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Communication Efficacy Using Technology within Virtual Teams

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Running head: COMMUNICATION EFFICACY IN VIRTUAL TEAMS

Communication Efficacy Using Technology within Virtual Teams

Jeremy DaRos

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Abstract

Technology has given businesses the flexibility to allow employees to collaborate beyond the limitations of geography. Today's businesses are taking advantage of collaborative teams that are separated by distance, but work together as if they are in the same room. While technology enables these teams to work together, it is this same technology that often causes misunderstandings between members. The objective of this study was to answer questions pertaining to how virtual team members communicate. Specifically, this study investigated how teams use lean and rich media to communicate, and whether or not variables such as gender and age impact communication choices and success. Pursuant to the objectives, 66 virtual team members were surveyed regarding their virtual communication tendencies. The average age of the sample was 42, with participation from 41 women and 25 men. Results support the idea of rich media theory, which is that people use lean media to communicate non-complex ideas, while turning to richer media to communicate more complex messages. Overall, virtual team members were found to use a variety of lean and rich media, however leaner media had a tendency to increase communication errors. Further, while the outcome of statistical analysis did not reveal an expected significant difference among the generations in terms of virtual communication, the present research did show a significant difference between the rate of misunderstandings between men and women concerning telephone usage.

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Introduction

As globalization broadens its geographical and economical reach into the 21st century, businesses wishing to remain competitive in the marketplace have recognized the importance of building teams of employees who work hundreds or even thousands of miles apart (Algesheimer, Dholakia, & Gurău, 2011).

Historically, organizations were forced to rely on employee engagement through face-to-face contact within the confines of brick and mortar buildings. The use of technology has opened more collaborative possibilities in the last few decades, introducing new avenues and options for employee interaction (Townsend & DeMarie, 1996). With this new marketplace, however, the challenge of new diversities, ranging from cultural to time zone differences, have emerged (Zofi, 2012). Leadership styles that may have historically been successful with face to face teams now require further consideration. For example, research in the area of virtual versus face-to-face teams support the notion that high performing virtual teams have a reduced need for older models of hierarchical leadership than do teams that meet in person, emphasizing the communicative interaction between the team members themselves (Hoch & Kozlowski, 2014). Additionally, emphasis on individual performance within the workplace is diminishing. Organizations are moving toward favoring team approaches to solving problems (Bell & Kozlowski, 2002) while teamwork, rather than individual effort, is rewarded. With the paradigm shift from individual efforts to coordination with other members of the team, this new world demands that organizations expand flexibility and adapt to the different environments enabled by expanding

technology (Bell & Kozlowski, 2002). Consequently, leaders now face the challenge of building teams without proximity, and will require utilization of the right technology to support this transition. For example, telecommunications technology has grown exponentially to support IP telephony—computer and video conferencing and software—bridging the distances between workers (Andres, 2002). The demand for technology has grown, and software applications now exist to support what was previously impossible; thus the emergence of virtual teams.

Virtual teams are not perfect (Kerber, 2004). Employees need to find ways to utilize virtual team technology that enables them to literally connect if distance were not a factor. There are advantages to working virtually, such as the flexibility to work anywhere, and the opportunities to collaborate without the expense of travel. Yet, many challenges exist for virtual workers that are absent within face-to-face groups. Examples include missing a sense of personalization within communication contexts (Andres, 2002), unclear role expectations, and lack of trust among team members (Greenberg, Greenberg, & Antonucci, 2007; Kahai, Huang, & Jestice, 2012). Consequently, it is important for leaders to learn about the conditions which give virtual teams the best chance of success.

With the goal of learning about these teams in mind, this study investigated the impact of certain circumstances within virtual teams that elicit the highest sense of team inclusion and greatest sense of effective communication. Additionally, the study focused on the communication technology preferences

that facilitate the greatest sense of efficient social interaction among a diversity of virtual team members.

On the basis of these focal points, answers to the following research questions were sought:

1. Do virtual teams communicate effectively through utilizing both lean and rich media?

2. Do virtual team members prefer full team interaction such as team meetings versus more personal one on one time with their leader or other team members?

3. Do variables such as gender or generation predict technology preference?

Hypothesis A

It is hypothesized that virtual team members communicate more effectively through a balance of both lean and rich media interaction, as well as frequent team meetings using a variety of electronic communication.

Hypothesis B

It is also hypothesized that younger generations, such as Millennials and Gen Xers, gravitate more toward newer technologies such as instant messaging and web cams (Considine, Horton, & Moorman, 2009).

Hypothesis C

Converse to hypothesis B, this hypothesis suggests that older generations prefer legacy technologies, such as telephone, in the context of one on one conversations.

Definition of Terms

When attempting to understand the dynamics within the rapidly changing workforce, it is important to appreciate the context around which virtual teams emerge. Theodore Levitt of the *Harvard Business Review* is widely credited among the first to coin the term globalization (Feder, 2006), and underlying force behind the rise of virtual teams. He described globalization as the homogenization of emerging global markets, breaking down previously established regional barriers, driven primarily by technology (Levitt, 1983). Understanding the impact of globalization is important, since it is linked to the ability for employees, previously bound by their proximity, to interact as they would in person.

Born from globalization is the concept of remote or virtual employees, which comprise of teams that use this technology to accomplish common goals. For the purposes of the proposed study, “remote” and “virtual” employees and corresponding teams are synonymous. However, that which constitutes a virtual team may have a wide array of definitions. According to Zofi (2012), virtual teams include only members who “work together to a common purpose, while physically apart” (p. 7). Nevertheless, a multitude of definitions exist beyond Zofi’s (2012) within the literature, and for this reason, the overarching classification of virtual teams must be established.

Researchers tend to have their own interpretation of what comprises a virtual team. Not surprisingly, the literature available on virtual teams is not always in congruence. This variability may be explained by the subjectivity of the virtual team concept, since definitions of virtual teams are somewhat fluid.

For example, a review of literature on virtual teams by Cur eu, Schalk, & Wessel (2008) establishes some dissimilarity among the definitions. Discrepancies were attributed to the fact that virtual teams may differ in their objectives, criteria for membership, and task types (Zigurs, 2003, as cited by Cur eu et al., 2008). Cur eu et al. (2008) offered studies that argue virtual teams and virtual groups are synonymous, while other researchers (e.g., Furst, Blackburn, & Rosen, 1999) posited that virtual teams have greater degree of interaction between members than do groups. Beyond this discrepancy, there is some divergence over the extent to which virtual team members interact with each other to earn the right to be called a “virtual team.” Specifically, Cur eu et al. (2008) found that some in the field believe virtual teams refer wholly to teams that interact through electronic media, while most others agree that a certain amount of face-to-face interaction of team members would still satisfy the definition. In order to demonstrate the varying definitions that accompany virtual teams in the literature, Table 1 is provided below:

Table 1

Various Definitions of Virtual Teams

Author(s)	Definition
(Cascio, 2000)	Members of a team who are geographically dispersed from one another, from their leader, or both, are considered part of a virtual team.
(Green & Roberts, 2010)	Virtual teams depend on computers for electronic communication, the Internet, and videoconferencing for routine interactions.
(Beranek & Martz, 2005)	(Virtual) teams may for some, if not all, team meetings communicate virtually – without the limits imposed by geography, time and organizational boundaries.

(Nyström & Asproth, 2013)	(Virtual teams engage in) meetings, communication, information exchange, and so on, will be carried out with support of some kind of technology.
(Martins, Gilson, & Maynard, 2004)	Virtual teams are functioning teams that rely on technology-mediated communication while crossing several different boundaries.
(Malhotra, Majchrzak, & Benson Rosen, 2007)	Virtual teams are teams whose members are geographically distributed, requiring them to work together through electronic means with minimal face-to-face interaction

Synthesizing the definitions of virtual teams, one may reach two conclusions. The first is that the definitions are largely very similar, even across a range of time. There are some deviations however, making one standard definition all but impossible. The second conclusion is that there are two nearly universal threads associated with the definition of virtual teams: Virtual teams are comprised of (a) dispersed team members who (b) rely heavily on technology for their means of communication. The latter conclusion will be the standard definition upon which this research will be based.

The Concept of Lean and Rich Media. Beyond the definition of virtual teams, it is important to define technologies in the research. Different technologies are used to bridge members of virtual teams together, for a fraction of the cost available through alternate means. This technology can be categorized under two different types: lean and rich media. Lean media includes text-based technology such as email and instant messaging (Andres, 2002; Smith, 2014), and further toward the rich end of the continuum includes more sophisticated media such as video conferencing (Klitmøller & Lauring, 2013). Due to the fact that

users typically have both available, the focus of this study will be on the choices different people make to communicate with others on the team.

Residing in the middle of the rich media spectrum is the telephone (Smith, 2014). Telephones have historically been connected to older switched technologies, however IP telephony, also known as Voice over IP (VoIP) is a type of telephone technology that enables utilization of phone calls at a greatly reduced cost. This involves translating audible voice signals during a phone call into digital packets, similar to how other Internet data moves (Varshney, Snow, McGivern, & Howard, 2002). Consequently, organizations can utilize VoIP as an inexpensive alternative to older dial tone technologies.

Beyond phones, virtual teams also use a variety of lean and rich media technologies from email to instant messaging the latter of which continues to grow in popularity (Kahai et al., 2012). Instant messaging is defined as a tool with the capability of connecting individuals instantaneously, facilitating real time interaction (Ou, Davison, Zhong, & Liang, 2010). A more media-rich approach to communication is through the use of webcams. These cameras, often equipped with built in microphones, allow for real time audio as a phone conversation would, but add the dimension of video streams on employees' personal computers (Olson, Appunn, McAllister, Walters, & Grinnell, 2014). This study will ask users about their preference and experience using this type of technology, therefore testing the theories about rich-media interaction (Andres, 2002; Smith, 2014).

For the purposes of the planned study, it is important to define team member inclusion as well. While inclusion has varied definitions in the research,

several different aspects contribute to an overall understanding of inclusion, such as team members having a perception of influence on the team's goals, priorities, and decisions (Ravi & Aparna, 2012). The present study adopts this definition by identifying inclusion as team members gaining a sense of contributing to the wider team goals.

Finally, this study examined media preferences along gender and generational lines. Younger generations within the study included Millennials, which are those born between the years 1982-2002, Generation X, born between 1961-1981, and Baby Boomers, born between 1943-1960 (Graybill, 2014). Considering this range covers the vast majority of the current workforce, any outliers beyond these three generations were omitted from the data.

Review of the Literature

Considering the prevalence of virtual teams and the advantages they hold, it is no surprise that research on virtual team abounds. In order to gain a sense of the various virtual team dynamics that comprise the efficacy of communication and technology use among team members, the existing literature around these topics deserves mention. Research ranges from seeking to understand virtual team challenges, to the specific influences of virtual teams, to far more granular aspects such as the influence of elective appearance of virtual team members through avatar selection (van der Land, Schouten, Feldberg, Huysman, & van den Hooff, 2015).

Much research exists exploring elements of success in remote teams (Westerlund, 2008), as well as the extent to which certain leadership behaviors are

needed based on teams' level of "virtualness" when compared to face-to-face teams (Zimmermann, Wit, & Gill, 2008). Research into the impact of virtual teams on leadership is abundant as well, ranging from developing virtual team leadership within the medical field (Cowan, 2014), to the optimization of leadership of virtual teams within the software industry (Tuffley, 2012). While this literature is extensive and inclusive of many considerations impacting virtual teams, questions remain about how members of virtual teams prefer to interact with one another, and the technology behind the communication.

Dynamics of Teams

For the purpose of this literature review, authors focusing on the communication dynamics of team members will be highlighted. The way team members interact virtually ties into what may be learned about how these teams function. Two areas to note in particular are trust and communication.

Trust among virtual team members. Prati, Douglas and Ferris (2003) found that trust is an important aspect within teams that enhances information exchange, and reduces conflict. In a pair of different surveys mentioned in the literature review by Szewc (2013), the condition of "trust" surfaced as the first and second contributing factors to success of the virtual team. As such, much of the literature touches on how best to establish and maintain trust within a group of employees that seldom, if ever, finds themselves within the same physical space.

According to Malhotra et al., (2007), leaders have the opportunity to impact trust. During this qualitative study, researchers observed virtual teams formed at different organizations, and noted some key interactions (Malhotra et

al., 2007). For example, virtual teams within one organization worked across different time zones, making it difficult for meetings to be scheduled at times that were routine for everyone. To address this issue, leaders of these teams purposely scheduled meetings during different periods of the day, giving everyone a chance to participate in events within their normal comfort zone, rather than giving preferential treatment only to those who worked in a particular location. This type of consideration went a long way in building a trusting relationship between leaders and followers. Team leaders were interviewed during the study, and one in particular recapped the idea of trust within virtual teams as delivering on promises within the context of the team (Malhotra et al., 2007), perhaps suggesting a model for other leaders to follow in order to increase trust among members.

The aforementioned study focused on successful virtual teams, however the definition of what qualified a team as “successful” was somewhat ambiguous. The criteria for success were data collected from surveys of executives familiar with the teams (Malhotra et al., 2007). Survey questions were not included in the published research, and simply gauging the teams’ success on the opinions of executives may introduce bias, raising questions around the validity of the criteria. Within the current study, the measure of success will be a subjective sense from the participants of successful communication and sense of inclusion within their geographically dispersed group.

Correspondingly, Greenberg et al., (2007) posited a model for trust within virtual teams. Such models are important, according to the authors, because establishing trust within virtual teams is more difficult than with their face-to-face

counterparts. This is due to the physical separation of virtual team members. Those who work within the same confines are able to have social interaction more readily, such as impromptu contact (e.g., passing in the hallway), while benefitting from interactions supplemented by important body language. In contrast, those who work virtually are prone to misunderstandings in their communication (Greenberg et al., 2007). While Tuckman's (1965) landmark research on team formation is valid for face-to-face teams, Greenburg et al. (2007), argue that changes were needed in consideration of virtual teams. Rather than forming, storming, norming and performing, they suggest a model that includes establishing, inceptioning, organizing, transitioning, and accomplishing (Greenberg et al., 2007). Unique details within these steps target virtual teams explicitly, such as training in communications software that involves electronic communication norms and how to perceive communication lag. This type of open and informed communication is supported by other literature, which encourages teams to establish norms about electronic communication (Malhotra et al., 2007). The concepts of trust and cohesion are often intertwined within teams, and research has found that trust within a team has strong connections to several team dynamics leading to greater performance, including the ability to communicate openly (Mach, Dolan, & Tzafrir, 2010). It is for this reason the role of technology to strengthen, rather than hamper communication within virtual teams, is so critical.

Virtual and electronic communication. According to the literature, communication discrepancies are common. One case study about a multinational

company found that ‘onshore’ employees (those who were part of the national parent company) were much more satisfied with their virtual communication practices than those who were ‘offshore’ (those separated from the onshore employees by geography) (Lockwood, 2015). Some discrepancies within these teams were around perception of silence and frequent talking within their daily communications. Those who were onshore perceived silence as a lack of confidence, and those in the offshore participant pool did not perceive talking often in the same positive light as those onshore (Lockwood, 2015). While this particular study shed some light on virtual communication, many of the independent variables revolved around culture, versus the virtual communication itself. This might shed more light on cultural differences than the way in which virtual team members interact. A more valid study would seek to eliminate differing cultural variables, and focus more on homogenous teams to reduce differences in social norms.

Beyond cultural issues, virtual teams are challenged with diverse challenges of communication due to how electronic media can interrupt communication cadence, and introduce unique types of misunderstandings that are less prevalent in face-to-face teams (Klitmøller & Luring, 2013). The solution offered by some researchers to overcome this is rich media theory (RMT). This theory suggests that rich media, such as video conferencing, should be used to support more complex interactions among teams. Lean media (e.g., email), tend to be a poor choice for supporting the more complex interactions that virtual team communications require (Klitmøller & Luring, 2013). On the other

hand, email and similar forms of communication are more appropriate for sharing more explicit information where interpretation is less within the user's discretion. In other words, a balance of media should be used based on the complexity of the message conveyed (Majchrzak, Rice, King, Malhotra, & Sulin, 2000).

Further investigating the idea of rich media in geographically dispersed teams, additional research has been conducted to investigate the idea of social presence within communication. Social presence is the idea that a communication medium allows members of a group to "feel the presence of other group members and the feeling that the group is jointly involved in commutative interaction" (Shore et al., 1976, as cited by Andres, 2002). Literature about social presence with electronic communication offers almost identical theories about media richness along the same line of thought as other researchers (Kahai et al., 2012; Klitmøller & Luring, 2013). Put another way, the more we are able to use electronic media to convey our tone, body language and verbal feedback in real time, the more we are able to reduce ambiguity and misunderstanding.

In summary, the literature suggests that virtual teams should select their communication media carefully. Communicators need to be educated about the norms and usage of the software applications available, and choosing lean versus rich media can affect the quality of the communication experience. As an example, while email has its place among virtual teams, rich media should be used to convey complex information.

Communication preference and inclusion. Literature about virtual team communication may be prevalent, however there are two specific conditions of

these teams that are much harder to find using various research queries: (a) virtual team member inclusion; and (b) preferences for communication style and cadence. This study seeks to learn more about each, however it is important to expand upon how these two facets impact team members. One of a handful of studies about virtual team inclusion was published in 2012 from researchers at University of Illinois at Urbana-Champaign (Ravi & Aparna, 2012). Specifically, researchers were interested in the contribution from team members in the area of decision-making, a critical component to a sense of inclusion (Kirkman, Rosen, Tesluk, & Gibson, 2004). The premise for the study was that globally dispersed teams have fewer opportunities, not only to exchange information via the physical and social cues afforded by face-to-face teams, but that virtual team members also lack the opportunities to observe the impact of contributions they make. As a result, team members have fewer chances to contribute, and even less chance to feel the impact they made.

As a possible solution, the researchers posited that Leader-Member Exchange theory (LMX), which suggests that leaders have unique relationships with their followers (Graen & Scandura, 1987), has an impact on perceived involvement within teams that are geographically distributed. The personalized relationship that LMX offers to those working on a virtual team creates a positive relationship between the leader and followers, and reduces ambiguity of one's value and worth to the team during these interactions. Moreover, Gajendran and Joshi (2012) touched on the frequency with which the leader interacts with others on the team. Their hypothesis was that interaction frequency would have a

moderating effect on LMX, especially on the team members' sense of influence on key team decisions (Ravi & Aparna, 2012).

Findings garnered from the study support the hypotheses. Survey results from over 200 individuals indicate that LMX may present some solutions for lack of inclusion on virtual teams, and the communication cadence of the leader. For example, researchers found LMX had a positive impact on how team members perceived their influence on decisions ($p < .01$), but only when interaction between the leader and team members was high (Gajendran & Joshi, 2012). Outcomes are important for leaders who want to encourage innovation through participation within the geographically dispersed groups they lead; however, the study does not explicitly go beyond answering "how often" as questions remain around the questions of "how." In other words, are there particular media that foster a sense of inclusion? Do other variables exist around inclusion beyond simply focusing on the leader's communication, e.g., team meetings? This study seeks to find more information about communication within these teams, with survey questions geared toward filling in some blanks that Gajendran and Joshi (2012) leave to be filled.

Conclusions from the Literature on Virtual Teams

Some conclusions about trust, communication, and inclusion may be drawn from the reviewing existing literature on virtual teams. Virtual teams operate on many of the principles of teams that meet regularly in-person, but with many unique exceptions. While building trust with virtual teams is important, establishing this relational quality with virtual team members is even more critical

due to the lack of face-to-face interaction. Informative feedback taken for granted during face-to-face interactions is missing when communicating electronically. As a result, building trust through effective communication is a component of successful virtual teams. The frequency with which these interactions happen is another important variable of significance. All of these different aspects of virtual team literature paint a somewhat clearer picture of what may increase performance within these newer, unique teams, however further study is needed to focus on more specific questions.

Limitations of These Studies

The different studies among virtual teams seem endless; however, these studies, and most others, focus on performance output. More studies are needed that survey virtual team members and gain insight into their preferences about communication design. For example, are there certain technologies that support a sense of team inclusion more than others? Is there a hierarchy of communication technologies that facilitate cohesiveness and alleviate confusion more than others? Are certain team communication structures such as team meetings, web conferencing and newsletters preferred by certain generations and genders over others? The current study attempted to answer these and other questions.

Method

A quantitative study based on a survey method was conducted to explore team communication methods and communication technology as well as their impact on virtual team inclusion and perceived communication effectiveness. Virtual teams face communication challenges that their face-to-face counterparts

may take for granted and virtual teams have teams have several options available when communicating within the team. However, feedback from virtual team members about which methods they choose may lead to insight, prompting leaders to focus on setting norms and provide training on how best to utilize these tools. Email, Instant Messaging, Telephone, and Web conferencing, are the primary modes of communication upon which this study focused. Specifically, this study included (a) methods of virtual team communication and (b) variables within virtual teams and how those variables correlate with different technology.

Measures

Different methods and frequency of communication, such as team meetings, one on ones, and online newsletters, are often deployed within the virtual team environment. To collect information about the effectiveness of these options for this study, a survey method was used. Survey Monkey software was chosen as the interface and distribution of 14 questions to virtual team employees. The survey was cross-sectional, meaning the data was collected at a point in time, rather than over a longer period (Cresswell, 2014). Different sections of the survey required participants to answer questions about the conditions of their virtual team environment. Some of these questions targeted technology preference, while others focused more on individual contribution and relationships with leaders. For example, participants were asked basic questions to elicit frequency-based answers, such as how often they would like to have team meetings, and which methods of communication give team members the greatest sense of contributing to their teams.

Virtual team members and technology. As the methods of virtual team communication are varied, so too are the media through which this communication occurs. Different media such as instant messaging, email, and web conferencing may appeal to different demographics of virtual team members. Consequently, various questions served to collect data on the variety and brands of communication applications. However, while part of the aim of this study was to uncover popularity of applications among geographically dispersed team members, an ideal outcome was to further understand communication breakdown frequency, and the participants' behavior to remedy these problems, bringing into focus a possible hierarchy of communicating without physical restrictions.

Specifically, participants were asked how often email, telephone, instant messaging, and video conferencing elicited a misunderstanding with their team members. The adjacent question asked what technology they are likely to use in order to alleviate the misunderstanding (e.g., when encountering a confusion during an email conversation, are participants likely to pick up the phone and clarify the intended message?). The pairing of these two questions was intended to establish whether or not methods of communicating virtually are prone to richer information exchange experiences, and therefore more valuable to most users in certain situations.

Technology correlated with other variables. Certain questions within the survey were designed to isolate specific variables and test for preference via comparison of means analyses. Examples of these included gender, age, and leadership experience. Isolating responses from these groups were compared with

the type of communication preference (i.e., which technology team members find most rewarding). The end result could provide insight into whether men prefer a certain type of technology over women, which media are preferred by different generations of users, and to what extent leadership experience in the realm of communication impacts virtual team members.

Question formatting. Questions about miscommunication frequency and behavior asked participants to answer via a Likert scale (Likert, 1932) such as whether or not users of certain technology never, rarely, occasionally, frequently, or very frequently, encountered a misunderstanding while working within those particular applications. Four questions asked participants to use ranking style answers to provide input about their communication media choices and frequency. Finally, near the conclusion of the survey, two open ended questions were asked about general challenges and enjoyment pertaining to working within a virtual team. The questions asked were: (a) “Thinking about your work within a virtual team, what tends to frustrate you the most about communication?”; and (b) “What have you enjoyed most about working on a virtual team?” These questions were designed to stimulate participants’ thinking around virtual team experiences, with the goal of learning trends and common themes that virtual team members might share within their collective experiences. The complete survey is shown in Appendix A of this report.

Participants. The survey targeted a heterogeneous sample comprised of known virtual team workers, with additional reliance on volunteers to complete the survey. Volunteers were solicited from various social media such as Facebook

and Twitter, making this sample one of convenience. Organizations such as Aetna Insurance, Idexx, and EarthLink Business were originally pursued for their abundance of virtual employees, however as public corporations, they all enforced strict policies about survey distribution within their organizations. While this may have limited the number of participants, an advantage gained within the survey population was the natural diversity of industry and marketplace for those who volunteered to participate. However, it should be noted that because this was a sample of convenience, the generalizability to the general population is weakened.

66 virtual team members responded to the survey and most completed the 14 questions. The final sample consisted of 41 women and 25 men. The mean age for all participants was $M = 41.89$ ($SD = 10.05$), with a diversity of age ranging from 24 to 72, spanning three different generations (Graybill, 2014). Those within the sample indicated varied levels of leadership experiences, nearly half of participants did not hold a leadership position, and 51.5% held a leadership position of supervisor or above.

Table 2

<i>Participant Demographics</i>		
Gender	Number	Percentage
Men	25	37.9
Women	41	62.1
Position		
Non-leadership	32	37.6
Supervisor	1	1.2
Manager	20	23.5
Director and above	13	15.3
Generation		
Millennial	14	21.9
X	46	71.9
Baby Boomer	4	6.3

Survey results were exported from Survey Monkey and analyzed in SPSS, which include means comparison tests such as independent sample *t*-tests, and one-way ANOVA analyses. The aim of these tests were to determine a relationship between variables such as gender and age with different types of virtual team communication technology.

Timeline

The study began in December, 2015, and concluded at the end of April, 2016. The survey design was loaded into Survey Monkey and deployed to participants in January 2016. The survey was held open to participants from January 1st 2016, to February 28th. Participants were invited to take the survey via email, and notified they had until the end of February to complete. The data sorting and interpretation occurred shortly after data collection.

Results

Analysis of the data show different trends among virtual team members, some of which have significance among variables related to gender, generation, and media usage. While the data can be scrutinized at the detailed independent variable level, it is important to first look at the data holistically among all respondents. Doing so allows for a generalized view of how virtual teams impact technologies and relationships among team members.

Frequency of Application Choice

The applications through which virtual team members choose to communicate is varied and demonstrates a mix of utilization between rich and lean media. Each of the 13 applications listed within this particular survey were chosen by at least eight participants, while applications such as iMeet, Spark, and Polycom Real Presence were also listed in the “other” category. Overall, email was indicated to be the most prevalent, with 92% of participants indicating they use it with their virtual team. After email, the most frequently used technology was Microsoft Lync, a service that combines leaner media such as instant messaging, with richer technology like screen sharing, VoIP calls, and web conferencing. In 2011, Microsoft acquired Skype, rebranding their commercial application “Skype for Business,” in the early part of 2015 (Keizer, 2014). This is significant within the survey question, because while 56% of participants specified Microsoft Lync as an application they had used, it was revealed that another 47% of participants chose Skype from the list. The survey question allowed for respondents to choose all applications that apply to their work, which

suggests that Microsoft's client is a very popular choice for those working in virtual teams, regardless of corporate branding.

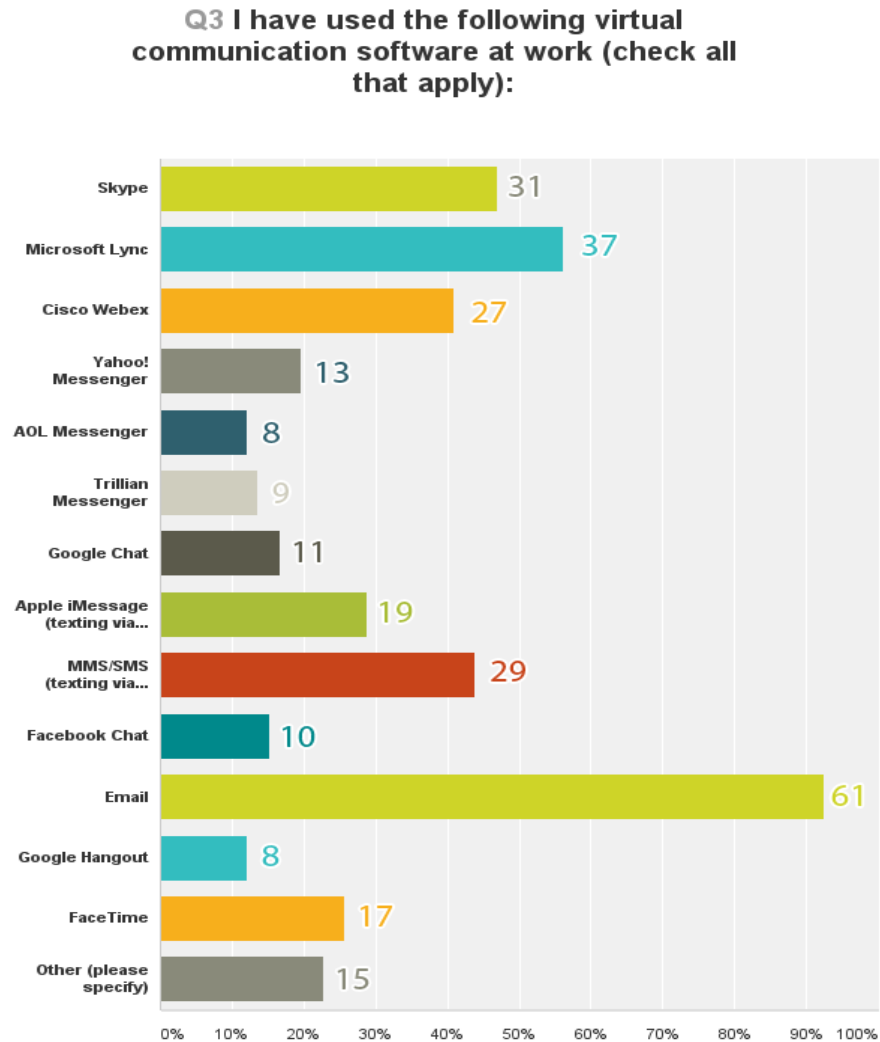


Figure 1. Application use among virtual team members.

With application usage comes communication errors. Those who participated in the survey were asked questions about miscommunication experience, their likelihood to occur with certain applications, and what action they took to resolve. Hypothesis A stated that virtual team members communicate

more effectively through a balance of both lean and rich media interaction, as well as frequent team meetings using a variety of electronic communication. To gain more insight into this balance of lean and rich media usage, a general question required participants to indicate which technologies—email, instant messaging, telephone, or video conferencing—their teams relied upon too much.

Overwhelmingly, email (70%) was the most popular answer, with instant messaging a distant second at 18%. Combined, these two methods of lean media comprised nearly 90% of what respondents felt were overused, indicating an over-reliance on leaner options versus their richer counterparts.

Augmenting this section, the survey contained a pair of questions designed to collect data on the likelihood certain media would contribute to communication errors, and probed whether or not team members would make a different media choice after the failure occurred. As foreshadowed by answers about over-reliance, respondents revealed that misunderstandings occurred in email at least occasionally, 85% of the time. In parallel, email received the lowest score of all media types to rarely or never be used during a misunderstanding, at 87%.

Overall, results indicate that lean media, such as email and instant messaging, are more prone to misunderstanding than richer media, like telephone and video conferencing. For full results of the question about media type and misunderstands, see Table 3.

Table 3

Frequency of Communication by Media Type

	Weight ed	Neve r	Rare ly	Occasional ly	Frequent ly	Very Frequent ly	N/ A
--	--------------	-----------	------------	------------------	----------------	------------------------	---------

	Average						
Email	1.88	2%	24%	61%	12%	2%	0%
Telephone	1.02	14%	73%	8%	2%	2%	3%
IM	1.68	3%	32%	41%	11%	0%	14%
Video Conferencing	1.02	14%	44%	12%	2%	0%	29%

Examining further the phenomenon of misunderstanding through virtual media, a subsequent question asked survey participants which media they might switch to with the intent to alleviate the misunderstanding. The objective of this question was to establish whether or not a type of media hierarchy exists, as it pertains to successful communication. Put another way, do certain forms of virtual communication hold more value for their ability to deliver messages aligned with the users' intent? According to the data, virtual team members indicated they are "very likely" to move the conversation to a phone call, by a margin of 56% over the next selected technology, instant messaging. Notable within the results is the fact that only 2% of respondents indicated they would be "unlikely or not at all likely" to use the telephone during a misunderstanding. This indicates that speaking in real time over the phone, a more media rich technology, is viewed by virtual team members as a clarification tool when other, more modern technologies may fail. Table 4 displays the full results of this question.

Table 4

Likelihood of Switching to the Following Media During Miscommunication

	Weighted Average	Very Likel y	Likel y	Somewha t Likely	Unlikel y	Not at All Likel y	N/A
Email	1.88	6%	29%	27%	23%	8%	3%
IM	1.02	11%	32%	17%	14%	8%	9%
Telephone	1.68	67%	29%	2%	2%	0%	2%
Video Conferencin g	1.02	8%	11%	11%	15%	26%	20 %

Team Meetings and Other Team Communication

The latter part of Hypothesis A predicted that virtual team members would provide input suggesting they require team meetings as a way to effectively communicate. The underlying theory of this hypothesis is that team meetings provide a predictable structure for all team members to have virtual interaction, which ensures contributions of team members are heard. Specifically, team members were asked “Which group communication method gives you the greatest sense of contributing to your team?” Survey instructions asked for participants to rank the following team communication methods: (a) team meetings via telephone

conference call; (b) team meetings via video conferencing; (c) team emails. Respondents overwhelmingly chose conference calls as their first option, which indicates that using a lean media, while convenient, does not provide the connection that users find in richer media. Paired with the question about fulfilling a sense of contribution, participants were also asked to rank which form of communication they prefer with their leader. Again, telephone ranked as the top choice by 40% over email, with further supports the notion of forming bonds with other team members by speaking on the phone. Interestingly when the survey question shifted to how team information is preferred to be disseminated, email and telephone methods were chosen nearly identically.

Generational Impact on Communication Preference

Hypothesis B stated that younger generations gravitate more toward newer technologies such as instant messaging and web cams for their interactions with team members. Conversely, hypothesis C stated that older generations would be more comfortable using legacy technologies such as telephone. Specifically, three generations were surveyed: Millennials born 1982-2002, Generation X, born 1961-1981, and Baby Boomers, born 1943-1960 (Graybill, 2014). Four different one-way ANOVA tests were used to compare the means of four ranking questions. Questions asked participants to rank different virtual team communication from most to least, based on which methods gave them the greatest sense of contribution to the team, which methods they were most comfortable using, which they preferred for one on ones with their manager, and which method they preferred most for team information. Hypotheses B and C

stated that older generations would gravitate toward legacy technologies such as the telephone, while younger generations would prefer newer technologies such as instant messaging and web cams. Both of these hypotheses were rejected, as the ANOVAs did not produce any significant results.

Gender and Communication Preference

An independent samples *t*-test was conducted with the intention of comparing answers from male and female respondents to their proneness to misunderstandings in communication with specific technologies. A separate independent samples *t*-test was conducted to compare male and female responses with the technology they switched to with the intention of alleviating miscommunications. When asked how likely they are to encounter a misunderstanding using email, instant messaging and video conferencing, there were no significant differences, which indicate that men and women share similar experiences using the three communication methods. There was, however, a significant difference between how men ($M = 0.68$ $SD = .48$) and women ($M = 1.4$ $SD = 1.04$) responded to the same question, looking at telephone as the communication medium at the .05 level of significance; $t(64) = -3.30, p = .002$. These results suggest that while men and women face similar struggles with other communication technologies, they significantly differ in how they perceive telephone conversations, with women more likely to perceive communication errors using the telephone than men. For the second *t*-test regarding decisions about switching technology men and women make when there is a

miscommunication, the null hypothesis of no significant difference between men and woman was accepted, as no significant difference was found.

Table 5

Independent Samples t-Test for Communication Errors Among Men and Women

Media	Gender	<i>N</i>	<i>M</i>	<i>SD</i>	<i>SEM</i>	<i>t</i>	<i>df</i>	<i>p</i>
Email	Men	25	1.84	.55	.11	-3.35	64	.72
	Women	41	1.90	.77	.12			
Telephone	Men	25	.68	.48	.10	-3.30	64	.00
	Women	41	1.41	1.05	.16			
IM	Men	25	1.80	1.04	.21	-1.21	64	.23
	Women	41	2.12	1.05	.16			
Video	Men	25	2.00	1.87	.37	-.55	64	.58
	Women	41	2.27	1.94	.30			

Discussion

The results of the survey and subsequent statistical analysis are important on two fundamental levels. First, as virtual teams become more prevalent and replace traditional face-to-face teams, there is an increased need to understand the conditions under which they most effectively work together. Understanding how these teams communicate is an essential piece of the virtual team puzzle that informs organizational budgets, and information technology resources. For example, results of this study indicate that telephony technology is highly valued, and investing in cheaper, reliable voice technology such as VoIP may benefit many organizations. This may also explain why Microsoft's new version of Skype

is so popular, as it combines immediate voice connections with instant messaging, and email enhancements. Rephrased with the terminology of this study in mind, Skype may be preferred due to its balance of lean and rich media interaction. Second, this information is valuable to those who lead and manage virtual teams. Knowing ways in which virtual team members prefer information disseminated, what gives them a greater sense of inclusion, or that gender influences communication preference, leaders can structure team interaction, emphasizing certain technologies over others.

In terms of technology choice, results demonstrate that while email may be one of the leanest and perhaps oldest technologies, it still remains one of the most widely used, and the technology with which virtual team members feel most comfortable. As results from the survey indicate however, this familiarity and comfort may lead to decreased productivity, especially if team members are using their time to clarify intention and statements. Participants gave a clear indication that email is replied upon too much within their virtual teams. This may be due to the fact that email fails to deliver key nonverbal cues and body language which also guide the intent of the user to the recipient of the communication. Respondents indicated that while email may be one of the underlying reasons for the miscommunication, it is important to not only give team members the ability to use a different method, such as telephone, but to encourage them to use different technology to have more effective communication.

It may be determined by the data that lean media has a tendency to contribute more to misunderstanding or communication failure, perhaps

establishing a media hierarchy within virtual teams: lean media forming the lower part of the hierarchy, rich media toward the top. However, considering a majority of participants within this study indicated high usage and comfort levels with email, the very active role email and instant messaging plays within virtual teams holds value, and should not be dismissed. Rich media theory does not necessarily establish a hierarchy of communication, but rather postulates that users will find different media appropriate based on the complexity of ideas they are attempting to communicate. A different way of asking the question on this survey would have been, “when communicating simple messages, how often do you have a misunderstanding with email?” Rephrasing the questions around more of a situational context, as opposed to the generality of the questions within the survey for this study, may yield different results.

Additionally, users chose conference calls as their preferred method of team communication that gives them the greatest sense of contributing to their team. This signifies the need for people to literally be heard, and to augment the boundaries of their digital world with the humanizing impact of their voices. This information is important for team leaders who may be tempted to continually gather the team electronically versus having team conference calls, and may serve to remind leaders of the importance of softening digital boundaries with more intimate communication experiences. Conversely, these same users were asked how they prefer information to be disseminated, and chose email by a slim margin. Reasons for this may be that email is a much more effective archival medium, serving better to store information for later retrieval by the user.

Conclusions from these two questions imply that how users treat information is different from how they view the value of interaction, something to keep in mind as these teams accomplish work by being apart.

Implications for Leaders

With the three hypotheses of this research in mind, there are some important conclusions to make. First, generational differences do not seem to have an impact on the technology choices or success rate communicating with specific applications used by virtual teams. On the contrary, experiences using lean and rich media are ubiquitous, and transcend generations. It should not be assumed that older team members will struggle with newer communication technologies, nor should it be assumed that Millennials will find the latest communication gadgets preferable. Results from the current survey indicate not only a high level of comfort and frequency of email use, but also an overreliance on email as well. For leaders who are given the responsibility of understanding their virtual team's needs, the implications of the results suggest that team members should use a blend of technology, while being careful not to give in to comfort and familiarity at the cost of communication integrity. It may be that phone conversations require more effort, and therefore staying within the medium of email is the result of habit. Regardless, leaders should encourage richer interactions that tend to be more effective.

Second, it is important to note participants indicated a significant difference along gender lines, and gender, rather than generational influence may be a key differentiator in how virtual team members choose to interact. Those

wishing to pursue research within the realm of virtual teams may be interested in exploring gender differences further with wider, more random samples.

Researchers could also differentiate responses based on industry sector, race or ethnicity, or culture based on nationality.

While this research offers some conclusions, it is not without limitations. Finding respondents to this survey proved to be difficult, and it is recommended that future samples be larger and less of a “sample of convenience.” Participants being recruited based on social circles and therefore only a few degrees of separation from the researcher may have led to a more homogenous sample than was desired. Sampling diversity as well as an increase in sample size may offer better insight into some of the data trends should this research be duplicated.

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Appendix A

Virtual Team Communication Survey

Consent to Participate

The purpose of this form is to provide you with information about this research study, and if you choose to participate, document your decision. Your participation is voluntary.

Why is this study being done?

This study is an effort to understand the communication preferences and habits among virtual team members. By choosing you wish to participate below, an online survey will be provided which will ask questions about how effective you feel certain communication technologies strategies are among the virtual team members with which you work.

Who will be in this study?

Similar to you, others participating in the survey are virtual team members who accomplish work within a team that is geographically dispersed. You must be at least 18 years of age to participate. The study will involve 100-200 other participants.

What will I be asked to do?

Participants are voluntarily agreeing to answer a short survey regarding their virtual team communication preferences and communication strategies among their virtual team that they find most meaningful and inclusive.

What are the possible risks of taking part in this study?

There are no reasonable or foreseeable risks to completing the survey.

What are the possible benefits of taking part in this study?

There are no direct benefits to you for participating in this study. There may be a benefit to other researchers and those who work with or manage virtual teams from a leadership perspective.

What will it cost me?

There is no financial cost to completing the survey.

How will my privacy be protected?

Survey results will be anonymous, and your name will not be asked during the survey.

How will my data be kept confidential?

Your age and gender, though not directly identifiable to you, will be part of the data recorded. Survey results will be stored on a password protected server. This study is designed to be anonymous, which means that no one can link the data you provide to you, or identify you as a participant.

NOTE: anonymous means that no one (including the researcher) can link data to an individual. Please note that regulatory agencies, and the Institutional Review Board may review the research records.

What are my rights as a research participant?

Your participation is voluntary. Your decision to participate will have no impact on your current or future relations with the University of Southern Maine. You are free to withdraw from the survey at any time, for any reason. If you choose to end your participation in the survey, there will be no penalty to you.

Who may I contact with questions?

The researcher conducting this study is Jeremy DaRos at the University of Southern Maine. For

questions about this survey, you may contact him at jeremy.daros@maine.edu, or via phone at 207-749-1954.

2. Which best describes your current title?

- Non-Management/Hourly
- Supervisor
- Manager
- Director or above
- Other (please specify)

3. I have used the following virtual communication software at work (check all that apply):

- Skype
- Microsoft Lync
- Cisco Webex
- Yahoo! Messenger
- AOL Messenger
- Trillian Messenger
- Google Chat
- Apple iMessage (texting via apple mobile devices)
- MMS/SMS (texting via cell phone)
- Facebook Chat
- Email
- Google Hangout
- FaceTime
- Other (please specify)

4. My virtual team relies too much on (choose up to 2):

- Email
- Instant messaging
- Telephone
- Video conferencing

Other (please specify)

5. How frequently would you like to have team meetings?

Daily
 Multiple times per week
 Once per week
 Several time per month
 Once per month
 Other (please specify)

The following 2 questions require you to indicate how often you encounter misunderstandings using a variety of virtual team media, and how likely you are to switch to another form of communication when you encounter this scenario.

6. Thinking about the different technologies you have used to communicate within your virtual teams, how often do you encounter a misunderstanding with your team members? If you have never used the technology, please choose N/A.

	Never	Rarely	Occasionally	Frequently	Very Frequently	N/A
Email	<input type="radio"/> Email Never	<input type="radio"/> Email Rarely	<input type="radio"/> Email Occasionally	<input type="radio"/> Email Frequently	<input type="radio"/> Email Very Frequently	<input type="radio"/> Email N/A
Telephone	<input type="radio"/> Telephone Never	<input type="radio"/> Telephone Rarely	<input type="radio"/> Telephone Occasionally	<input type="radio"/> Telephone Frequently	<input type="radio"/> Telephone Very Frequently	<input type="radio"/> Telephone N/A
Instant messaging	<input type="radio"/> Instant messaging Never	<input type="radio"/> Instant messaging Rarely	<input type="radio"/> Instant messaging Occasionally	<input type="radio"/> Instant messaging Frequently	<input type="radio"/> Instant messaging Very Frequently	<input type="radio"/> Instant messaging N/A
Video conferencing						

7. When you encounter a misunderstanding with a virtual team member, what other technology are you likely to switch to, in order to alleviate misunderstanding? Example: If you encounter a misunderstanding with a coworker via email, you may start Instant Messaging them to clear up the confusion. If you have never used the technology, please choose N/A.

	Very likely	Likely	Somewhat likely	Unlikely	Not at all likely	I've never used this communication technology to alleviate a misunderstanding	N/A
Email	<input type="radio"/> Email Very likely	<input type="radio"/> Email Likely	<input type="radio"/> Email Somewhat likely	<input type="radio"/> Email Unlikely	<input type="radio"/> Email Not at all likely	<input type="radio"/> Email I've never used this communication technology to alleviate a misunderstanding	<input type="radio"/> Email N/A
Instant messaging	<input type="radio"/> Instant messaging Very likely	<input type="radio"/> Instant messaging Likely	<input type="radio"/> Instant messaging Somewhat likely	<input type="radio"/> Instant messaging Unlikely	<input type="radio"/> Instant messaging Not at all likely	<input type="radio"/> Instant messaging I've never used this communication technology to alleviate a misunderstanding	<input type="radio"/> Instant messaging N/A
Telephone	<input type="radio"/> Telephone Very likely	<input type="radio"/> Telephone Likely	<input type="radio"/> Telephone Somewhat likely	<input type="radio"/> Telephone Unlikely	<input type="radio"/> Telephone Not at all likely	<input type="radio"/> Telephone I've never used this communication technology to alleviate a misunderstanding	<input type="radio"/> Telephone N/A
Video conferencing	<input type="radio"/> Video conferencing Very likely	<input type="radio"/> Video conferencing Likely	<input type="radio"/> Video conferencing Somewhat likely	<input type="radio"/> Video conferencing Unlikely	<input type="radio"/> Video conferencing Not at all likely	<input type="radio"/> Video conferencing I've never used this communication technology to alleviate a misunderstanding	<input type="radio"/> Video conferencing N/A

The next five questions require you to rank different virtual team communication methods in order from most to least (1 being the most) in the following contexts. Please choose N/A if you do not use the technology listed.

8. Within my virtual team, I am most comfortable using:

Email

 N/A

Instant messaging

 N/A

Telephone

 N/A

Video conferencing

N/A

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9. Which group communication method gives you the greatest sense of contributing to your team?

▼

Team meetings via telephone conference call

N/A

▼

Team meetings via video conferencing

N/A

▼

Team emails

N/A

--	--	--

10. I prefer team information to be exchanged via:

▼

Telephone conference

N/A

▼

Video conferencing

N/A

▼

Online chat/messaging

N/A

▼

Email

N/A

▼

Team/Company Newsletter

N/A

--	--	--	--	--

11. What is your preferred *1 on 1* method of communication from your team leader/manager

Email

N/A

Telephone

N/A

Instant messaging

N/A

Video conferencing

N/A

--	--	--	--

The following two questions are free-form fields, please enter as much information as you would like.

12. Thinking about your work within a virtual team, what tends to frustrate you the most about communication?

13. What have you enjoyed most about working on a virtual team?

14. Are you:

Male

Female

15. What is your age?

FINAL APPROVAL FORM

THE UNIVERSITY OF SOUTHERN MAINE

May 6, 2016

We hereby recommend that the thesis of Jeremy DaRos entitled *Communication Efficacy Using Technology within Virtual Teams* be accepted in partial fulfillment of the requirements for the Degree of Master of Leadership Studies.

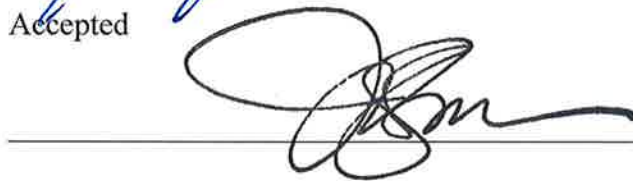


Advisor



Director

Accepted



Dean, Lewiston-Auburn College