly once the pandemic is over, further research into this area is vital to ensure continued success. Additionally, results from such research may serve as a component for building a best-practices model to improve communication and data sharing within virtual teams for many years to come.

## VII. LIMITATIONS AND FUTURE RESEARCH

Therefore, this research was limited in scope and did not shed light on how a particular CMC technology was used to share data within a virtual team. Additionally, this research did not look at the differences in usage between the genders. For future research, it would be useful to explore those topics further. The research could examine the individual CMC technologies and discover how they are used to share data within a virtual team effectively. The research could also be performed to look at what role gender played by asking questions such as "were men and women impacted differently by the pandemic?"

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