Face-to-Face to Interfaced: Facilitating Mediated Communications in Technical Support Work

Utilizing E-Mail, Online Chat, Telephone, and Remote Desktop in Technical Support Interactions

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Submitted to the Faculty of Extension

University of Alberta

in partial fulfillment of the requirements for the degree of

Master of Arts in Communications and Technology

September 9, 2019

Acknowledgements

This report results from the convergence of many paths: It aligns my professional aptitude for information technology with my academic passion for communications; it emerges from the ongoing love and support of family and friends; and, it reminds me that a purposeful life is not lived until self-imposed barriers are seen as challenges, not obstacles.

The real-world effects of what my research explores would not had been possible without the volunteer participation of my research participants. Thank-you to each and every one of you for sharing your experiences, your time, and your honest candor.

Thank-you to the faculty and the administration of the Communications and Technology Graduate Program within the Faculty of Extension at the University of Alberta. Dr. Gordon Gow, your keen insights, practical advice, and unwavering patience compelled me to grow as much as an individual as I did a graduate student. Dr.s Tommy Barker, Stanley Varnhagen, and Rob McMahon, each of you enriched my scholastic experience and broadened my academic horizons. Eileen Crookes and Susan Petruszczak, you're the backbone without which the faculty and the MACT students would not thrive. Patti Sherbaniuk, our MACT librarian, you left no stone unturned to surface the necessary resources for my research.

My MACT 2015 cohort: Each of you contributed to the fabric of my MACT experience. We came together for only a few short years of graduate school, but my memories of our time together will last a lifetime.

Jim, this exploration into higher learning was not possible without you. You encouraged me to make possible what I once considered unattainable. Your abiding ability to keep my confidence buoyed when it waned kept me afloat. I dedicate this report to you.

Abstract

This paper explores how technical support workers approach, connect, and engage with mediated communications in their technical support work. Distributed computing to the Cloud and beyond situates local technology at distances away from their home environments and support networks. Remote technical support workers are called upon to diagnose, troubleshoot, and solve technical issues on problematic devices remotely through mediated channels (i.e., e-mail, online chat, telephone, and remote desktop) neither having seen, touched, nor experienced the technical issue firsthand themselves. Viewed through the theoretical framework of Daft and Lengel's (1986) media richness theory (MRT) drawing a matching correlation between a medium's capabilities to transmit information and the communication's demands of same, this study adopted a qualitative approach of descriptive phenomenology using semi-structured interviews to explore where, when, and how six technical support workers experienced the influence of mediated communication cited in MRT in their work of delivering technical support. This study found support for Daft and Lengel's (1986) MRT assertion, but suggests its premise can improve through the concurrent applications of Clark and Brennan's (1991) grounding in communication (GIC) theory and Orlikowski's (2008) structuration theory. Findings report that shared understanding between technical support workers and their supported end-users reached through GIC and facilitated through MRT is important for technical support work. Additional findings call for the interplay of Orlikowski's structuration theory to evolve technical support interactions and surrogated troubleshooting activities through proxied local agents to facilitate remote work. This research will be of value to technical support workers, vocational institutions teaching technical support, and managed service providers with distributed remote workers.

Keywords

technical support work, media richness theory, mediated communications, remote desktop, grounding in communication theory, surrogated troubleshooting by proxy, structuration, sequela

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Introduction

You are about to board your red-eye flight to Copenhagen, Denmark where you will be presenting your graduate research at an academic conference. You had planned on finalizing your presentation during the 9-hour transatlantic flight, but you forgot to copy your presentation to your laptop. You attempt to connect to the university's network over the public Wi-Fi network at the airport to download your presentation onto your laptop, but you cannot. You can connect to the airport's Wi-Fi network, but you cannot logon to your university's system. Is there a problem with the airport's Wi-Fi network? Is there an issue with your laptop's wireless connection? Is there a problem with the university's system? Technical support from the university's help desk is available over the phone, but only during regular business hours. You cannot access the university's automated online help desk chat without first connecting to the university's system. Technical support for the airport is only available through an online, self-service web portal. Without knowing exactly wherein lies the problem, you don't know who to contact for help. What can you do? Who should you turn to?

Technical support is seldom a satisfying prospect. It can be hard to seek help when we don't know what the problem is. How can we gain assistance when we can't describe the problem? Technical issues are only one part of the problem with technical support communications; communicating *about* technical issues is the other. Why does it have to be so difficult? Where it's challenging in person, it's almost impossible via e-mail, over the phone, or through an automated chat system.

Purpose of Study

Technical support communications are often more challenging because of communication problems rather than technical issues. When technology fails to function, technical support is necessary for it to be fixed. How the problem is relayed and its solution extended depends on the mode of communications used in its delivery. Seeking technical support in person is different than it appears across mediated modes of communication (i.e., e-mail, online chat, telephone, or remote desktop).

This paper looks at how technical support communications are used in the delivery of solutions to technical problems. Specifically, it addresses the usage of mediated communications across e-mail, online chat, telephone, and remote desktop as they compare to in-person, face-to-face communications. This study is based on the primary research question:

> ***How do technical support workers approach, connect, and engage with mediated communication (i.e., e-mail, online chat, telephone, and remote desktop) in their work of delivering technical support?***

This research contributes to current scholarship on technical support communications within the field of information communcations and technology (ICT) by exploring the manner in which mediated modes of communications are used and, most specifically, the ways in which the use of remote desktop can be used in conjunction with other mediums to increase effectiveness and improve efficiencies of technical support service. The limitations of this study are restricted to

the use of e-mail, online chat, telephone, and remote desktop within the confines of business users excluding consumers. Other mediums and other user populations are not covered by this study.

Preview Literature

The literature which supports this study emanate from the academic field of communications in the topic areas of knowledge, online resources, technical support interactions, media richness, cognitive overload, and adaptive structuration. Major studies included in these topic areas are Daft and Lengel's media richness theory (1986,) Nonaka and Takeuchi's SECI model of knowledge (1995,) Orlikowski's structuration model of technology (2008,) and Clark and Brennan's grounding in communication theory (1991) which serve as important influences in the development of this research paper.

Preview Methodology

This study adopts a qualitative approach using descriptive phenomenology to describe the experiences of technical support workers using mediated communications in their work of delivering technical support. Because this research study explores how the mediums of e-mail, online chat, telephone, and remote desktop are used, a qualitative approach was taken to appropriately study their experiences. Descriptive phenomenology, instead of interpretive phenomenology, was used in an effort to contain any biases, prejudices, predilections, and preconceived notions I may hold in my professional experience of working in information

technology.

Summary

Exploring how technical support workers approach, connect, and engage with mediated communications channels in their work of delivering technical support is becoming increasingly important as current technology situates itself farther and farther away from its support structures. Understanding where, when, and how technical support workers connect with us from a distance to support our devices helps us to increase both our utilization of and our relationship with our technologies. From the abstraction of knowledge from online resources, to its embodiment in technical support interactions as it traverses mediated channels, paying heed to cognitive overload, to the scaffolding behaviour of adaptive structuration, this study looks at technical support workers in their work of delivering technical support. From a qualitative approach, seen through a descriptive phenomenological lens, a textual analysis surfaces the key themes crucial to this study.

This research study is divided into three major chapters: The literature review chapter summarizes key academic literature on which this study is based; the research design and methodology chapter details the approach and methods employed in its data collection; and, the findings and discussion chapter analyzes the gathered data, explains its results, and discusses its implications.

The next chapter – literature review – introduces the academic literature which will form the theoretical foundation on which this study will be based.

Literature Review

Introduction

Technical support is a service accessed when assistance is needed to fix a technical problem. In an earlier time, help was delivered to us through live technicians at our desks where our computers were stationary. We could discuss and demonstrate what troubled us with the technician directly. In the present day, technical assistance is offered from remote locations at a distance to wherever we might be situated through mediated channels of communication such as the Internet, e-mail, or the telephone. Unable to demonstrate the problem live and in-person, we must explain the issue verbally or through written text. Complications arise from not being able to locate the correct vocabulary or identify appropriate comprehension in explaining what's happening or not occurring as expected. My research looks at the technical support communications that are shared between end-users seeking help and the technical support workers who assist them. Specifically, it explores how technical support workers use mediated communications in their delivery of technical support.

This chapter looks at the literature on the use of mediated channels of communication within the broader field of communications in general and within a narrower scope of technical support communications, more specifically. In identifying pertinent literature, it establishes the theoretical foundation on which my study will be built. Six themes – knowledge, online resources, technical support interactions, media richness, cognitive overload, and adaptive structuration – dominate the landscape of current scholarship which influence directly this study.

The procedure by which this relevant literature was located, selected, and reviewed precedes their presentation. Finally, the manner in which the chosen literature connects to the research design developed for this study is discussed.

Overview of the Field of Study and Methodology of Literature Search Process

This paper explores how technical support workers approach, connect, and engage with mediated communications (i.e., e-mail, online chat, telephone, and remote desktop) in their work of delivering technical support. In exploring where, when, and how these mediums are used in the delivery of technical support work, the experiences of technical support workers form the basis of my research. To frame my study of these experiences, it was necessary to survey many different disciplines – organization science, management psychology, business and technical communications, and management information systems – as well as the broader field of communications scholarship for existing research which could inform my study of mediated channels of communication in technical support communications.

This literature review spans 104 peer-reviewed journals of past and current research to surface insights, directions, and emerging approaches to technical support. The initial search for appropriate literature commenced with the search terms of "technical support communications," "technical support delivery methods," "technical support methods," "technical support rich-media," and "technical support lean-media" dating back five years. It was limited to these terms in contemplation that Daft and Lengel's (1986) media richness theory (MRT) would anchor the

research and that "delivery methods" would capture appropriately the location – either remote or local – of the work performed. However, in short order, it was discovered that this limited scope and this short period yielded insufficient material on which to establish the literature review. The search criteria was expanded to include just "technical support" and extended in time backwards to no specific starting year. This change resulted in a much deeper and broader reach of applicable resources including, specifically, technical support services delivered deskside in the era of remote terminal and mainframe computing. From face-to-face conversations at the deskside to interfaced chats on a computer screen, this literature review spans the whole of technical support literature.

The material surfaced six connected themes on which this literature review is based: Knowledge; online resources; technical support interactions; media richness; cognitive overload; plus, adaptive structuration and metastructuring.

Review of the Literature

For many consumers, technical support is a means to an end. Technical assistance is required, for example, when we need to resolve a software bug, enable a feature, or install a new wireless router. Petersen (2010) suggests that technical support is a post-sales service used to establish a product into its intended environment. Pentland (1995) writes that an unsupported product is hardly a product at all. Technical support provides access to technological resources and infrastructure (Chung and Kwon, 2009). Technical support provides solutions (Pentland, 1995). Overcoming technical issues allows us to use the technology as intended.

For others, technical support is a well-spring of resources where technical acumen and human resourcefulness converge to extend technology. Technical skill is only one aspect of many in technical support work.

Knowledge

Computer supported cooperative work (CSCW) from information sciences considered knowledge to be artifacts, such as documents or computer records, where it was stored in repositories as coined in early studies from the management information systems (MIS) and decision-support systems (DSS) era. Knowledge was static and externalized or mobilized as objects. Niehaves and Ortbach (2016) embrace design practice theory and explanatory design theory (EDT) to evaluate why objects become artifacts. Design theories are dualist constructs which, in this sense, relates design as both a product as well as a process. Niehaves and Ortbach (2016) reference Gregor and Jones (2007) on the principles of form and function in contrast to the principles of implementation. Later studies tied people to this knowledge where it traveled through communications throughout their organizations. This change internalized knowledge through people in their particular settings. Knowledge became situated and contextualized to their environments (Ackerman, Dachtera, Pipek, and Wulf, 2013). Through people, topical experts emerged as authorities in their subject areas (Wang, Jiao, Abrahams, Fan, and Zhang, 2013; Bandi and Shah, 2016) where they curated content (Ahmed, Yang, and Johri, 2015) for others. Cunningham, Knowles, and Reeves (2001) caution that knowledge extracted from their environments where these professionals produced it served to reduce and remove their cultural significance.

Chennamaneni and Brown (2013) differentiated the transfer and sharing of knowledge from the dissemination of knowledge. Knowledge can be tacit (subconsciously understood) or explicit (formally articulated). Nonaka and Takeuchi's (1995) knowledge management model of socialization, externalization, combination, and internalization (SECI) figures prominently amongst the literature (Nonaka, Toyama, and Konno, 2000). Technical knowledge can be domain-specific where it is focused and concentrated or domain-general where it is broad and foundational (Allen, Gugerty, Muth, and Scisco, 2013). Eschenfelder, Heckman, and Sawyer (1998) cite knowledge markets with knowledge buyers trying to solve problems and knowledge sellers with internal market reputations with substantial knowledge. Knowledge is transferred, then built and ingrained through a serial process of transmission of knowledge and absorption as a belief system from the individual to his group before moving onwards to his organization (Chen, McQueen, and Sun, 2013). This transfer is important otherwise it falters and fails to emerge as organization knowledge (Fellhofer, Harzl, and Slany, 2015). These transfers fill the gaps with shared knowledge as social capital (Gheitasy, Abdelnou-Nocera, and Nardi, 2015). Dwelling in the social capital and consuming only the knowledge without building upon it, diminishes the possibility for future learning (Gray and Durcikova, 2005).

Knowledge, as it is applied to technical support, is both the channel and the content which ties the past to the present and onwards into the future. It morphed from something apart from us in early studies to something a part of us as individuals, as groups, and in our organizations in the current literature. Ingrained as part of us, it can be difficult to extract without specific techniques such as mentoring (Bandi and Shah, 2016) and storytelling (Chennamaneni and Brown, 2013). Situated contextually in our environments, it cannot be removed, but it can be transferred and re-

built, built upon, and applied.

Online Resources

Internet resources for technical support are readily available resources. Online communities, such as forums, blogs, instant messaging (IM) or chats, and wikis (Bandi and Shah, 2016,) arose out of a need to better distribute information as earlier published by e-mail lists (Allen and Schneider, 2013). Knowledge bases offer curated content by experts (Das, 2003; Brown, Massey, and Boling, 2005,) knowledgeable amateurs through peer-to-peer (P2P) networks (Gu and Jarvenpaa, 2003a,) and answer-seeking customers via discussion boards (Gu and Jarvenpaa, 2003b). Manufacturers and vendors also offer their own technical support sites (Chu, Chen, Lin, and Wu, 2015). Communities of practice, as self-organizing systems (Singh, Twidale, and Rathi, 2006,) recognize that collaborative knowledge in the community is more effective than individual knowledge (Johnson, 2001). Curiously, in these amateur forums, what might be considered by industry (or others) as incomplete and obsolete is still useful information (Singh and Holt, 2013) for knowledge transfer. Online communities that form around these knowledge-sharing practices provide other benefits such as feelings of community and connectedness (Bolliger and Armier, 2013).

Technical Support Interactions

Traditionally, in-person technical support conversations situated the end-user seeking assistance in close proximity (e.g., deskside) to the technical support technician offering assistance. Close

at hand, the technician could see for himself the challenges that the end-user was experiencing. With in-person interactions, the diagnosis-troubleshooting-resolution process was experienced directly by the technician for he could perform his craft with the immediate ability to work hands-on. Proximity facilitates the exchange of knowledge (Pollock, Williams, Grimm, and D'Adderio, 2008). Mediated technical support, however, places both the end-user and the technician at a disadvantage for reasons of comprehension and unfamiliarity.

Allen et al. (2013) introduce cognition into the technical support interaction where the level of technical knowledge of the end-user, as well as the technician, are key to understanding the interaction. In mediated interactions, more so than with in-person interactions, the assessment of the situation relies upon the description of the issue by the end-user (e.g., What are you experiencing? When does the problem occur? Where does the program fail?) Due to differences in understanding and technical skills, the end-user may not see the same things that the technician sees. This incongruence in the asymmetrical comprehension of the situation creates equivocality where the inaccurate descriptions could imply many interpretations and noise where the incorrect description could offer a distorted interpretation (Pentland, 1995). Pentland (1995) considers the end-user's description of the situation a temporal reference which he names *indexical expressions* that are unique to the local context of the end-user. Citing Schutz (1962,) Pentland purports this "reciprocity of perspectives" problematic where if the end-user and the technician swapped places they would not see the same thing (Pentland, 1995, p. 16). Unstructured problems (Bandi and Shah, 2016) exacerbate the challenge of interpretation where what the end-user is experiencing may be new, unknown, and novel to the technician as well. Here, the technician must interpret both the actual problem plus the end-user's model of the

problem (Pentland, 1995, p. 8). Petersen (2010) suggests that the end-users are the "local supporters [with] domain knowledge" (p. 900) of the situation, yet they are hampered by the inability to articulate it. Pollock et al. (2008) name this method of removing the situation from its local context *disentanglement* where it can be extrapolated from its local environment (p. 1). The lack of shared understanding further complicates the difficulties in remote help (Poole, Edwards, and Jarvis, 2009). Shah and Bandi (2003) purport that this problem of co-presence is a prevalent problem in interpretive work with remote technical support. Silverstone and Haddon (1996) report that a failure to recognize the user denies their role as an integral part of the interaction.

Technical support interactions are complicated because separate assessments of the same situation may not share the same understanding. Different interpretations can result in different approaches in the troubleshooting process. Applying one solution to an altogether different problem applies an incorrect fix to the wrong problem. With varying levels of skill in understanding and interpreting technical issues, end-users and technicians lack shared understanding of the situation at hand. Remote technical support exacerbates these challenges because the technician is blind to what the end-user describes without their own presence to see for themselves the local environment where the end-user experiences the technical challenges.

Media Richness

Daft and Lengel's (1986) media richness theory (MRT) suggests that information acquisition is affected by the match between the medium's capabilities with the content to be communicated. Badger, Kaminsky, and Behrend (2014) suggest that richer media conveys information which is

more complex, ambiguous, and unfamiliar more effectively than less rich media (p. 868). Bandi and Shah (2016) write that media differ in the ability to facilitate a common understanding and shared meaning (p. 104). Dennis and Kinney (1998) purport that the richness amongst different media affects its ability to change understanding within a time interval (p. 257). The number of cues which media is able to convey determines its level of richness. Face-to-face is the richest medium of communication (Chidambaram and Jones, 1993; Dennis and Kinney, 1998; Mennecke, Valacich, and Wheeler, 2000; Jenkins, Durcikova, and Burns, 2012) followed by video, then audio, then text. In addition to cues (non-verbal such as head-nods, hand gestures,) the immediacy of feedback also denotes a media's level of richness. Media richness is realized by four factors: the transmission of multiple cues (e.g., head-nods, hand gestures, voice inflections); immediacy of feedback (e.g., time-lags of responses, synchronous or asynchronous); language variety; and, personal focus of the medium (Dennis and Kinney, 1998). Two properties of media-rich or media-lean communications fluctuate resulting in varying effectiveness: Uncertainty and equivocality. Uncertainty in a communication is the lack of adequate information sufficient to convey its meaning and equivocality is, conversely, the presence of too much information giving rise to too many interpretations resulting in an unclear message. Where the ultimate objective is to achieve a shared understanding between sender and receiver, media-rich or media-lean communications lack the clarity in either too much or too little information, respectively, to convey the message appropriately.

The literature reveals a number of studies applying Daft and Lengel's (1986) media richness theory with varying results. Dennis and Kinney (1998) evaluate new media testing for immediacy of cues and feedback in matching media richness to task equivocality. Their

matching exercise yielded no improvement in decision quality, decision time, consensus change, or communication satisfaction. Using media that provided few cues gave rise to slower decisions. Delaying the response time between sender and receiver interactions diminished the cues necessary to reduce uncertainty negatively affecting the resulting satisfaction. Fellhofer et al. (2015) studied a software development project which began with face-to-face, in-person meetings before extending outwards as a globally-disperse group using Internet Relay Chat (IRC) as lean-media for the duration of the project. Huang, Watson, and Wei (1998) contradict the commonly supported understanding that lean-media cannot appropriately support complex messages of high equivocality. Inserting concepts from the hermeneutics approach as distanciation, autonomization, social construction, appropriation, and enactment, Huang et al. (1998) suggest that senders package where receivers unpackage rich meaning from lean-media communications. Klitmøller and Lauring (2013) investigate knowledge sharing in an intercultural context for a globally-dispersed team. Where rich-media communications in normal circumstances are suitable for conveying complex, equivocal information to great effect, a multi-cultural context erects social boundaries and surfaces stereotyping. Extended further, lean-media reduces surface-level cultural cues and reduces cultural/linguistic differences. Kock (2005) recommends a media naturalness rather than a media richness in explaining the proclivity towards rich media as an evolutionary development towards face-to-face communication instead of seeking to reduce equivocality. Synchronous and co-located communications is sought by reasons of evolutionary engineering. Liu, Liao, and Pratt (2009) evaluate the use of rich-media in an online, educational setting and caution that rich-media can lead to user fatigue due to the cognitive demands of learning through media-rich channels.

Cognitive Overload

Badger et al. (2014) suggest that cognitive load limits the desired effect of rich-media in conveying equivocal information. Citing Sweller (1988,) Badger et al. (2014) write that humans possess a limited amount of cognitive resources with which to process their surroundings. The greater the amount of information one must process within a limited amount of time, the higher the mental workload increases to process the information in working memory. Mental workload is higher when working memory must work harder to process information which is new or something for which we have no prior familiarity. Prior exposure provides the opportunity to erect schema or systems with which to process the familiar more readily. Badger et al. (2014) suggest that people will learn less with a higher cognitive load. Bolliger and Armier (2013) studied cognitive load on students learning to produce medium-rich content (i.e., audio files) to accompany their studies in online learning environments. Students with no prior experience in navigating the online learning environments while also learning to produce audio files experienced cognitive overload in the form of overwhelm when faced with learning numerous new systems at the same time. Bower, Kenney, Dalgarno, Lee, and Kennedy (2014) evaluated new instructors facilitating concurrent in-person (face-to-face) students in class alongside remote (live video) students at a distance. While the combination of the two environments – in-person and remote – gave rise to engaging discussions, lively content exchange, and compelling social presence in their synchronous and multi-modal formats, the instructors endured cognitive overload in addressing both the in-person and remote students at the same time. Jenkins et al. (2012) combined learning theory, media richness theory, and cognitive load theory to study the influences of rich-media on security training. Highly-rich media was more effective than

medium-rich media in influencing perception, comprehension, and projection of security awareness. Medium-rich media was more effective than lean media in influencing comprehension and projection, but not in perception of security awareness. Jenkins et al. (2012) purports the varying results stem from cognitive load in rich-media pointing to the limitations of concurrent working memory load where we're limited by how much we can retain plus what we can perform with it.

Adaptive Structuration

Building upon the earlier idea that knowledge: Is situated in people and in location (Ackerman, et al., 2013); is embedded in its original context (Chen et al., 2013); cannot be extrapolated through a reductionist approach (Cunningham et al., 2001); is situated within a social context that regulates or influences communication (Sproull and Kiesler, 1986); is situated in context and practice (Pentland, 1995); and, is extended through learning in context aware environments (Jacob and Issac, 2014), this literature review arrives full circle from its earlier segments of knowledge, online resources, technical support interactions, media richness, and cognitive overload to arrive at two key notions: 1) DeScantis and Poole's (1994) adaptive structuration which posits that "groups' structure, task, and appropriation of technology are jointly involved in determining the outcomes of a group's technology use (Griffith and Dougherty, 2001, p. 212); and 2) metastructuring as "technology-use mediation [which] structures users' use of technology by influencing their interpretations and interactions, by changing the institutional context of use, and by modifying the technology itself (Orlikowski, Yates, Okamura, and Fujimoto, 1995, pp. 425-6). These two ideas – adaptive structuration and metastructuring – inform this literature

review's investigation into how mediated communications influence technical support interactions through the idea that the structures (or conversations) which occur in technical support communications emerge from the dynamics of the conversation as it takes place.

Media richness theory bounds a variety of mediated communications channels (face-to-face, video, audio, text) through which technical support interactions can occur. Cues and feedback in the exchanges, regardless of the medium selected, reveal the success or failure of the channel in relaying the information necessary to elicit a shared understanding. If a shared understanding is not attained in one medium, then another can be selected. For example, if e-mail is not working to convey the message properly, then choose the telephone where a quick, verbal conversation may be better. Or, if a video-chat does not convey the appropriate message correctly, say, because of latency in the videostream because of a poor Internet connection, then choose a face-to-face conversation where there is no electrical noise or signal attenuation. Or, if face-to-face is too challenging, say, in an intercultural situation where language, vernacular terminology, or accents are disruptive and confusing, then choose e-mail where the effects of language are restricted. Here, the targeted result of shared understanding in the communication drives the channel selected. In effect, it may be adaptive structuration in reverse where the outcome of the technology use determines the technology appropriated instead of the appropriated technology determining the technology used. Riel and Polin (2004) suggest that networked technologies support variations in perspectives on collaboration work. The interaction between the end-user and the support technician striving to reach a shared understanding of the technical issue is a collaborative effort where the variety of communication mediums from which they select their medium of choice is a supported variation on a networked technology.

Orlikowski (2008) writes that the process of enactment enables a deeper understanding of the constitutive role of social practices in the ongoing use and change of technologies in the workplace (p. 404). This understanding points to the situated placement of knowledge within the environment in which it is located, activated, and actioned. Various sources for this literature review revealed the import of local people as knowledgeable actors with intrinsic knowledge of their environments. When the end-users at their local sites are mobilized through interactions with their remote technical support advisors, they act upon the shared knowledge negotiated during the technical support interaction. This action of enactment by them in their local contexts activates the social practices of knowledge sharing in their home environments. Pollock et al. (2008) call this process "post local" naming the process which shifts the how, when, and where technical problems are managed and resolved in the context of the end-users.

Analysis of Findings from Literature Review

The six areas identified in this literature review together create the theoretical foundation for this research study. Knowledge, situated and contextualized, in the environment in which it is held, is both the source object and the target result necessary for extending technical support work. Online resources are a container for, and a generator of, the knowledge to be consumed and generated in the execution of technical support. Delving into the nature of technical support interactions themselves hints at the complexities surrounding the interpretations and the difficulties that arise from them in the absence of shared knowledge. Media richness looks at the influence of mediated channels of communications and its effect on the fullness or richness of the transmitted information resulting in the delivery of partial knowledge. Cognitive overload

addresses the dangers of too much information and the inability to process it. And, finally, adaptive structuration and metastructuration acknowledges user agency in manipulating knowledge in the execution of technical support interactions through the mediated channels available.

Assessed for their contributions to this study, the literature was evaluated for the following strengths, weaknesses, and oversights. A core strength which permeates the literature throughout in one form or another is the social construction of knowledge. Socially constructed knowledge is situated contextually into the environments in which it is embedded where it cannot be disentangled readily. Disentangling it from the processes which embed it is a necessary activity when identifying faulty knowledge or repairing processes. Technically oriented approaches are reductionist focussing only on the technology itself without regard for the processes which situate the knowledge. A weakness which was obscured in much of the literature could be located within its methodological approaches. Common amongst many of the existing studies were textual analyses of technical support transcripts from contained environments (i.e., academic locales) or artificially manufactured settings (i.e., purpose-built testing situations). These controlled situations were limited in-scope and did not represent true, authentic environments where a variety of technical support interactions could be studied. Absent were experiential studies of real-world experiences by real-world technical support workers. An oversight which was not apparent without considerable contemplation is the absence of remote desktop in the existing literature. Stemming three decades from 1986 to 2016, noticably absent upon later scrutiny, no studies could be identified in the literature where remote desktop was considered as one of the forms of mediated communications used in technical support work.

Remote screensharing, as it was formerly named, entered the marketplace in the early 1990s with Norton pcAnywhere and later in the 2000s with Microsoft Windows XP in its built-in tool of Remote Assistance. The literature does cite, however, video as a remote communications channel, but it is used as a teaching tool or a virtual meeting workspace rather than a transactional tool for remote troubleshooting or technical problem solving.

Media richness theory (Daft and Lengel, 1986) suggests that different media maintain varying capabilities to transmit information. Richer media is purported to be able to carry more information and leaner media is able to carry less information. Is richer necessary better? When applied to socially constructed knowledge, does knowledge traverse mediated channels intact or does its context change when removed from the environment into which it is embedded? Structuration (Orlikowsi, 2008) purports that structures emerge about technologies in the processes which situate them. Here, technologies and the processes which integrate them into their environments are symbiotically intertwined. Can they exist separately without disrupting their effective roles?

Technical support work investigates technical problems as both technical issues which reside in the technology itself as well as applied integrations of the technology into the environments into which they are situated. When approached remotely from a distance, what influences are applied to the socially constructed knowledge as it traverses the distance from its embedded environment to the remote worker's locale? In this regard, how does remote support at a distance differ from local, in-person, face-to-face support? This research study explores how technical support workers approach, connect, and engage with mediated channels of communication in their work

of delivering technical support solutions.

Significant Studies

Dennis and Kinney (1998) evaluate the dialogue which occurs about feedback extending affirmations and corrections or repairs. They suggest that it is not the "richness" of media which is important for determinations of success, but rather the constructs of feedback and social presence cues (p. 270). Moreover, they purport that "media switching may be the best choice for optimum performance in tasks that require both information dissemination and convergence on a decision." Where technical support troubleshooting efforts rely upon the flow of information and the feedback which ensues to decide which troubleshooting route to take, this paper directs this research study's focus onto the dialogue between the end-user and the technical support worker and the information which traverses the conversation leading to troubleshooting efforts. Note: Dennis and Kinney (1998) provided the connection to Clark and Brennan's grounding in communication theory (1991) which is introduced later in this paper.

Pentland (1995) reveals that cognition and comprehension, where incorrectly identified, are pervasive problems in technical support work which requires not only diagnosis and repair of a remote system, but also analysis of human problem solving (p. 3). In addition to working with empirical data from the technology itself, "support people must interpret other people's interpretations" (p. 11) when attending to technical support work. This view informs my research by directing my study to look at how technical support people investigate interpreted interpretations through mediated modes of communication in their technical support

communications.

Orlikowski (2008) suggests that people, as they interact with a technology, enact structures which shape their emergent and situated use of that technology (p. 404). In this view, I adopt this approach for technical support workers creating the structures (i.e., processes and procedures) as they emerge in their troubleshooting efforts in the unique situations from which each technical issue arises. Orlikowski et al. (1995) extend this notion further out into groups where it broadens its context into institutional and organizational processes for the development of industry practices.

Daft and Lengel (1986) form the core of this study on which my literature search, research design and methodology plus findings and discussion are founded in their media richness theory which suggests that different media have different capabilities to convey information differently resulting in varying levels of comprehension. Their research informs my study directly in framing how varying media can be utilized to varying effect in the delivery of technical support.

Current Studies

Daft and Lengel's media richness theory (1986) forms the core basis for this research study. However, five other noteable theories were considered although not adopted due to scope and spatial limitations of time and space.

Cognitive task analysis takes comprehension of the work involved in executing technical support

work further by delving into the cognition processes of the individual technical support worker. This process would follow the initial identification of the problem and dive deeply into the understanding of the troubleshooting process. In their study, Allen et al. (2013) examined the cognitive and communicative processes used by technical support workers when providing remote, Internet-based technical support focusing on the role of the end-user receiving technical support. On the part of the end-user, the level of detailed explanation offered by them to the technical support worker was evaluated.

Interaction analysis, akin to cognitive task analysis, would deconstruct the troubleshooting process and dissect each interaction as it moves outwards from problem identification into its constituent parts in my research. Query, Wright, Amason, and Eichhorn (2009) cite Cappella (1990) and Heritage (1989) in identifying "the goal of interaction analysis as capturing empirically the sequencing of messages and their related function within focal conversations" (p. 91). In my work, this approach encompasses the interactions between the supported end-user and the supporting technical support worker.

Hierarchical task analysis, like interaction analysis, looks at the constituent parts of activities, but looks at the order and sequence in which the investigative work unfolds. Caird-Daley, Fletcher, Baker, Shehab, Ball, and Tjahono (2013,) use task decomposition to expand hierarchical task analysis in exploring tacit knowledge in "observable and unobservable physical and cognitive aspects of manual task [work]" (p. 354).

Skills, Rules, and Knowledge Framework, in my research, would be a comprehensive study of

the troubleshooting process integrated into technical support work bringing in the skills necessary for its execution, the rules which dictate the flow of the work, and the knowledge required to support the work. Citing Rasmussen (1983,) Caird-Daley et al. (2013,) suggest ways in which SRK (skills, rules, and knowledge) framework addresses the "tacit cognitive task elements" (p. 350) inherent in human performance of tasks.

SECI (Nonaka and Takeuchi, 1995) analysis is the socialization, externalization, combination, and internalization of knowledge which frames the utilization of knowledge in technical support work. Ackerman et al. (2013) cite Nonaka and Takeuchi (1995) "'making tacit knowledge explicit' … as a design goal[] to associate with IT tools'' (p. 547) addressing the exposure of hidden knowledge to the surface in technical support work.

These five theories considered – cognitive task analysis; hierarchical task analysis; interaction analysis; skills, rules, and knowledge framework; and, socialization, externalization, combination, and internalization framework – although not embraced in this research study, would be well-suited to future studies of mediated communications in technical support work because each, in their own right, address the use of knowledge applied to the work of resolving technical support issues.

Theoretical Framework

Daft and Lengel's media richness theory (1986) is the basis for the theoretical foundation of this study. In exploring the information processing capabilities of selected media in relation to the

information processing demands of the situation, it's well suited to the study of technical support work facilitated through mediated communications. How information related to the technical issue is exchanged between the end-user seeking assistance and the technical support worker extending it influences how the knowledge necessary to resolve the technical issue is applied. This flow of information is metered differently through mediated channels than it is in person. In looking at the properties which characterize the theory – cues/feedback, synchronous communication, presence, and language – as well as the objects of these characterizations, uncertainty and equivocality, these measures are apt as investigative touchpoints for this study. These touchpoints serve as the intersections from which this research study's exploration into how technical support workers use mediated communications in their work.

Absent from the current literature is significant research on the use of remote desktop in technical support activity. With the exception of one resource from the 104 journal articles reviewed, mention of remote desktop technologies is rare and limited to support of home-users rather than business-users. In their study of supporting home networks, Poole et al. (2009) address the security risks inherent with remote desktop use rather than its facility for extending remote technical support. Other mentions of remote viewing or screen-sharing pertain to distance learners (Bower et al., 2014; Mark and Wong, 2013). Scrutinizing the available literature revealed a significant knowledge gap in the use of remote desktop as a visual means by which technical support communications could be supported. Feedback extended by visual cues could aid the troubleshooting efforts necessary to execute effective and efficient technical support work.

Summary

Established literature was surveyed for relevance to this study of technical support work through mediated communications. Six key areas emerged as crucial for the execution of this study. Knowledge is both the operator and the operand; online resources act as repositories or containters for this knowledge; technical support interactions articulate how technical support work is carried out; media richness illustrates the influences of mediated communications on remote technical support work; cognitive overload presents the consequences over inappropriate media richness; and, adaptive structuration recognizes the flexibility with which the tools and techniques available in technical support work interoperate coooperatively.

While the research question ***How do technical support workers approach, connect, and engage with mediated communications (i.e., e-mail, online chat, telephone, and remote desktop) in their work of delivering technical support?*** establishes the core focus of this research study, a secondary follow-up question ensues. Where the core question implies a movement towards distributed technical support across mediated channels of communication, a related question asks: ***As technical support interctions move to mediated communications, is there any longer a place for in-person, face-to-face interactions in the industry?*** Increasingly, small- to medium-sized businesses are abandonning in-house IT support in favour of external, third-party remote technical support services available across mediated channels with the occasional on-premise site visit. This follow-up question has far-reaching implications where technical support services may no longer be a member of in-house staff, but a subscribed service apart from a company's organizational structure. For an integral service such as technical support which manages and

maintains a company's core operational infrastructure such as information technology, what are the implications for it to be separated from its parent?

Where this study explores how technical support workers approach, connect, and engage with mediated communications in their work of delivering technical support, the theortical framework articulated in and about media richness theory establishes a sound footing on which the next chapter – research design and methodology – can flow.

Research Design and Methodology

Introduction

Technical support is the service used when technical assistance is required to resolve a technical issue. When accessed across remote channels of communication rather than in-person, face-to-face, restrictions on the flow of the information necessary to troubleshoot the technical issues remotely are invariably introduced. Media richness theory (Daft and Lengel, 1986) suggests that information traversing varying mediated channels are influenced by the absence of multiple cues, physical presence, language use, and personal focus. This study explores these limitations in the practical experiences of real-world technical support workers as its research participants. To understand how mediated communications relates to the experience of delivering technical support, this study utilizes a qualitative methodology via a descriptive phenomenological lens supported by semi-structured interviews of six research participants to bring forth their experiences of using mediated communications for information gathering and data analysis.

This chapter opens with a discussion of the research design and methodology adapted for this research study making clear the reasoning behind the selection of a qualitative approach using descriptive phenomenology, explains the recruitment of the research participants, details the settings in which the semi-structured interviews were held, outlines the choice of semi-structured interviews as the research instrument, explicates the procedures by which the data was gathered, and elucidates the means by which the data was analyzed.

Design

Background

The research interest for this study of technical support communications was borne from the researcher's own professional background in information technology (IT) and academic background in communications. Having worked on a remote help desk before the advent of remote desktop technology which allows a remote user to remotely control and view a remote system, I'm familiar with the challenges of talking an end-user through troubleshooting procedures on a technical issue over a telephone. Where we might not name computers parts the same or when we can't see what the other person is looking at, how well can an exchange proceed onward towards mutual agreement of issue resolution? This conundrum has long piqued my curiosity and has led me to this formal investigation through this research paper which explores how technical support workers approach, connect, and engage with mediated communication channels (i.e., e-mail, online chat, telephone, and remote desktop) in their work of delivering technical support.

Qualitative Research

This research study adopts a qualitative approach because in responding to the research question exploring how technical support workers approach, connect, and engage with mediated communications in their work, we're exploring the quality of their experience. Cigdemoglu, Arslan, and Akay (2011) write that "qualitative research allows attaining insight into people's

behaviours, attitudes, motivations, aspirations, culture, experiences, lifestyles and even knowledge [where] phenomenological research is commonly used to describe structures of experiences gained in order to arrive at a deeper understanding of any given phenomena" (p. 791). In Englander (2012,) we see that "[if a researcher] seeks knowledge of the content of the experience, often in depth, to seek the meaning of a phenomenon, [then the] researcher has a qualitative purpose and a qualitative research question" (p. 21). Further, Englander (2012) states that in "tr[ying] to identify the essential structure of a phenomenon, [one] uses descriptive phenomenological psychology, [] a qualitative method" (p. 23).

Descriptive Phenomenology

Englander (2012) suggests that the initial research question of a research study should serve as the main determinant of its research method (p. 15). Since my research question seeks to explore how technical support workers approach, connect, and engage with mediated communications in delivering technical support, it follows that the research method should gather information on where, when, and how technical support workers embrace their work. Gathering descriptions of their experiences affords the opportunity of discovering the human scientific meaning of a particular phenomenon (Englander, 2012, p. 15). Technical support issues experienced by individual technical support workers can never by the same by virtue of who experiences the issue, where it occurs, when it transpires, and how it manifests as well as the environmental conditions of time and space under which it arises. Each technical support instance is its own unique self-contained version of reality for those experiencing it. Denscombe (2010) suggests that alternate versions of reality are valid in their own right when seen "different ways by

different people at different times in different circumstances" (p. 97). These individual alternate versions of realities are the "lived experiences" (Cigdemoglu et al., 2011; De Gagne and Walters, 2010; Denscombe, 2010; Englander, 2012; Kang, 2012; Lopez and Willis, 2004) of each technical support worker. An exploration of the lived experiences of others demands a phenomenological approach to "describe structures of experiences … [where] interviews, observations, or written self-descriptions of lived experiences" (Cigdemoglu et. al, 2011, p. 791) present themselves as target experiences for study. Zadvinskis, Chipps, and Yen (2014) write that "phenomenological approaches are used to understand phenomena from the perspective of those who experience the phenomena" (p. 90). Rossman and Rallis (1998) suggest that "the structure and content of one's lived experiences tell people how to make sense of these lived experiences" (as cited in Kang, 2012, p. 397). Cigdemoglu et. al (2011) concur on the use of phenomenological research "to describe structures of experiences gained in order to arrive at a deeper understanding of any given phenomena" (p. 791).

Seeking to describe the lived experiences of technical support workers experiencing the phenomenon of using mediated communications in delivering technical support work, descriptive phenomenology is the most appropriate research method for my study. Reiners (2012) writes that "descriptive phenomenology is used when the researcher wants to describe the phenomenon under study" (p. 2). Moreover, with my professional background in technical support, it's crucial that my preconceived notions, predilections, and prejudices about technical support be suspended such that my opinions not introduce bias into the research study. Reiners (2012) writes that "Husserl developed descriptive phenomenology, where everyday conscious experiences were described while preconceived opinions were set aside or bracketed" (p. 1).

Contrastingly, Heidegger's interpretive phenomenology seeks the meaning of phenomenon and the researcher does not bracket and, in fact, contemplates the meaning behind the phenomenon (Reiners, 2012, p. 2). Using descriptive phenomenology rather than interpretive phenomenology allows the research participants' recollections in their own words to remain truthful accounts of their experiences.

The positivist paradigm asserts that reality is "ordered, rational, and logical [whereby] positivists assume[] objectively measured knowledge … [i]s independent of human interaction" (Reiners, 2012, p. 1). In technical support work where technical support is more or less delivered by humans, a positivist approach would not be a suitable philosophical basis for this research study. Contrastingly, the naturalist paradigm – closely aligned with the philosophy of phenomenology – presumes that "reality was not fixed, but based on individual and subjective realities (Reiners, 2012, p. 1). With the possibility of many realities of a phenomenological approach, a positivist perspective seeking explanations to fit one universal reality was not considered (Denscombe, 2010, p. 97).

A descriptive phenomenology approach is the most appropriate research methodology for my research study because it frames the experiences of those involved in the phenomenon at the centre of the data collection and analysis as well as suspends bias on the part of the researcher through bracketing. Descriptive phenomenology was embraced in this research study because how others describe their experiences articulates their subjective perspectives thereby imbuing them with meaning.

This study's research methodology is designed uniformly such that both its data collection method and its data analysis procedures are structured around a single unified process based on the same underlying theory of science founded in Husserlian descriptive phenomenological philosophy. This unbroken line of logic, according to Englander (2012,) extends rigor onto the research design.

Participants

Research participants were recruited from the information technology community of technical support workers employed in the professional capacity of help desk workers. The recruitment criteria required that all research participants be currently employed in full-time work thereby mandating their use of current technical support tools and techniques plus be employed for at least three months at the time of the interview thereby satisfying a rudimentary degree of competency respecting the de rigueur employment probation period of three months leading to a permanent position.

From this resource pool of technical support workers, participants were selected for their experience in supporting business end-users in a corporate setting rather than consumers as customers because business end-users utilize a more standardized set of applications requiring commonly identifiable technical skills. Candidates without experience supporting standardized applications in corporate technical support environments will lack the training, knowledge, and expertise in identifying, assessing, and resolving technical issues this study seeks. Potential participants must be currently employed given the rapid pace at which new technologies are

introduced and older technologies are either advanced or replaced necessitating exposure or experience in working with current tools and techniques in technical support environments. All must have experience resolving technical issues in-person, face-to-face with end-users as well as experience or exposure in the delivery of technical support across the mediated communication channels of e-mail, online chat, telephone, and remote desktop.

Purposive sampling was selected for the recruitment of the research participants because a very specific set of experiences were sought for this research study. “Phenomenological understanding, or understanding from the participant’s insider perspective” (Bamberger, Rugh, and Mabry, p. 138) was the most appropriate sampling method over, say, random sampling. “When relatively few participants in a program can be interviewed, selection of interviewees must be very careful – not random, but purposive or purposeful” (pp. 138-139).

Six participants at a minimum were sought from which at least two participants for each level of the traditional three-tiered support structure could be identified. In the traditional three-tiered support structure, Tier I is the entry level for novice staff on basic support functions, Tier II is the secondary level for intermediate staff on complex technical issues, and Tier III is the tertiary level for senior staff on advanced engineering issues. This range was sought to provide a varying range and depth of experiences in the use of the different mediated communication channels. Creswell (2007) writes that “selecting individuals who fulfil certain criteria as participants is the most suitable method of selection for a phenomenological study” (as cited in Cigdemoglu et al., 2011, p. 791). This minimum number of six participants, although not large, was appropriate for this study given the limited resources available to the researcher and the time allotted for this

research study. De Gagne and Walters (2010) suggest that "adequate sample size in qualitative research is the researcher's judgmental call in that a sample size of 12 may be big enough to derive significant outcomes for the intended study, while a size of 5 can be big enough to reach the point where no new information is obtained" (pp. 2-3). Denscombe (2010) purports that "phenomenological research does not normally involve large numbers or instances of the phenomenon being studied" (p. 103). Englander (2012,) when asked "How many interview subjects do I need?" answered "Interview so many subject[s] that you find out what you need to know" (p. 20). Further, Englander (2012) suggests that qualitative research "seeks knowledge of the content of the experience, often in depth, to seek the meaning of a phenomenon, not "how many" people [] have experienced such [a] phenomenon" (p. 21).

Purposive sampling was sought initially from alumni graduates of a technical training certificate program at a local vocational institution, then later from the researcher's own network of professional colleagues. The local vocational institute offered two certificate programs catering to technical support professionals: The Network Administration and Security Professional (NASP) program and the Technical Support Professional (TSP) program. These two certificate programs offered both technical training leading to industry certifications for Microsoft, Linux, and CompTIA as well as "soft skills" training in communications, project management, and conflict resolution. The two complementary skillsets of both technical acumen and people skills would offer well-balanced individuals ideally suited for this research study. Reiners (2012,) in her phenomenology study of nursing, selected student nurses with specific number of years of study because "their experiences were related to the area of interest that was studied" (p. 2). Kang (2012) specifically precluded some online faculty members when researching teaching

online courses because they no longer taught online even though they had possessed the experience (p. 397). The alumni graduates from the vocational education institution would be ideal potential candidates for this research study.

The administrative coordinator of the two programs was approached via e-mail to solicit potential interest on behalf of the department for its alumni graduates to participate in this study. Having had received a positive response from the administrative coordinator as well as an introduction of the initial solicitation to the program's director, the Recruitment Letter, the Information Letter and Consent Form, and the ethics applications were drafted. Proceeding onwards into the ethics application process, the Recruitment Letter plus Information Letter and Consent Form required only minor changes before being finalized by the Research Ethics Board (REB). During this time, repeated communications to the program's director did not receive any responses whatsoever, unfortunately. The programs' administrative coordinator was unable to provide a reason for the non-response. Not wishing to appear too aggressive, I elected to not pursue any further recruitment activities with the vocational institute. Alternatively, as both an alumni graduate of the NASP program myself as well as a member of the NASP program's Facebook group, I approached the Facebook group's moderator for permission to post a recruitment post on the Facebook group's wall. Having received from the moderator both positive encouragement as well as permission to post my recruitment post, I posted a recruitment post to the group's Facebook page (see Appendix on page 123). Although viewed by less than a dozen people from the over one hundred members, the post only garnered one enquiry. Responses were extended to the single enquiry with no further responses received. As recruitment activities had only received authorization from the REB to recruit through the

vocational institute, Facebook, and the researcher's own professional network, I refocused my recruiting activities on my own professional network having had failed to recruit any research participants through the vocational institute or Facebook.

In order to circumvent any potential bias or sense of obligation on behalf of potential research participants through the researcher's own professional network, no contacts with whom the researcher enjoyed any paid relationships for whom a sense of professional obligation or monetary benefit were contacted. Only former colleagues, past classmates, or peer colleagues were approached. Twelve positive responses were received from six former colleagues, two past classmates, two peer colleagues, one personal friend, and one word-of-mouth contact through a mutual acquaintance. De Gagne and Walters (2010) cite "nominated sampling" in reference to a "purposive snowball sampling method … [whose] method mainly relies on nominations of others already in the sample" (p. 3). The word-of-mouth recruitment, although it did not originate from another research participant already in the sample, originated from my personal Facebook post (see Appendix on page 124) to my personal Facebook network seeking nominations of potential candidates. Although this nominated candidate was not someone of my personal acquaintance, this "nominated sampl[e]" possessed "the experience that I [was] looking for" (Englander, 2012, p. 19) thereby qualifying him for the study. As a caution, De Gagne and Walters (2010) warn that a "weakness of [the] approach is the probability of restriction to a small network of acquaintances" (p. 3). Because purposive sampling of specific populations would yield participants with the exposure to and experience of technical support work at the core of this study, no other sampling method (i.e., random) appeared appropriate. Random sampling would had necessitated a broader range of possible participants who may or may not possess the

necessary exposure or experiences. Given the challenges encountered with recruitment activities through the vocational education institution and the lack of responses from the Facebook posts, the small network was deemed acceptable.

From these twelve, eight were signed-up to participate. These eight were e-mailed the Recruitment Letter to provide background on the study, the requirements for their participation, and the next steps should they elect to proceed further. From these eight, six responded positively and further contact ensued to schedule the interviews. For the other two, one did not respond in time for his interview to be scheduled during the time-frame permitted by the REB and the other did not respond at all.

Before scheduling the formal interviews with each of the six research participants, a pilot interview was performed with a test subject, called Participant 0: 1) to evaluate the usefulness of the research questions to solicit the intended responses; 2) to help the researcher gain familiarity with the interview process with asking the interview questions, following-up with structural questions, practice speaking purposefully plus maintain focused attention and steady eye contact with the research participant; and, 3) to practice recording the audio and experience the transcription process. The pilot interview process helped the researcher to prepare the checklist of: 1) introducing himself to the participant; 2) gaining signed authorization via the Information Letter and Consent Form; 3) seeking permission to record the interview by audio recording for transcription purposes; and, 4) using the prepared set of note paper for taking notes during the interview with its sealed envelopes (see Conducting the Interviews under Procedures later in this chapter).

Setting

Permission from the REB was obtained to perform interviews in-person wherever possible or via Skype whenever in-person interviews were not feasible. Five out of six research participants were local to the researcher thereby facilitating in-person interviews; one research participant lived in a neighbouring province which necessitated the employment of Skype to conduct the interview. Permission was granted only to conduct interviews at the researcher's place of work or home plus the research participant's place of work or home. Five out of six interviews were conducted in person and one interview was conducted via Skype.

Each participant was assigned a pseudonym to facilitate ease of reference for discussion (see Table 801 on page 49) and to protect their anonymity. Restricted locations for performing the interviews at either the researcher's home or place of work; the research participant's home or place or work; or, Skype afforded the necessary limitations of privacy and confidentiality. In each of the six interviews conducted, no other persons were present in the interview space thus providing the environments appropriate for privacy and confidentiality.

Table of Participant Codes and Pseudonyms

Participant Code	Pseudonym
A	Adam
B	Brad
C	Clay
D	Dave
E	Eric
F	Fred

Table 801

Interview One with Participant A – pseudonym of Adam – was held in a private boardroom located in the researcher's office building, but not in the researcher's office. Seated across from one another at the boardroom table, the researcher and Participant Adam spoke in a relaxed manner with the recording device in the middle. Unexpectedly throughout, Participant Adam banged the table with his fingertips for emphasis when making marked points in his responses that the recording device picked up which resulted in intermittent banging resonating through the recorded audio. The banging appeared in the audio recording as "pings." The researcher, at the time during the interview, elected to not mention anything about the banging out of concern that it might impede Participant Adam's ability to respond to the research questions unhindered. This 51-minute interview proceeded without issue other than a fast-paced, excited pattern of speech on behalf of Participant Adam. There were only the two people – the interviewer and the research participant – present in the room.

Interview Two with Participant B – pseudonym of Brad – took place at the research participant's place of employment. The 36-minute interview itself took place at a chest-high, bar-stool height table with two bar-stool height stools with the audio recording device situated on the table between the researcher and Participant Brad. The setting was situated in a seating area meant for conversations (i.e., conversation pit). Although situated in a public area of potentially high traffic, only three other people appeared in the area. In fact, just before the recording of the interview began after the Information Letter and Consent Form were signed, one of the three stopped by to borrow a pen. A pen was lent and the person went away. This interview proceeded without further disruption. There were concerns on behalf of the interviewer that Participant Brad's accented English might present itself as problematic during the transcription process, but

it was realized at the same time that the audio recording during replay for transcription could be decreased to a lower speed to aid in obtaining an accurate transcription.

Interview Three with Participant C – pseudonym of Clay – took place at the research participant's office. The 39-minute interview itself took place in the employees' lounge separated away from their offices. The researcher and Participant Clay were each seated on leather sofas facing one another at a 90-degree angle. There were no others in the employees' lounge and the only disturbance emanated from the window cleaners washing the exterior windows of the lounge. Participant Clay did not look directly at the researcher when responding to the research questions. Soon after the interview commenced, it became apparent that the research participant appeared to be responding to rehearsed responses to the subject matter of the study articulated in the Recruitment Letter. That is, Participant Clay appeared to be offering advice on how to use mediated communications in technical support work rather than speaking only from his experience. I decided to proceed with the interview as it transpired and ensure that leading questions asked of Participant Clay were asked specifically seeking his experience in working with the medium avoiding as best possible opportunities for him to offer advice.

Interview Four with Participant D – pseudonym of Dave – took place at the research participant's home. Sitting next to one another on the three-seater leather sofa, the 45-minute interview proceeded at a lively pace with quick, rapid fire answers to the researcher's questions. The leather "squeaked" from time-to-time when either Participant Dave or the researcher shifted in their seats. These "squeaks" are noticeable in the audio recording. Participant Dave offered plenty of contextual background information with his responses so not too many structural

questions for framing were required by the researcher. This participant spoke with accented English at a rapid pace with some odd terminology which the researcher considered might be difficult to translate.

Interview Five with Participant E – pseudonym of Eric – took place at the researcher's home. Located in the home office/den, the researcher and Participant Eric were seated directly across from each other with the researcher at his desk and Participant Eric on the two-seater sofa, respectively. Participant Eric exuded a relatively timid character which influenced the liveliness of the interview. At times, Participant Eric responded with pat, vague answers which were not descriptive specifically of the participant's own experiences, but of broader experiences applicable more generally. I used structural questions in response to his vague answers to elicit more descriptive answers from his own experience. Because Participant Eric did not offer a lot of personal context with his vague answers, I prefaced a number of my structural questions with context of the question or examples of situations for him gain a better understanding of what I was asking. This approached succeeded sometimes in eliciting a more specific response from him, but at other times he simply repeated what I had said in my example and asserted his agreement. In these instances, where he offered no opinion of his own, the "parroted" excerpts were excluded from the analysis. I made a note to be exclude his "parroted" excerpts from analysis since they would not reflect his own true, unbiased voice.

Interview Six with Participant F – pseudonym of Fred – was conducted via Skype. The researcher was seated in his home office/den and Participant Fred appeared to be sitting in his living room where his Internet-connected SmartTV with a built-in webcam was situated.

Towards the outset of the interview, just after the introductions and the general agenda for the interview was laid out, the Internet connection disconnected and the Skype interview terminated unexpectedly. Connecting about three minutes later, Participant Fred informed the researcher that his Skype version updated automatically which required a mandatory restart of the application. At the outset of the interview, Participant Fred asked if it was acceptable that his wife be present in the room (since he was located in their living room where the Internet-connected SmartTV was situated). I responded that it was okay. Since any personally-identifiable information, such as his name or workplace, would be removed from the interview transcripts, I did not consider that her presence during the interview would be at all disruptive or affect negatively the interview process in any way. To be sure, she appeared in the view of the camera about halfway through the interview and sat down in the armchair adjacent to his.

Instrument

Semi-Structured Interview

This study extends the interview instrument in adopting what Kvale and Brinkman (2009) call a semi-structured interview which is comprised of two parts: Description and meaning (as cited in Englander, 2012). Each question is delivered as an open-ended question inviting a response framed as the respondent deems most appropriate which the researcher can then follow-up with structural questions designed to carry the respondent's original response farther. Here, the researcher "directs" the interviewee rather than "leads" which affords the participant a "structure" in which to follow his initial response (Giorgi, 2009, as cited in Englander, 2012).

This approach is echoed in Denscombe (2010) writing that such interviews "allow the interviewee to raise issues that he or she feels are important … [which] helps the phenomenologist's investigation by highlighting things that matter to the person being interviewed" (pp. 99-100). Kang (2012) purports that semi-structured interviews "guide interviewees to describe their lived experiences" (p. 397). Further, Englander (2012) suggests that "what [the researcher] seeks from a research interview in phenomenological research is as complete a description as possible of the experience that a participant has lived through" (p. 27).

Interviews, or in this case semi-structured interviews, were deemed the most appropriate instrument for the gathering of analyzable data because it afforded the opportunity for in-depth investigation of the experiences of the research participants. Focus groups, for example, would not had been appropriate for they would had narrowed the focus onto group interactions rather than an individual's experience. Carey and Asbury (2012) suggest that "focus groups are not the method of choice when the research question involves the magnitude of the problem" (p. 18). Here, not enough information about the use of mediated communication in technical support work is known at the outset of this study to determine the magnitude.

Interview Guide

The tenets of Daft and Lengel's media richness theory (1986) were consulted in the development of the interview guide to direct the context of the interview questions. The premises of media richness theory which attend to processing capabilities matching processing demands, two-way communications, multiple cues, social presence, and natural language were matched

conceptually to indicators or measureable ideas which could be observed. These observable indicators were then extended into realizable characteristics of interview questions. (See Table 802 on page 55).

Construct Testing Matrix on Media Richness Theory (MRT) (Daft and Lengel, 1986)

Construct Testing Matrix on Media Richness Theory (MRT)		
Construct/Concept	**Indicators / Measurable Ideas**	**Interview Questions**
Processing capabilities match processing demands	Bandwidth provided/demands	Routine/non-routine, structured/unstructured, familiar/unfamiliar, uncertainty, equivocality, task-oriented/conceptual
Two-way communications	Ask/answer, immediate/delayed, synchronous/asynchronous	Received and sent, purposeful, utterances, affirming statements, articulated questions, challenge presumptions
Multiple cues	Written, verbal/audible, visual, physical	Received and sent, purposeful, utterances, affirming statements, articulated questions, challenge presumptions
Social presence	Visual sights, audible signals	Observable presence or absence
Natural language	Natural language or catered language	Readily understandable, jargon, acronyms, presumed understanding

Table 802

The interview guide was developed from Seidman (2006) (as cited in Bevan, 2014) and Bevan (2014) with their three areas of phenomenology and interview domains, respectively. Seidman (2006) suggested that each research participant should undergo three interviews per person where the first interview covers a focused life history for context, the second interview reconstructs experiences for its relationships and structures, and the third interview invites the respondent to reflect on the meaning of the experience. Bevan (2014) developed three phenomenological interview domains where the first domain is named contextualization

(covering natural attitude and lifeworld); the second domain covers apprehending the phenomenon (covering modes of appearing and natural attitude); and, the third domain covers clarifying the phenomenon (covering imaginative variation and meaning) (p. 138). These parallel approaches align as corresponding segments (see Table 803 on page 56).

Alignment of Phenomenological Analysis Groupings

Segment	Seidman (2006)		Bevan (2014)	
A	Focused List History	Context	Contextualization	Natural Attitude & Lifeworld
B	Experience Reconstruction	Relationships & Structures	Apprehending the Phenomenon	Modes of Appearing & Natural Attitude
C	Reflection	Meaning	Clarifying the Phenomenon	Imaginative Variation & Meaning

Table 803

Borrowing from Seidman (2006) and Bevan (2014,) I've drafted my interview script with six questions where each pair of questions relates to segments A, B, and C for Context of the Phenomenon (in green,) Experience of the Phenomenon (in blue,) and Meaning of the Phenomenon (in yellow,) respectively. (See Table 804 on page 57.) The questions were framed specifically around the cited phenomenon to elicit appropriate responses. These responses would surface the target phenomenological experiences sought from each of the participants.

Conceptual Framework of Interview Guide/Script

Segment	Interview Question No	Interview Question	Concept
A	1	Tell me how you got your start in IT.	Context
A	2	Complete this thought: "Technical support is …"	
B	3	In what ways have you delivered technical support and describe your experience of working with them.	Experience
B	4	Describe a prior experience in delivering technical support where the assessment of the situation, troubleshooting the issue, and identifying the solution was challenging	
C	5	Describe how you might adapt the previously described experience in Question 4 using other forms of mediated communications.	Meaning
C	6	Having described your experiences of delivering technical support through various forms of mediated communications and reflected on those experiences, how might your response to Question 2 completing the thought "Technical support is …" change?	

Table 804

Note: An adjustment to the sixth and last interview question was made upon reflection after the pilot interview with Participant 0 had completed. The first version of the interview script included a question which was later adjusted from its intial form before being finalized. The sixth and final interview question asked initially, "*Describe an ultimate technical support tool or technique that could overcome all your challenges in performing technical support work. This tool or technique might not already exist, may be made-up or fantastical, or may be found in a science-fiction movie.*" While maintaining strategic alignment with the reflection phase from Seidman's (2006) approach and the clarifiying the phenomenon phase from Bevan (2014,) I considered later that this question lacked the necessary direction for the research participant

responding to the question to answer readily. Its framing was too broad. To scale back the scope to a more focused lens, the question was removed and replaced with "*Having described your experiences of delivering technical support through various forms of mediated communication and reflected on those experiences, how might your response to Question 2 completing the thought 'Technical support is …' change?*" This revision focused the participant's response in a more succinct manner of reflection back to the interview session itself rather than to a broader consideration. The research participant still had an opportunity to reflect in more broad terms towards the conclusion of the interview when he was asked if he had anything more to add which he felt important to raise/discuss in the context of the research.

Procedures

Conducting the Interviews

Each interview opened with a spoken thank-you to the research participant for his time. An assembled interview package was presented containing: 1) a closed, large-sized manila envelope containing all necessary interview materials; 2) the Recruitment Letter; 3) the Information Letter and Consent Form with "sign-here" markers for both the researcher and research participant's signatures; 4) the Interview Script; 5) two pieces of blank paper for notes; 5) a letter-sized white envelope to return the research participant's signed and dated copy of the completed Information Letter and Consent Form plus the Recruitment Letter to the participant upon the conclusion of the interview; and 6) an open, medium-sized manila envelope into which the Interview Script and the two pieces of blank notepaper could be sealed until later required for the transcription

process. The signed and dated Information Letter and Consent Form would be digitally scanned using the researcher's document scanning app – Microsoft Office Lens – on his smartphone for the researcher's record-keeping of the signed and dated documents stored on the researcher's encrypted Cloud storage device facilitated by his password-protected smartphone. Note: All participants declined their original copies of the original, signed, and dated Information Letter and Consent Forms at the time they were signed and dated repressing the need for the digital scans of the documents. They were also asked if they wished to receive digital copies of the signed documents which they also declined. All documents were retained by the researcher upon the conclusion of the interview. Each document, form, and envelope were marked with the Participant's Letter Code (i.e., A, B, C, D, E, and F) in the top-left hand corner for ease of identification during the analysis phase.

The research participant was asked to read the Information Letter and Consent Form to ensure that he fully understood the interview process, his rights throughout, and the nature of the research to be explored. I reminded him that at any time during the interview, he could stop the interview should he feel uncomfortable or wish to halt the entire process altogether. Verbal authorization was sought and obtained from the research participant for the interview to be recorded for transcription purposes. The research participant was assured that no one except for the researcher (and the researcher's supervisor as needed) would have access to or be able to listen to the recording. I advised the research participant that the audio recording itself would be encrypted and stored only on password-protected equipment (i.e., researcher's smartphone, researcher's personal computer, and Cloud storage) thereby protecting the privacy and confidentialy of the recording.

The time alloted for each interview was 60 minutes. Each of the six interviews conducted ran from a minimum of 36 minutes to a maximum of 62 minutes.

At the start of each interview, I reiterated what was already stated in the Recruitment Letter and the Information Letter and Consent Form. The information contained therein frames the research question and the interview's objective to explore the experiences of technical support workers. Upon the completion of the sixth and last formal question, I disclosed information on what my literature search had revealed to me in terms of media richness theory and its tenets, then invited the research participants to add any additional information which they felt would be relevant to my research given this information they'd just received about media richness theory. By withholding this information from them at the outset of the interview before asking them to answer the interview questions, they would be free to respond in any way which they deemed appropriate from their own experiences without feeling obliged to a respond through a perspective framed by the literature. With this new set of information regarding media richness theory, they might be able to offer further insights regarding its use which would not had appeared without it.

Transcribing the Interviews

With the exception of Interview One, no interview materials were reviewed (i.e., notes) or listened to (i.e., replay of transcripts) until all six interviews had been concluded. As an exception, Interview One was transcribed for this research project's supervisor to review and comment as necessary.

Upon the completion of the sixth and final interview, the transcription process commenced. Each interview was transcribed manually by the researcher. The six hours of recorded interviews required approximately 30 hours of manual transcription time. During the manual transcription process of Interview One, the editing process for comprehension (i.e., removing repeated words, pauses, and speech impediments) proved to be too time-consuming. To ease the overall process of transcribing all six interviews totalling some six hours of recorded audio, I determined that it would be more efficient to transcribe all subsequent interviews verbatim including all repeated words, pauses, and speech impediments and to apply editing for readability during a subsequent cycle.

Three successive passes through the recorded audio recordings were applied to capture the research participants' experiences. In the first pass, the audio recordings were transcribed verbatim – including pauses, utterances, and repeated words – in order to maintain the authentic voice of each research participant. Denscombe (2010) suggests that "the researcher's role is not to act as editor for the way people explain their experiences. Nor is it to impose some artificial order on the thoughts of those being studied by trying to remedy any apparent logical inconsistencies" thereby explaining that edits on behalf of the researcher should not impose his/her "artificial order" (p. 98). The verbatim transcripts were reviewed in the second pass denoting initial notations necessary to surface preliminary themes. The third pass modified the verbatim transcripts adding discretionary punctuation, capitalization, and missing words to improve comprehension of the transcripts. As readable transcripts, the interviews were finessed for improved readability while maintaining their genuine meaning.

Summary

The gathered data extended the opportunity to cement the theoretical ideas borne from the literature review in concrete ways through the framework of the research methodology. The interview process allowed the experiences of the research participants to come alive through the lenses of theory and seat the theoretical musings in very real ways. The successive, iterative turns – three in total – of the recorded interviews and their written transcriptions provided me with the chance to experience many times over how meanings deepen and their reach broadens. The results of this chapter offered keen insights into this exploration of how technical support workers approach, connect, and engage with mediated communications in its many forms in delivering technical support.

The next chapter – findings and discussion – builds upon the data gathered through analysis and reflection to introduce further insights and meaning to this paper.

Findings and Discussion

Introduction

Technical support communications are influenced by the mediated communication channels through which they pass between the end-user and the remote technical support worker. This influence affects how technical support workers approach, connect, and engage with their technical support work through mediated communications.

This chapter presents firstly the data analysis of the coded data before extending to the data presentation of the findings from the research interviews with six technical support workers of varying lengths and broad ranges of experience. Responses to six interview questions are summarized according to 15 emergent themes. Secondly, overlaid atop the emergent themes is the theoretical framework of Daft and Lengel's (1986) media richness theory (MRT) to reveal where the framework and the experiences of the technical support workers intersect. Clark and Brennan's (1991) grounding in communication theory (GIC) is added to introduce dialogue as a necessary component in applying MRT. The development of three key findings is presented before being followed by the development of five secondary findings. Finally, the findings are placed in context of current research before pathways for future research are introduced.

Data Analysis

The use of phenomenological interviewing extended the opportunity to glean insights into the

experiences of technical support workers in their delivery of technical support through mediated communications. The interview transcripts were analyzed for meaning units representing how the research participants referenced their work in their own words. The meaning units were then grouped into summative themes and viewed through the theoretical framework of media richness theory adapted for this study. These summative themes are identified as modes of appearing (Bevan, 2014). Following a consistent framework from the gathering of data to its analysis extends a unified approach which lends rigor to the research process. Englander (2012) suggests that "the research process be methodologically articulated in such a manner that data collection and data analysis are both seen as part of a single, unified process with the same underlying theory of science. Hence, if one is following Husserlian descriptive phenomenological philosophy as a basis for a phenomenological theory of science, both the data collection and the data analysis need to follow descriptive phenomenology in order to achieve rigor" (p. 15). Moreover, the completed interview transcripts were provided to the research participants for their review and comments before including them for analysis in this final report (Kang, 2012) thus ensuring further rigor.

Coding the Data

Textual analysis was applied to the transcribed interview texts to surface the themes, issues, and phrases common amongst all six transcribed interviews. Four iterative passes through the readable transcripts were applied until no new realizations arose in the analysis of the gathered data. These four passes prepared the data for analysis as later interpretations.

The first pass sought key passages for use as possible excerpts in support of the findings. Pass two transferred the key passages into a Notepad text file where citable segments marked the interview question, the Participant Code, and the time location within the audio recording. The third pass further transferred the citable passages into an Excel spreadsheet file in preparation for manipulation of the data for analysis and investigation. Pass four applied "meaning units" (Giorgi, 2012) as a means of identification of themes and ideas for the researcher where "these identifications are arbitrary where assigned by the researcher and represent an early attempt to classify the data" (pp. 5-6). (See Appendices for example of Interview Analysis Excel Spreadsheet on page 132).

Meaning Units

The gathered data was reviewed to identify 17 key issues. These identifications represented intersections of cross-reference between the theoretical constructs from media richness theory (Daft and Lengel, 1986) and the research participants' experiences.

Table of Meaning Units (Giorgi, 2012)

Keywords	Frequency
Problem Solvers	54
Troubleshoot	36
Structuration	9
Feedback	11
Cues	14
Physical	10
Presence	8
Focus	11
Language	8
Uncertainty	5
Equivocality	4
Socio-Cultural	14
Rapport	15
Tacit	14
Collaboration	12
Negotiating Commutuality	5
Sequella	4

Table 901

Bar Graph of Meaning Units (Giorgi, 2012)

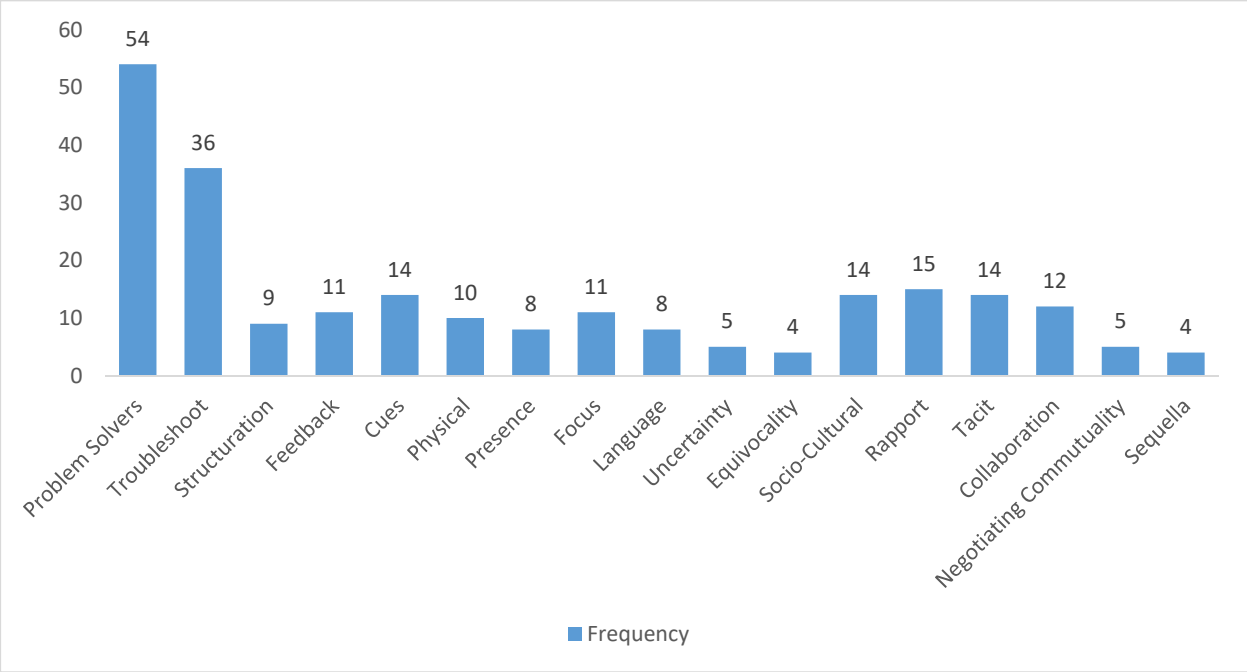

Chart 902

Interpreting the Data

From the coded data, two further iterative passes were applied to glean further insights from the research participant's experiences.

The fifth pass refined the surfaced meaning units into summative themes. Only two items could be merged into others thereby reducing the 17 meaning units into 15 summative themes. Cues and feedback were merged into one considering the symbiotic relationship between the two where cues inform feedback and feedback manifests as cues. Physical and presence were reluctantly merged into one because the distinction between the two could be considered narrow or far depending on the view. My classification of "physical" pertained to the physical touch required in the transaction to perform the troubleshooting work; whereas, the classification of "presence" represented more of an abstract influence which physical presence introduces. However, for the ease of manipulation, both "physical" and "presence" were merged into one because presence could not exist without the physical and physical is affected by presence.

Modes of Appearing

The 15 summative themes could be assessed for modes of appearing (Bevan, 2014) where they serve as touch-points for the analysis. These themes represented the finest points from which no further aggregation of the coded data would be refined. These modes of appearing demarked the experiences of the research participants which this study seeks to explore.

Table of Modes of Appearing (Bevan, 2014)

Summative Themes	Frequency
Problem Solvers	54
Troubleshooting	36
Feedback / Cues	25
Physical / Presence	18
Rapport	15
Socio-Cultural	14
Tacit Knowledge	14
Collaboration	12
Personal Focus	11
Structuration	9
Natural Language	8
Negotiating Commutuality	5
Uncertainty	5
Equivocality	4
Sequela	4

Table 903

Bar Graph of Modes of Appearing (Bevan, 2014)

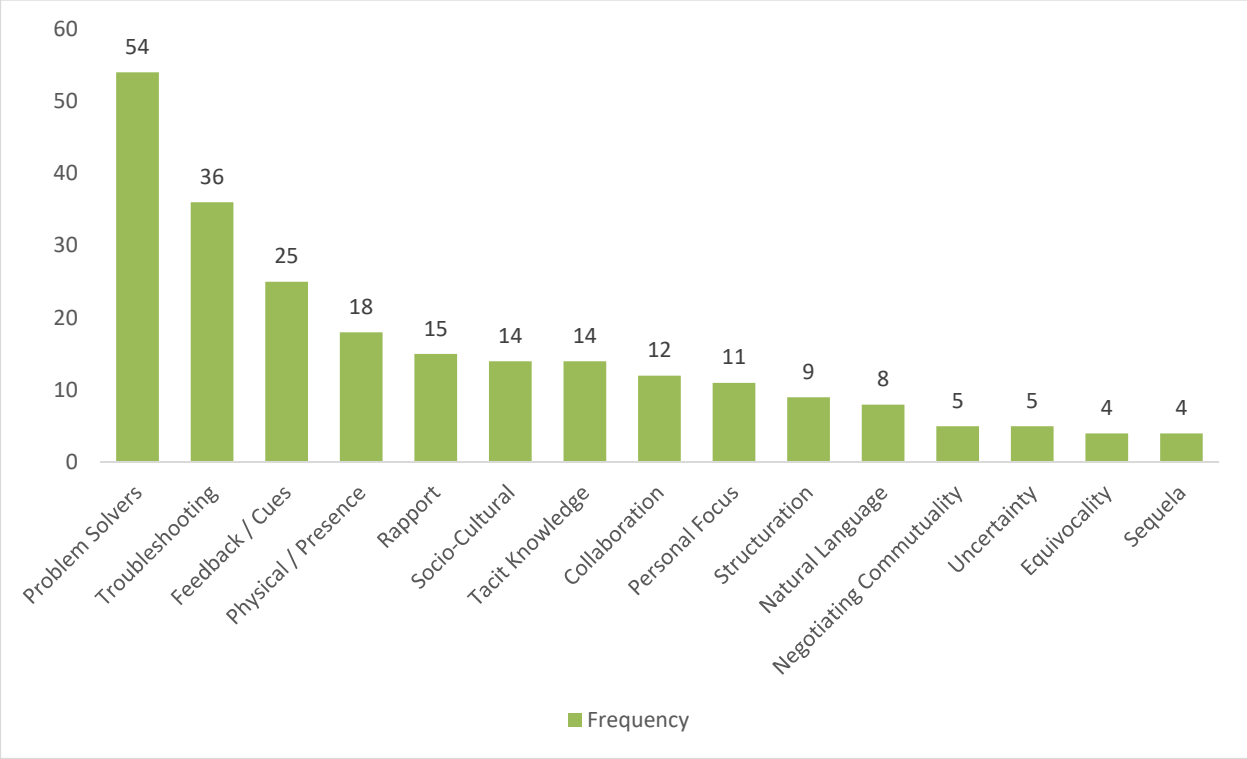

Chart 904

The sixth and final pass returned focus to the context from which the modes of appearing arose. This process surfaced the specific situations in which the summative themes were based to elicit deeper meaning and insights from which additional analysis could be formed.

Data Presentation

Following the phenomenological analysis groupings from the previous section, this section looks at foundation/context, apprehending the phenomenon, and clarifying the phenomenon.

Foundation and Context

Exploring the lifeworld and natural attitudes of the research participants, this section describes the participants in terms of their years of experience, current and past work roles, and the impetus for their entry into technical support work setting the stage from which their experiences can be understood.

Who are the Technical Support Workers

Six research participants with working experience in technical support were recruited from the information technology community. Although the intent was to gain a span of experiences across a range of seniority (years of service) and expertise (depth of knowledge,) the recruited participants were mostly intermediate to senior staff with many years of experience. Chart 905 (see page 70) charts the six participants with their respective support tier level (Tier I, Tier II, or Tier III,) number of years of experience, and their job title. In the conventional three-tiered

support structure, Tier I is entry level for novice staff, Tier II is intermediate level for experienced staff, and Tier III is senior level for expert staff.

Chart of Participants' Tier Levels, Years of Experience, and Job Titles

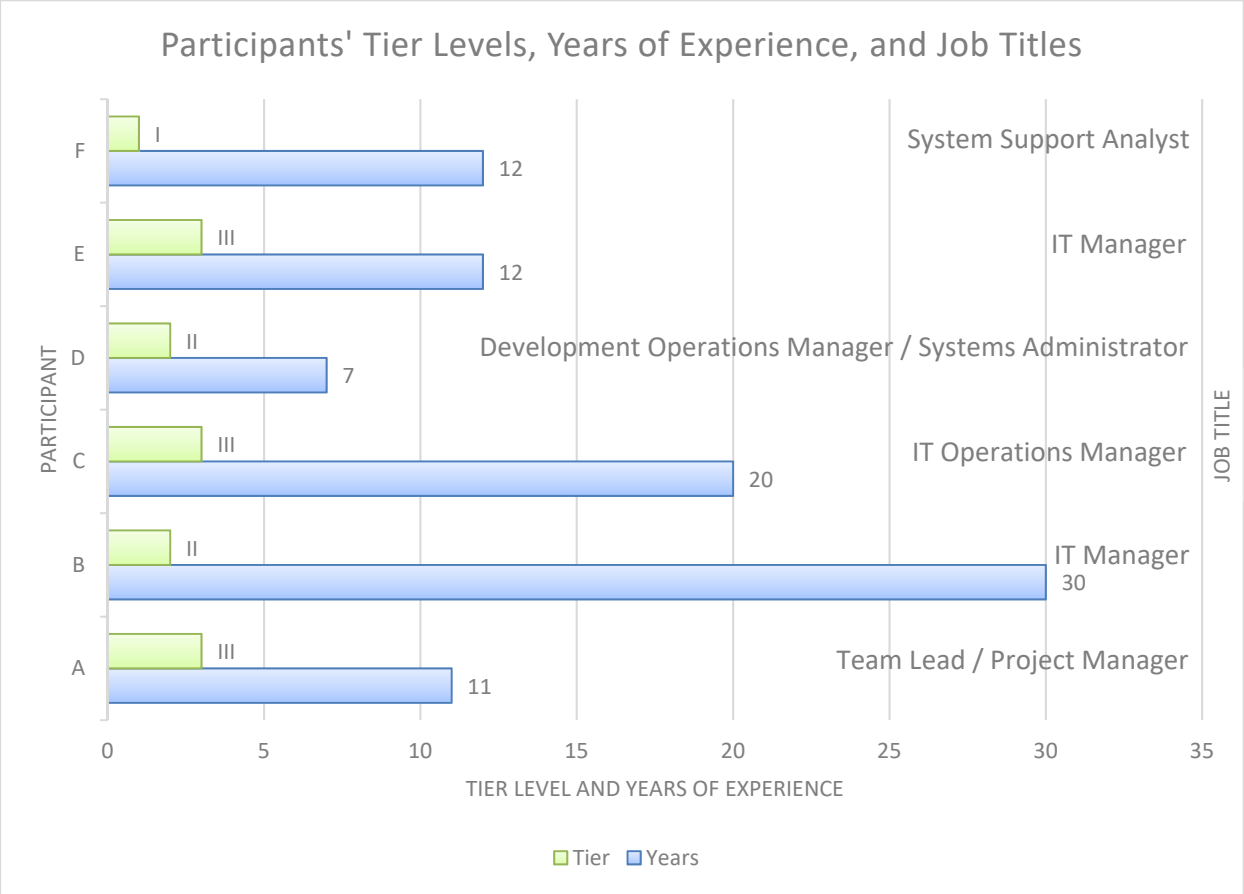

Chart 905

There appeared to be no correlation between the numbers of years of experience with the support tier level classification. For example, Participant Brad (see Participant B) functions at Tier II with 30 years of experience, yet Participant Eric (see Participant E) with 12 years of experience participates at Tier III. Curiously, all participating research subjects were male. There was only one female subject in this researcher's circle of potential research participants, but her invited

participation did not materialize.

Exploring How Technical Support Workers Approach, Connect, and Engage

To respond to the research question of *how* technical support workers approach, connect, and engage with mediated technologies in delivering technical support, I considered the tools that they use apart from the techniques that they embrace. The tools utilized represent the manner and methods of utilizing the mediated channels available to them and the techniques are illustrated by their engagement of their approaches.

The Tools: Face-to-Face, E-Mail, Online Chat, Telephone, and Remote Desktop

The five modes of communication – Face-to-Face, E-Mail, Online Chat, Telephone, and Remote Desktop – were extracted from the interview transcripts to reveal the frequency with which the research participants referenced them. Table 906 (see page 71) and Chart 907 (see page 72) reveal that Face-to-Face appeared most frequently at 32%, then E-Mail at 28%, then Telephone at 24%, then Remote Desktop at 11%, and finally Online Chat at 5%.

Table of Mediated Communications Use Distribution

Medium	Frequency	Percentage
Face-to-Face	34	32%
E-Mail	30	28%
Online Chat	5	5%
Telephone	26	24%
Remote Desktop	12	11%

Table 906

Pie Chart of Mediated Communications Use Distribution

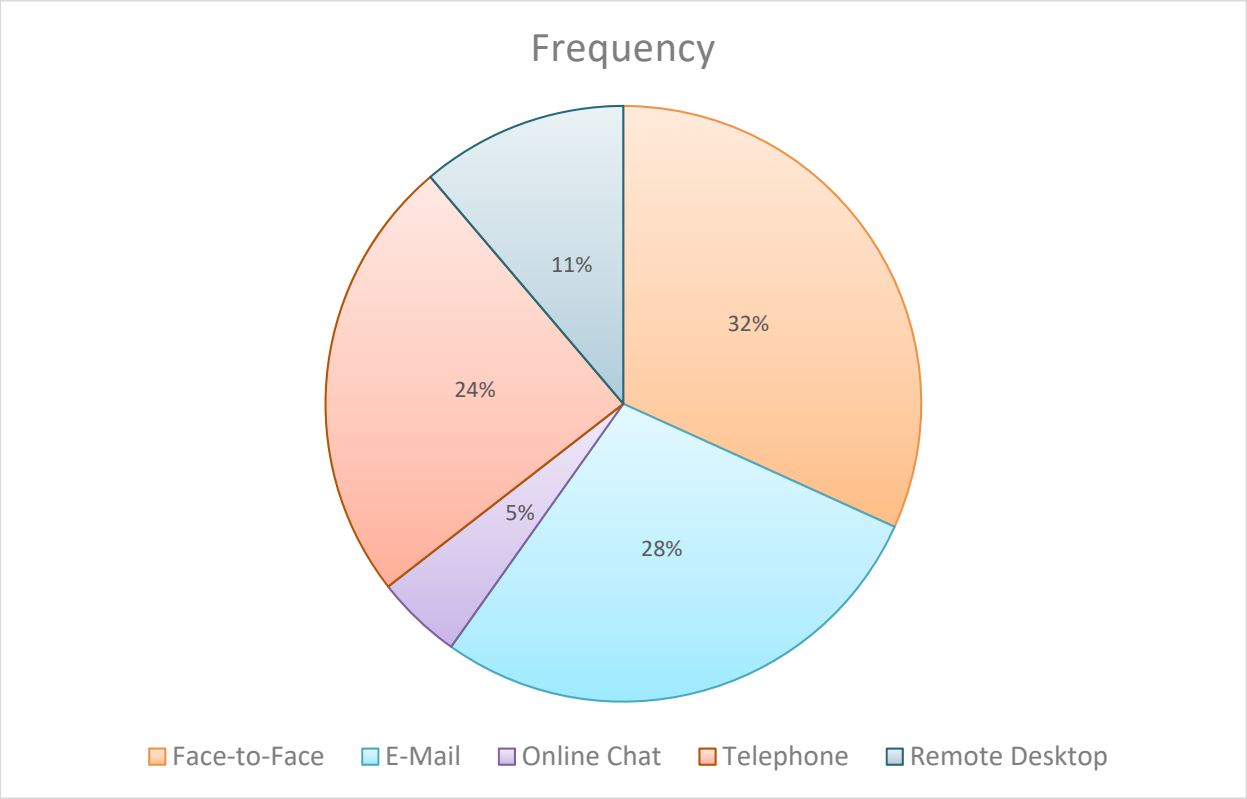

Chart 907

The appearance of face-to-face as the predominant method may be misleading in the analysis since it serves as the standard against which the mediated channels are compared. Regardless, in the participants' own words, face-to-face is a more efficient and effective way of communicating when it comes to technical support work. They say that end-users pay attention more, that it's easier to show people how to do things, and that it's possible to troubleshoot physical problems which would otherwise be virtually (double-entendre intended) impossible across mediated channels.

E-Mail is used for coordination activities and exchange of information. It's used for facilitating

the coordination of technical support interactions (e.g., initiating support requests, arranging on-site visits, etc.) Where e-mailed requests for support are self-contained (i.e., containing sufficient unambiguous information,) then more-or-less complete answers can be furnished by return e-mail. For self-contained instances, how-to guides or knowledge base articles would be sent by return e-mail to the end-users. When it's used for interrogative dialogue, then it quickly becomes tiresome due to the uncertain or equivocal nature of the issue and its appropriate resolution.

Telephone is the most agile method next to face-to-face communications according to the participants. It's an easier way of managing interrogative dialogues which are problematic in e-mail. They sense the focus (or lack thereof) with the person on the other end of the line since they know that they may not be looking at what they're directing them to look at or they may be multitasking on other things while on the phone with them (because that's what the technical support workers do, too).

Remote Desktop allows the technical support workers to connect to remote systems to look at the Desktops (as in the computer's desktop displayed on the screen rather than the physical desktop computer which contains the system's CPU, hard drive, RAM, etc.) Four out of the six participants have use of remote desktop in their environments on a persistent basis. One of the two that does not use it regularly cannot use it because it relies on a physical connection (in his case, a wireless connection,) which is not readily available in his environment due to the transient nature of his end-users (which are conference delegates attending the conference facility for a limited-duration only). The other participant does not have regular use of remote desktop in his junior, Tier I position.

Online Chat was not well favoured by the research participants appearing in only two out of six interviews. Out of these two, none of them used it in *delivering* technical support, but rather only in *consuming* technical support. That is, no one offered assistance to end-users using online chat, but used it themselves as end-users when seeking technical support.

The Techniques: Talking, How-to-Articles/Knowledge Bases, and Converged Media

Talking was raised by two of the research participants as something that the older generation addressed as crucial in technical support work. Rapport was raised by a number of the participants as an underlying theme on which communications for technical support work emanated. In this case, however, talking was referenced more in terms of a preferred method over writing.

How-to-Articles or Knowledge Bases also figured somewhat in the conversations in terms of automated or semi-automated technical support work. Five out of the six participants cited these instructional methods of communication with their end-users. The participants suggested that their end-users are still accessing them for technical support, but they're accessing them for assistance via another mode of mediated communications. The How-to-Articles would be provided manually to the end-users in response to their initial enquiry through a reply e-mail. For the Knowledge Base articles, they would be accessible via fully automated means on a shared repository against which searches could be performed for the requested information.

> *"We have a knowledge base so sometimes … ummm … if they know that the answer that they're looking for might be in this knowledge base, then they'll search it, then they don't have to … ummm … communicate with me, I mean, they're communicating through a different method, they're going through IT support, but they're going to IT support's knowledge base" (Participant Eric, 2018, 54:45.5)*

Converged media is the use of single applications offering multi-media features rather than combining single-mode media cooperatively. For example, rather than sending a document via e-mail to a colleague, waiting for them to receive it, then connecting with them over the telephone to discuss it (in this case, the single-mode media of e-mail is used to send and receive the document while using the single-mode media of telephone to discuss it,) you use a single application such as Skype to view the same document in the shared workspace while talking with them over the built-in microphone/audio capabilities.

Emergent Themes

From the 17 meaning units (see Table 901 on page 66 and Chart 902 on 66) obtained during the coding procedures identifying the detailed key issues, summation was applied to arrive at 15 modes of appearing (see Table 903 on page 68 and Chart 904 on page 68) as summative themes. Each summative theme will be introduced with a description before being demonstrated with key excerpts from the research interviews.

The 15 modes of appearing appear in descending order from greatest number of appearances to

the least number of appearances. The frequency with which they appear denotes how important the themes appear in the research participants' interview transcripts.

Predominantly, the technical support workers interviewed feel strongly about problem solving in their roles as troubleshooters. These two combined represent almost 40% of the interview discussion. From here, they recognize the import of cues and feedback as well as physical proximity and physical presence in their troubleshooting work. Each pair represents about 10% of the discussion amounting to 20% of the total. Amounting to almost 60%, these top four modes of appearing are at the forefront of what occupies the minds of technical support workers.

Table 908 (see page 77) extends Table 903 (see page 68) and Chart 909 (see page 77) extends Chart 904 (see page 68) by overlaying the summative themes of Daft and Lengel's (1986) media richness theory thus clarifying the intersections of the findings within the theoretical framework developed for this study. The six lines pertaining to media richness theory are denoted by "(MRT)" in the description as well as highlighted in light green. (The one line suffixed with "(GIC)" and highlighted in blue references Clark and Brennan's (1991) grounding in communication theory which will be explained in the Expansion of the Theoretical Framework segment under the Discussion section later in this chapter (see page 104).

Table of Modes of Appearing within MRT (green) and GIC (blue) Theoretical Frameworks

Clustered Themes	Frequency	Percentage
Problem Solvers	54	23%
Troubleshooting	36	15%
Feedback / Cues (MRT)	25	11%
Physical / Presence (MRT)	18	8%
Rapport	15	6%
Socio-Cultural	14	6%
Tacit Knowledge	14	6%
Collaboration	12	5%
Personal Focus (MRT)	11	5%
Structuration	9	4%
Natural Language (MRT)	8	3%
Negotiating Commutuality (GIC)	5	2%
Uncertainty (MRT)	5	2%
Equivocality (MRT)	4	2%
Sequela	4	2%

Table 908

Bar Graph of Modes of Appearing within MRT (green) and GIC (blue) Theoretical Frameworks

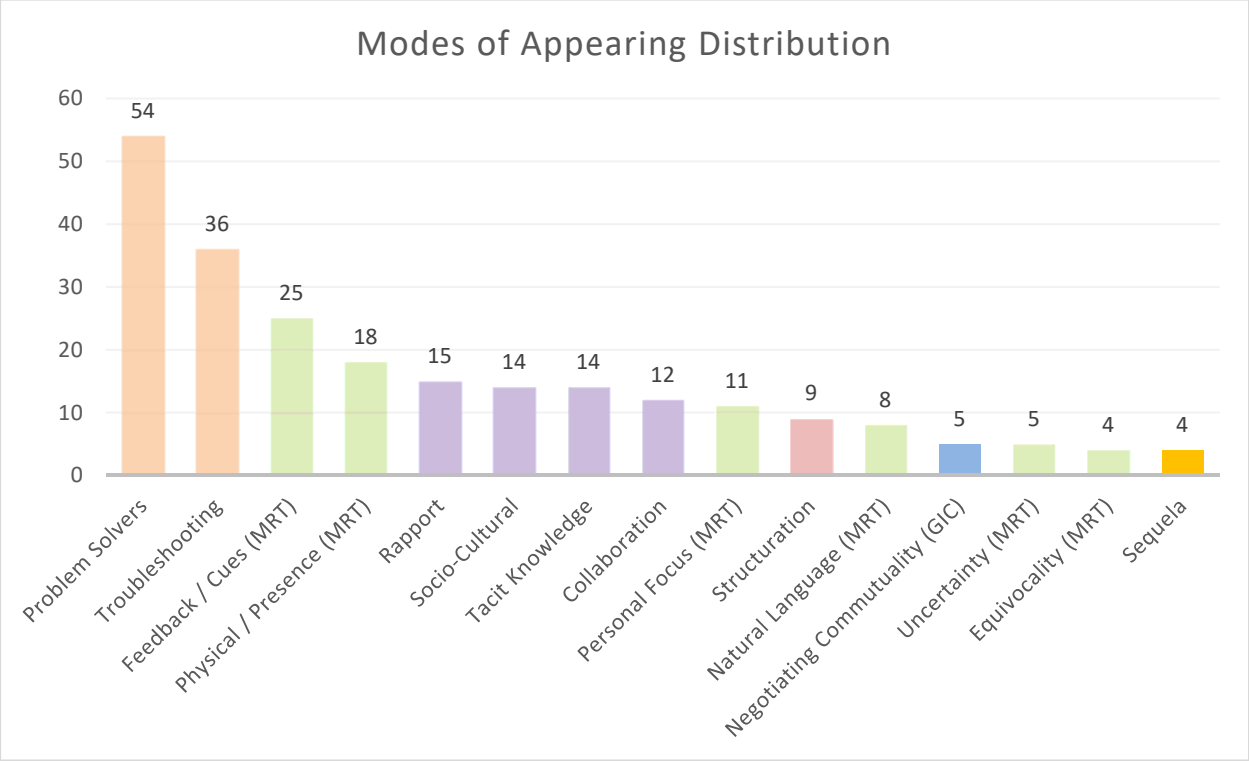

Chart 909

Problem Solvers

Technical support workers are problem solvers. This statement may appear obvious at the outset, but delving further into the meaning of what technical support means to the research participants and their natural attitudes and lifeworlds, they appear to come to problem solving instinctively. They leverage the information about them and engage user agency to activate what's necessary to solve the problem. While it is their paid job, to be sure, the technical support workers in this research study come by this inclination naturally. Phenomenologically, their natural attitudes and lifeworlds support this assertion.

Problem solving in technical support work is a process. The problem must be identified. Its various parts must be acknowledged and its behaviours recognized. This identification process is a necessary first step in the pursuit of a solution. Often times, systems behaviour is evaluated from what its expected behaviour should be to what it is actually doing. Is the technology behaving as expected? Is it performing as designed?

Problems in technical support work appear as either technical issues (i.e., faulty technology) or interpretation problems where the technology does not perform as expected (although it behaves as it was designed). In this paper, I frame the technical issues where the technology is at fault as "techo-scientific" and I consider the interpretation problems where the expectations of a technology's behaviour are not met as "socio-cultural." Here, the techno-scientific issues are more-or-less purely technical or scientific. For example, the software fails to perform as expected; the printer prints multiple copies when only one was selected; or, the fan on the

desktop computer is running high and emitting a high-pitch screech. In these cases, respectively, there could be a bug in the developed code of the software; the printer driver is interacting inappropriately with the printer hardware; or, the CPU is overheating which is causing the fan to run excessively in order to cool down the motherboard. On the other hand, socio-cultural issues are interpretation matters where constructed meanings of how technology is expected to perform are at fault. For example, an e-mail will fail to deliver because it includes an attachment which is prohibited. In this case, the attachment is prohibited because it contains an executable file which is blocked because it could contain malicious malware. Here, acknowledgement of the limitations of e-mail delivery is faulty when a user doesn't acknowledge the limitation and expects that anything can be attached to an e-mail.

Participant Clay cites an issue which represents both a techno-scientific problem as well as a socio-cultural issue. In this instance, Participant Clay was unable to gain access to a website to add a new user. On the screen that he connected to, there was no option to add a new user. Connecting to the website's help desk, he was advised over and over that the feature that he wished to access was available in the top right-hand corner of his console screen. However, what was unknown to both Participant Clay as well as the help desk, was that he had logged onto the console as a regular user rather than an administrator. Only administrators have access to the function for adding new users, regular users do not. Participant Clay was logged on as a regular user rather than an administrator. Here, the website was designed to prevent regular users with access to the add new user function from the techno-scientific perspective and the expectation that each had about what the other was seeing – Participant Clay wasn't aware that he was to have logged-in under a different user/administrator context and the help desk wasn't aware that

Participant Clay wasn't logged-in under the correct user/administrator context – is a social-construct highlighting what was expected (or not) from the website.

Troubleshooting

Troubleshooting in technical support work is the process applied to problems to elicit a resolution. Once the problem has been correctly identified, the troubleshooting can be applied to it in order to achieve the desired solution. However, troubleshooting is seldom a straight-forward prospect when the problem is neither correctly identified nor the solution applied appropriately.

Participant Dave acknowledges that no two problems are alike. Even if they're identical in every way – processes, parts, and expectations – the conditions under which they manifest can never be the same. Differences in environmental conditions (e.g., what are the complementary processes running concurrently, who else is connected to the network at the same time) plus spatial considerations of space and time (e.g., traffic congestion on the network might route your e-mail one way now, but another way later) will vary.

Participant Brad recalls a situation in which he was attempting to resolve a connectivity issue with a large customer of hundreds of conference delegates at his convention centre. The delegates expected to have network connectivity back to their home office across the continent just as if they were located at their home office themselves. The scale of the required solution, due to the hundreds of connections, demanded a more robust connection than what he would normally provide. With the large number of connections to the home office, the home office's

network considered the multiple connection attempts to be a DDoS (distributed denial-of-service) attack. To save its security perimeter, the home office's network refused automatically the connection requests. In this case, the connectivity problems were difficult to troubleshoot because of his unfamiliarity with the home office's environment, the large number of requested connections, and the environmental conditions on the Internet between his convention centre and the client's home office located across the continent.

Troubleshooting is an iterative, progressive process which draws openly from many concurrent sources in order to arrive at a solution. In recognition that each problem is unique, the appropriate solutions must be borne from individual troubleshooting efforts applied specifically to each scenario.

Structuration

Technical support workers are flexible in the tools and techniques they utilize when pursuing solutions to technical issues. Elsewhere in this paper, I suggest that technical support work spans the range from technical work (i.e., techno-scientific) to interpreting end-user expectations (i.e., socio-cultural) when viewed on a spectrum. Framing this space, technical support workers scaffold a variety of communications mediums (i.e., e-mail, telephone, online chat, and remote desktop) together with different communication styles.

Scheduling work is an oft necessary component of executing technical support work. Arranging a mutually-agreeable time with the end-user for attaining a shared understanding of the technical

issue as well as gaining access – either physically or virtually – to the faulty equipment is not always available. This coordination is sometimes merged into the initial reporting and assessment of the problem.

When servicing technical issues for users at remote locations, Participant Brad uses the telephone to arrange for access to both the equipment and the end-users. Participant Adam had a less agreeable experience where he was prevented from attending onsite to investigate a network connectivity problem. With mixed results, coordinating time to work on problematic technology and have a conversation with the affected users is an unavoidable necessity.

Cues / Feedback

A necessary part of problem identification and issue troubleshooting, cues and feedback are the clues that inform both technical support workers and end-users alike on the appropriateness of their assumptions. Offering responses on the conditions in which technical support activities are enacted, cues and feedback extend useful measures by which our actions can be evaluated and assessed. In this study, I review the effects of cues and feedback through the mediated communication channels of e-mail, telephone, online chat, and remote desktop.

Each of the six research participants state that face-to-face, in-person technical support interactions are the preferred mode of communication for technical support work because they offer the most cues and the best feedback. Next to face-to-face, in-person interactions, the next favourable method is telephone with remote desktop, then telephone, then e-mail, then online

chat. Aside from these individual technologies plus the pair of telephone together with remote desktop as a set, a number of research participants cited converged technologies which combine multiple channels into a single application.

> *"The face-to-face meeting with somebody is, for me, the most efficient way to resolve an issue because I'm there, I've got their attention, they've got my attention … you can see what they're doing, you hear what they're doing, and they explain things and it's a lot easier to for me, to work through the issue." (Participant Adam, 2018, 4:39.3)*

Here, the components of personal focus, visual cues, audible cues, presence, and synchronous communication are present. With telephone and remote desktop, Participant Adam says, "once I get onto their machine [via remote desktop] and while I've got them on the phone, my next question, my next words [to] come out of my mouth, okay, show me what's wrong. Show me what the problem is." Using these two methods together, the remote desktop offers the visual cues where the telephone extends the audible cues plus together both allow synchronous communication.

Participant Eric suggests that with telephone interactions, he'd "be able to give them [the end-users] directions maybe a bit better and they're listening and they can ask questions [plus] I can wait while they do it [perform the troubleshooting instructions,] they can give me like immediate feedback." Here, personal focus, audible cues, and synchronous communication are present. At times, Participant Eric will automatically commence a remote desktop connection to an end-user's computer while they're initiating their technical support request with him over the

telephone. He says, "so from right at the outset [of the call,] I can usually determine whether I need to get onto their computer or not … [where] they can show me right away what they're talking about … [because] it's good to hear their explanation [and] to understand either what their end goal is which … can be hard to figure out sometimes, but if they combine that with ... what they're actually showing, it makes it much better, makes it much easier."

> *"Virtual computers [remote desktop] that you are then able to connect to and take a look at … that's the closest to face-to-face you're going to be able to get at" (Participant Fred, 25:37.4)*

Participant Fred uses the visual cues available to him in remote desktop. He moves on to talk about leveraging the built-in screen-sharing feature of Skype with its video-chat capabilities "because you can see their face, you can do video-chat so you can [see] their face and you can see if they're starting to look confused or frustrated so that gives you the feedback that you need just from body language" as an alternative to combining the two individual mediums of remote desktop with telephone offering audible cues to using the dual cues of remote desktop with video-chat for both audio and dual video with one video on the remote desktop and one video on the person.

Curiously, the immediate feedback of the audio cues available over telephone channels is not favourable to Participant Adam because where the feedback is immediate, he feels ill-equipped to extend well-informed responses on the technical issues without having had time to properly assess the issue. Participant Adam says, "they're asking me questions [over the phone] and I feel

I'm unable to actually give them proper answers without seeing things." In this case, e-mail is preferred because "with e-mail I can take, you know, five, ten minutes to do some research and then give them my response whereas on the phone it's more they're kind of expecting you … I feel they're kind of expecting me to know the issue right away."

> *"Don't assume that someone knows something 'cause you don't know really, so it's easy to do though, especially when you're talking to somebody who seems like they're [someone] who does know what they're talking about." (Participant Clay, 2018, 23:53.1)*

Participant Clay recognizes a caveat with telephone or in-person where you're unable to validate the cues without another method. He acknowledges that supplementary cues and feedback are sometimes necessary to validate the appropriateness and correctness of what we're hearing.

Physical / Presence

Technology work can centre on physical equipment or virtual emulations of physical equipment. In-person attendance is necessary when the equipment requires physical manipulation. Virtual emulations of technology appear as simulations. In this case, virtual simulations of a desktop computer are represented by remote desktop (or screen-sharing,) for example. At times, however, physical manipulation of the actual technology is unavoidable and a necessity to complete the resolution of a technical issue.

Participant Brad is prevented from using remote desktop with his end-users because their

technical issues are predominantly network connectivity problems. In the convention centre where he works, his clients are conference delegates who utilize almost exclusively wireless network connections. Without a successful network connection to the end-user's device, there is no network connection available to carry the virtually emulated "remote desktop." Participant Brad says, "we have to actually go to them and actually see what's going on."

Participant Adam was tasked with resolving a problematic network connectivity issue for one of his clients. The problem stemmed from a faulty network port on a docking station which connected a docked laptop computer to its broader network. In this case, the troubleshooting efforts required that the network jack at the end of the network cable have its physical connections with the network port validated for successful connectivity. The test was performed by grasping the network jack, while inserted into the network port, and jiggling it to test for a loose or tight fit. A loose fit revealed intermittent physical contact with the wires between the network jack and its port resulting in the network connectivity problem. This issue could not had been resolved without physical touch of the equipment.

Participant Eric experienced an issue with a digital voice recorder not recharging when docked into its data/charging cradle. The lack of successful charging indicated a physical connectivity problem between the digital voice recorder with the data/charging cradle or the data/charging cradle and its power supply. Alternatively, the issue could had originated with the rechargeable battery itself when it had reached the end of its useful life and was no longer able to maintain a charge. Here, physical access to the equipment and its various components to troubleshoot the problem could not be avoided.

Participant Fred spoke to an issue with a faulty scroll wheel on a mouse. The problem appeared as jittery movements or stuttered scrolls of the screen when the scroll wheel was turned. In person, the problem could be replicated without issue. However, viewed remotely over a remote desktop connection, the physical mouse could not be tested because what the technical support worker saw on his screen were screen movements enabled by his own mouse rather than the mouse on the client's computer. In this case, virtual emulations are neither a true nor accurate representation of the actual issue.

Participant Clay encountered an issue with faulty network connectivity in a data centre environment. The problem in this case was a cable fault where two cables were interconnected using a network coupler to join them. One of the cables had been physically pulled with sufficient force to extricate one network jack from the network coupler effectively dislodging it from its connection. The detached connection was further hidden from ready view as these cables and its coupler were centred in the middle of a cable bundle of a dozen or so other cables.

The physical aspect of technical support work can manifest in further forms other than physical touch. Physical presence, alternatively, attends to the connotations which result from being physically present rather physical actions which can be enabled when present in-person. That is, physical presence influences how we interact with the environment about us where physical touch enables us to act upon items within that environment.

According to Participant Dave, physical presence is used to facilitate his reading of a situation by the feedback he reads in the faces of his end-users. He says, "from the facial expression, you can

easily tell that the person is happy with you or not ... it's harder for them to hide their emotion that way."

Participant Brad concurs when reading the facial expressions of his users:

> *"If you go see them, right? And, they kind of see you; they feel kind of happy – 'Okay, my problem's going to get solved!" (Participant Brad, 2018, 33:37.9)*

Personal Focus

Focused attention towards resolving a technical issue can be challenging when communicated through mediated channels. Limitations of cues in media influence the personal focus both end-users and technical support workers maintain in technical support interactions.

Participant Dave acknowledges that telephone communications are frequently affected by distracted attention. He says, "over the phone, the person can be very distract[ed] … they can be in the middle of doing something when they're on the phone with you." Recollecting further, he offers steps to resolve the person's technical problem for which he receives the response that they'll be attempted at a later time. In-person, however, he suggests that the person would feel a sense of obligation to attempt the recommended troubleshooting steps at that very moment.

Participant Eric will change from e-mail to telephone to direct focused attention on the technical issue. He says, "with e-mail, that can become difficult to get to where you want to go … get on

the phone and talk to someone, you have their attention." He clarifies further, "their attention over the phone is, you can be much [more direct,] everything can be resolved much quicker sometimes."

Participant Adam admits to multi-tasking over work while on the phone with an end-user. Here, his attention is divided between both the client at the other end of the phone as well as his other work.

Natural Language

The use of natural language in technical support communications utilizes plain, understandable language which is readily accessible. Its place in a field which is commonly filled with jargon, indecipherable acronyms, and incomprehensible terminology is useful when communicating with end-users unfamiliar with its idiosyncrasies.

According to Participant Dave, the use of plain language using plain English allows the person with whom you're conversing to not feel that they don't know anything or that you're looking down on them. Participant Brad works in an environment where conference delegates from around the world, who speak many different foreign languages, may access the technical support service for his network. Here, where use of languages other than English present obstacles, he must cater to his clients' needs using plain language free of non-essential vocabulary, terms, or complex statements.

Participant Adam supported a client in an industrial setting where he supported the technology on a shop floor where complex, heavy machinery was in use by workmen and tradesmen. In this setting, Participant Adam recognized that his manner and speech became very direct. He deliberately avoided the use of overly courteous, exceedingly polite language in favour of forthright exclamations such as "this is broken" or "this is what needs to be fixed" and direct statements like "don't do that or it will break." Participant Adam cites a "platinum rule" which guides him to "treat people how they want to be treated." He said "this [referring to this direct style] is how it needs to be done and they responded to that."

> *"You go to a construction site [where] these guys are always yelling and swearing at each other, right? You go in there and be very polite, they're going to walk all over you so you start cursing and swearing with them, you fit in. Then they respect [you] … they get your respect and [then] whatever happen[s,] you can actually work with them … it's changing how [you] interact with people." (Participant Adam, 2018, 36:24.8)*

Participant Carl recollects an incident over the phone where he was supporting remotely a healthcare worker in the Northwest Territories whose native language was Inuit, not English. He was called upon, more than once, to guide someone in their use of a computer where literally they had never used one before.

Uncertainty

In technical support work, uncertainty is the property of the unknown which surrounds technical

issues. It is the starting point from which end-users and technical support workers move away from in favour of what we can and do know. In order to troubleshoot the problem, the problem's parameters, such as its parts and its (mis)behaviour, must be recognized. If the problem is not correctly identified, then the appropriate solution can neither be identified nor applied to the respective problem. Uncertainty applies to comprehension, actions, or identification. With comprehension, an understanding of the issue or the problem and, in fact, the solution might be faulty. With actions, the incorrect steps might be taken or completed out of order or missed altogether. With identification, parts or procedures might not be named correctly resulting in a different part being acted upon or an altogether different procedure performed.

Participant Eric describes a recurring incident in which correcting instructions extended to an end-user did not yield the intended results. He says, "you give someone instructions and they tell you that they've tried it and it's still not working and there's … times where you know that these are the [correct] steps fixing this, that will work."

For technical support workers, uncertainty appears sometimes as unknowns to themselves about the situations they encounter. For them, they are reluctant to provide responses out of concern that their understanding of the problem is incorrect and they don't wish to provide an incorrect answer. In approaching some situations, Participant Eric admits "I don't quite understand and I don't want to answer them and give them the wrong answer." Participant Adam concurs, "they're asking me questions and I feel I'm unable to actually give them proper answers without seeing things." In this case, Participant Adam is unsure of the descriptions offered by the end-users where he's reluctant to extend an answer to their questions as they asked them without

checking for himself by looking at the issue.

Equivocality

A variety of multiple, equally correct solutions is the premise of equivocality. In technical support work, equivocality appears as a variety of technical solutions where one resolution is not necessarily any better than the other. It's just different.

Speaking to the same situation described earlier (in Physical / Presence) with Participant Eric and the digital voice recorder not charging, the solutions available and troubleshooting efforts represent an equivocal response. The problem could had been any of the rechargeable battery was faulty or it wasn't receiving a charge from a faulty charging cradle or the connection between the battery and the digital voice recorder was problematic or the power cable on the charging cradle plus many more. Similarly, the troubleshooting efforts and their respective solutions, could had been to repair faulty connections or replace failed parts.

Participant Fred spoke to an issue which he frequently works on: Resolving video problems with dual-monitor displays connected to a laptop through a docking station. He says, it's "a problem where it has more than one cause and more than one solution." Similar to the Participant Eric's experience above, Participant Fred's variety of components – the monitors, the docking station, the laptop, plus the video connections between the monitors and the docking station – could each be the cause of the problem. Plus, in this case, Participant Fred reveals that they use two different types of monitors, three different versions of the docking station, and four different editions of

the laptop. Moreover, the display driver settings on the laptop which support the use of dual-display monitors and how it recognizes the video card could be problematic. Here, the potential causes of the problem and their respective troubleshooting efforts and correcting resolutions are exponential in number.

Socio-Cultural

All research participants are in agreement of the mix between purely technical issues (i.e., technology failures) and end-user issues where there's a misunderstanding of a technology's capabilities. In this paper, I consider the misunderstanding of a technology's capabilities to be a social-construct under which we construct our own interpretations, assumptions, or expectations of how a technology should perform. I name this notion "socio-cultural" as it represents the constructs created through a socio-cultural perspective of technology rather than an empirical view of technology through a "techno-scientific" lens.

Participant Adam differentiates between "techno-scientific" issues of a purely technical matter as "legitimate problems" where conversely he illustrates "socio-cultural" issues as a misunderstanding of how something works where the end-users may "just [have] issues with the way they're doing things." He goes on to say that "they may not know what the problem is or may not even know how to tell you what the problem is or explain what's happening." Furthermore, he purports that "they may say something, but they're doing something as well and that what they're doing is what the problem is as opposed to what they're saying."

Participant Carl concurs on the differentiation between technical and socio-cultural issues. He says "the issue may not be technical at all, it may be a user challenge." However, Participant Carl is quick to not cast judgment. He says "you [] deal with a lot of people with different technical background[s,] with different personalit[ies] … first of all not judging them … try to be level with them, try to find a common medium to communicate and … explain [to] them, explain technical term[s] in plain language and plain English … so the person that you're talking to doesn't feel that you're looking down on them … doesn't feel like they don't know anything."

Participant Eric understands this challenge of misunderstanding technology's capabilities on behalf of his end-users.

> *"There's times [sic] where they're not clear about this [confusion] so sometimes you have to ensure … what they're really asking for 'cause they could be … literally asking for something where … they're asking for something else … or they're not sure what they need … they're not sure exactly what they need themselves so they're, they're kind of depending on you to, to figure out what they need and to actually give it to them."*
> *(Participant Eric, 2018, 7:22.1)*

Participant Fred echoes the sentiments of the other research participants in his statement "there are plenty of times where … I have to explain to people that something doesn't work the way they thought it did."

Note: During the fourth research interview, I contemplated asking the participants for their

perspective on the percentage split between how frequently they respond to technical questions and how frequently they respond to socio-technical questions. I neglected to ask this question during the fifth research interview, but remembered during the sixth. The question was not asked during the first three interviews. While asking only two out of the six is not fully representative of the interviewed population, the two responses are interesting regardless. Participant Dave responded that 60% to 70% of his work stems from socio-cultural responses and the remainder of 30% to 40% centres around technical responses. Conversely, Participant Eric stated that about 75% of his responses are based on technical responses and 25% stem from socio-cultural work.

Rapport

Rapport appears as an intangible, yet not negligible, element which supports the quality of the communication between the technical support workers and the end-users they support. It represents a nuanced quality of the relationship which affects the interaction and the communication which flows from and around it. Although it was only mentioned in two out of the six interviews, its presence (and absence) permeated the other four interviews in aspects of its effect on the flow (or lack thereof) of contextual information from the end-users deepening and broadening the context around which the technical support workers could frame their troubleshooting efforts.

Participant Adam utilizes his age as an older technician who leverages “generational” rapport with his like-aged clients. He empathizes with his older-generation, end-users’ challenges with difficulties in understanding technology where he tells them “Well, yeah, I’m in the same boat as

you. Let's figure it out together" thereby establishing rapport which connotes a non-judgmental, empathetic perspective which makes the end-users less uncomfortable with learning a challenging technology. Participant Adam also adopts the use of humour in his interactions. "I'll try to crack a joke," he says "to see where they're at. If they laugh at my joke, they might [respond] a little more different[ly,] they're a bit more at ease." He goes on, "with appropriately established rapport, they respect you and they get your respect so that whatever happens, you can actually work with them … [rapport] helps change how to interact with people." Also, with rapport, the person answering your questions "will throw in a little bit more [context]" rather than someone with whom there is no established rapport who will answer with a simple "yes" or "no."

According to Participant Eric, rapport is used in his workplace to frame his responses more appropriately to the end-user. When delivering unfavourable responses (i.e., unable to provide the end-user with the answer they'd hoped for,) Participant Eric will sit in-person with them in their own office (rather than his) where they'd be most comfortable when receiving the news explaining why they can't use the technology as they expected due, for example, to restrictions in the software and hardware limitations. Using established rapport, Participant Eric will assess tacitly the rapport he shares with an end-user to gauge their familiarity with the technology at hand when framing his responses. He cites past experience "where these decisions on how to couch your answer are made in your head without thinking about it." Here, he knows "in his head" the depth and breadth of rapport between the end-user in question and himself using it as a basis by which to measure his response.

Tacit Knowledge

Useful knowledge which is hidden from view in technical support interactions where it could constructively assist the development of a resolution is an area of concern for the research participants in this study. In technical support work, all information relevant to the technical issue at hand is useful. When access to it is obstructed, its usefulness to influence decision-making is hampered. For technical support workers, this hidden information is tacit knowledge which can be both hidden by ourselves to ourselves as well as from others to us.

Participant Adam admits to accessing tacit knowledge as procedural checklists for troubleshooting in his head when resolving issues onsite. Here, this information is hidden from himself to himself because it is neither something which is explicitly articulated to himself or others nor is it addressed or accessed in any external form. Participant Adam calls this process "walking his brain."

Participant Brad says that "if you've been in this business long enough, you kind of pick up on things" implying an accumulation of incidents and experiences which accrue as tacit knowledge. In this case, Participant Brad is speaking specifically to anticipating what can go wrong from previous experiences.

Participant Clay cited an instance of collaborative troubleshooting where the tacit knowledge of a third-party vendor (in this case, a data centre) regarding the usage of an uncommon, unexpected piece of equipment caused a crucial network connection spanning the continent to

fail. The part in question was a consumer-grade interconnecting device used to connect two network cables in a home-networking environment rather than a commercial-grade, corporate networking environment for enterprises. Because it was unexpected, no one anticipated its use.

> *"I need the expertise of the person there [at the data centre] to go there [into the server room] and, you know, so I don't know how things are laid out at all so me looking at a whole bunch of wires isn't going to mean anything." (Participant Clay, 2018, 19:47.1)*

Here, Participant Clay suggests that the expertise of the local person at the remote location of the data centre needs to explicate their tacit knowledge on the usage of the consumer-grade interconnecting device. This tacit knowledge, had it been made known, would had aided and shortened the collaborative troubleshooting efforts.

Participant Dave reported an incident with a third-party vendor – a website hosting company – who made an unauthorized setting change on a website's configuration during an upgrade project without informing anybody which resulted in the turn-key website becoming inaccessible. Without any prior knowledge of what had happened with the third-party vendor, Participant Dave was required to commence his troubleshooting efforts without any clear idea or direction of what could had happened. Starting from the basics, Participant Dave was able to determine that the cause of the problem was an unexpected change to the firewall rules for the website which effectively blocked all access to the website. After auditing the activity logs on the configuration file for the website, Participant Dave was able to trace these changes back to the third-party vendor. The changes made by this third-party vendor was tacit knowledge which they held, but

not shared with Participant Dave, that was the cause of the inaccessible website.

Collaboration

Technical support workers work in conjunction with other resources in performing their technical support work. From inheriting technical problems from lower tiers to working cooperatively with other technical support workers at third-party vendors or partners, collaboration is a necessary component of technical support work. The transfer of information and knowledge in and amongst different team members in other support tiers plus relaying troubleshooting steps to contemporaries at different organizations demands collaboration.

Both Participant Clay and Participant Dave suggest in their interviews that effective communication amongst teams – whether on the same team or counterparts from other teams on the same project – is best achieved when "in the same room." Connecting face-to-face in the same room offers the myriad of cues, presence, asynchronous connections, and the use of natural language as crucial components for effective communication. Participant Dave says that a lot of people that he talks to say that they still prefer in-person communication where they can talk to someone in-house or at least sufficiently close-by stating that the "human touch" is otherwise lost.

Checklists are a collaboration tool which help to keep all team members equally informed at the same time. Participant Clay suggests that they keep "everyone on the same page," maintains an active record, allows for sequencing listing the ordering and prioritization of work, plus saving

on repeated or duplicated work because everyone can see what has been done. Participant Dave concurs that collaboration tools, such as checklists, help to keep everyone informed.

Negotiating Commutuality

Shared understanding of a technical problem is a necessary prerequisite for a technical support worker to appropriately resolve an end-user's technical issue. Where the technical support worker is unable to correctly identify the end-user's problem, the application of a devised resolution might not be appropriate to the problem at hand. In this paper, I assign the name of "negotiating commutuality" to the concept of "shared understanding" because it denotes action through "negotiation" on behalf of both parties – the technical support worker and the end-user – in reaching consensus on the technical issue being investigated plus denotes "common ground" in "commutuality" for mutual understanding resulting in shared perspectives where each party sees what the other sees. Clark and Brennan (1991) call this process "grounding in communication" where the "grounding criterion" are the properties which facilitate the reaching of consensus or shared understanding in conversation. In this next section, Discussion, I discuss Clark and Brennan's "grounding in communication" theory at length.

Participant Eric named instances where dialogues of successive, iterative questions were necessary to reveal the parameters surrounding technical issues reported by his users.

> *"I might need to ask a couple of other questions before I get to my main question … there's times where you're asking for something or you're trying to gather more*

information and … you don't know exactly what you're asking for" (Participant Eric, 2018, 43:09.9)

Here, Participant Eric uses successive, iterative questions in negotiating commutuality to arrive at shared understanding in his troubleshooting work.

Participant Adam suggests that trust is an important component in the process of negotiating commutuality where both parties respect the process to give rise to the shared understanding necessary in identifying the parameters and properties of the technical issue. He says "talking [through the issue] is fine when people are trusting the back and forth" echoing confidence in the interaction to reveal what is required in progressing forwards towards resolution.

Sequela

Adapted from pathology in medicine, the term "sequela" is borrowed in its Latin form which Dictionary.com (https://www.dictionary.com/browse/sequelae) defines as "that which follows, consequence." In this research paper, "sequela" refers to technical consequences which arise from a root problem. Here, root problems are the primary causes which result in secondary issues. Technical support workers in my study report instances of "sequela" where end-users report technical problems which are, in fact, secondary consequences of primary issues.

Participant Adam responded to an end-user problem reporting slow, sluggish performance of a client's laptop when starting up in the morning at her office. Furthermore, this problem arose

intermittently occurring only upon occasion. Troubleshooting efforts revealed that the sluggish performance resulted from the downloading and installation of outstanding Windows Updates which commenced when the laptop was connected to the network through its docking station. Further examination revealed a faulty network port on the docking station itself resulting in fitful connections to the network as evidenced by intermittent instances of the problem. Removing the docking station from the equation and plugging the network cable directly into the laptop itself, the sporadic network connection problem disappeared. Here, the faulty network port on the docking station was the root cause of the secondary problem of latent application of outstanding Windows Updates manifesting as sluggish performance.

Participant Brad routinely helps his end-users connect their mobile devices to his wireless network. Problems not infrequently arise for his end-users because the wireless connections they attempt to use are not correctly provisioned for their use. At the convention centre where Participant Brad works, either SSID Wi-Fi or Captive Portal Wi-Fi are offered. SSID Wi-Fi is the customized plan where a wireless network is identified by a unique SSID (service set identifier) with a readily identifiable name. SSID Wi-Fis are purchased in advance by a convention delegate's conference organizers. An organizer for the fictitious Technical Support Workers' Conference, for instance, might arrange for a SSID of "TSWConference." In this case, delegates of the Technical Support Workers' Conference, would simply connect to the Wi-Fi network named "TSWConference," enter the appropriate password, and gain Internet access. Captive Portal Wi-Fi, on the other hand, requires a secondary sign-on following the initial connection to a generic guest Wi-Fi network where they sign-up and pay for metred usage using a credit card. Captive Portal is the term used for the "portal" or "gateway" through which

subscribers must first pass in order to pay for the service. Users are captive in the portal, unable to gain Internet access, until the service is purchased. Problems arise for Participant Brad's users when their mobile devices, such as point-of-sale terminals, do not possess Internet browsers to connect to the Captive Portal through which they can sign-up and pay for their Internet access. Participant Brad states that the convention centre provides the wireless network connection, but it's up to the end-users to configure their own access onto the Wi-Fi network. Here, the problem of not being able to sign-up and pay for access onto a Captive Portal Wi-Fi network without a built-in Internet browser on a point-of-sale terminal is a secondary consequence of not subscribing to the correct plan as a root cause.

Participant Eric describes such scenarios in his interview with this excerpt:

> *'Cause they say, this isn't working, well, actually that part is another aspect of it or something that relies on another process that's not working" (Participant Eric, 2018, 8:17.7)*

where he illustrates being called-upon from an end-user to resolve a technical issue which is actually a subsequent result arising from a different, although related, problem.

Discussion

During the preliminary analysis phase of overlaying Daft and Lengel's (1986) media richness theory (MRT) atop the 15 modes of appearing (Bevan, 2014,) it surfaced that shared understanding of the technical issue between the technical support worker and the supported end-user is a main driver in technical support interactions. As demonstrated in the Emergent Themes section, the attainment of shared understanding is an objective reached through each of the 15 themes presented. Extending this realization further, I felt it necessary to expand upon how shared understanding in technical support interactions is reached. Dialogue is the common activity which exchanges the information necessary to arrive at the requisite shared understanding. To delve further into dialogue, I returned to the literature (Dennis and Kinney, 1998) to expand the theoretical framework initially established by media richness theory with grounding in communication theory (Clark and Brennan, 1991) which seeks to establish common ground in conversations that result in shared understanding.

Expansion of Theoretical Framework

This section reviews the theoretical framework of Daft and Lengel's (1986) media richness theory selected originally for this study and introduces a supplementary theory – Clark and Brennan's (1991) grounding in communication theory – as a complementary framework to extend this paper's findings.

Media Richness Theory

Daft and Lengel (1986) developed their media richness theory (MRT) as a means to explain the effect on communications as it passed through mediated channels of communication in its many forms. Spanning the spectrum from lean- to rich-media, MRT purports that different media have different capacities to transfer varying amounts of information differentiating the resulting effects of the transmitted information.

Identifiable Properties in Daft and Lengel's Media Richness Theory (MRT)

Daft and Lengel (1986) Media Richness Theory (MRT)	
Property	**Description**
Multiple Cues	Use of multiple cues (voice, sight, non-verbal, touch)
Feedback	Immediacy of feedback, synchronous communications
Language Variety	Catering language to situation
Personal Focus	Attention
Presence	Absent or present
Change Opinion	Change understanding within time interval
Uncertainty	Reduce uncertainty, lacks sufficient information
Equivocality	Resolve equivocality, multiple and conflicting interpretations

Table 910
Daft and Lengel, 1986; Rice, 1992; Dennis and Kinney, 1998

This theory alone formed the original basis for this research study's theoretical foundation through which the experiences of technical support workers would be investigated. During the investigation process of learning of their experiences in an iterative manner, it become known that the oft referenced interrogative dialogue of the e-mail and telephone communications warranted its own analysis. Returning to the literature seeking reference to these interactive conversations, I returned to the literature (Dennis and Kinney, 1998) to learn more about Clark

and Brennan's (1991) work on grounding in communication.

Grounding in Communication

Clark and Brennan (1991) address a number of the properties of media richness theory from Daft and Lengel (1986) (see Table 910 on page 105,) but extend them further. Table 911 (see page 106) illustrates the tenets of the grounding in communication theory of Clark and Brennan (1991).

Identifiable Properties in Clark and Brennan's Grounding in Communication Theory (GIC)

Clark and Brennan (1991) Grounding in Communication (GIC)	
Dimension	**Constraint**
Copresence	A and B share the same environment
Visibility	A and B are visible to each other
Audibility	A and B communicate by speaking
Cotemporality	B receives at roughly the same time as A produces
Simultaneity	A and B can send and receive at once and simultaneously
Sequentiality	A's and B's turns cannot get out of sequence
Reviewability	B can review A's messages
Revisibility	A can revise messages for B

Table 911
Clark and Brennan, 1991, p. 229

The tenets of the two theories of Daft and Lengel with Clark and Brennan are aligned visually in Table 912 on page 107. Here, we see that Clark and Brennan's two properties of visibility and audibility correspond to Daft and Lengel's multiple cues. However, they refine feedback as defined by Daft and Lengel with their clarified immediacy and synchronous communications by extending them further as a component of time by introducing the three distinct properties of

cotemporality, simultaneity, and sequentiality. Here, they extend the notion of the timing of feedback as a one-way communication with cooperative dialogue addressing the timing of a two-way communication. Reviewability could be related to delayed feedback with asynchronous communications and revisibility could be related to edited feedback and change of opinion where understanding can change within a time interval.

Alignment of Properties from Media Richness Theory (MRT) to Grounding in Communication Theory (GIC)

Daft and Lengel (1986) Media Richness Theory (MRT)		Clark and Brennan (1991) Grounding in Communication (GIC)	
Dimension	**Constraint**	**Dimension**	**Constraint**
Presence	Absent or present	Copresence	A and B share the same environment
Multiple Cues	Use of multiple cues (voice, sight, non-verbal, touch)	Visibility	A and B are visible to each other
		Audibility	A and B communicate by speaking
Feedback	Immediacy of feedback, synchronous communications	Cotemporality	B receives at roughly the same time as A produces
		Simultaneity	A and B can send and receive at once and simultaneously
		Sequentiality	A's and B's turns cannot get out of sequence
Delayed Feedback	Delayed feedback, asynchronous communications	Reviewability	B can review A's messages
Edited Feedback	Change opinion/understanding within time interval	Revisibility	A can revise messages for B

Table 912

This composite understanding of the application of these two theories suggests that further study of cues and feedback in the interrogative dialogue between the technical support worker and the end-user will improve an understanding of the use of mediated communications in technical

support work.

Development of Key Findings

Three findings which arose from the 15 emergent themes present themselves as key findings in this research study. Subtle, yet not insignificant, distinctions appear in how cues and feedback inform technical support investigations. The use of proxies at local sites enact surrogated troubleshooting by remote technical support workers situated elsewhere. And, structuration is the means of scaffolding the tools and techniques necessary in the delivery of technical support through mediated communications.

Cues and Feedback

Although used interchangeably by the research participants in this study, closer inspection of the nuances contained within the interview transcripts revealed a crucial distinction between cues and feedback. Cues are the signal that further attention or investigation is warranted. Feedback is the message which the cue draws attention to. Cues draw our attention to a condition or a situation where something is not behaving as it might. However, cues are not ubiquitous. They rely upon the context in which they appear to give them meaning. A cue in one context may present a fault which requires repair; the same cue in another context may signal a confirmation that all is well and that the status quo is maintained. The placement of cues in context ascribe them their meaning. Unfolding the environment in which the cue appears is a necessary activity in technical support work to determine its message and the meaning contained therein.

Enveloped within social constructions of interpretation, cues which draw the attention of one may not draw the attention of another. Attention is warranted by significance of the cue to its viewer. In technical support work, the significance of the cue and the interpretation of its meaning through its feedback is unfolded through dialogue between the technical support worker and the end-user supported.

Surrogated Troubleshooting by Proxy

In remote support work where the technical support worker is situated apart from the end user experiencing the technical issue, the technical support work relies upon the end user local to the issue to act as his/her proxy. As his/her proxy, the remote technical support worker enacts what I term "surrogated troubleshooting" where the troubleshooting activities of the technical support worker are facilitated by the end user local to the issue as his/her surrogate or proxy. In effect, the end user is acting as the technical support worker's "eyes, hands, and ears" where he/she looks at the technical equipment, manipulates it manually with their hands (i.e., keystrokes, mouse clicks, powering on/off,) and listens for changes.

Mediated communications are often used in place of in-person, face-to-face communications because remote locations are not local to one of either the end-user or the technical support worker. In such situations, troubleshooting efforts are hindered by the absence of physical proximity which would otherwise afford the technical support worker the opportunity to see, hear, and touch directly the environment in which the technical issue being experienced at hand is situated.

Structuration

Structuration is the engagement of user agency on behalf of the technical support workers to use the tools and techniques available to them in the delivery of technical support. The tools available to them in this study refers to the five modes of communication: Face-to-face, e-mail, online chat, telephone, and remote desktop. Face-to-face is the favoured approach endorsed by all six participants. Unexpectedly, rather than using one *or* the other, a number of participants adopted a blend of one *with* another. In a number of instances articulated by the research paricipants, the cooperative use of telephone in conjunction with remote desktop was used. Asked if the combination of telephone with remote desktop could serve as a suitable replacement for face-to-face, the responses were mixed were a few stated that it could, but one refuted that it could not. The techniques embraced were the changing use of a selected tool and variations on the use of language. Where one chosen tool was ineffective in providing the information ncessary, then another was selected. Here, this elective use of change reflects the tenet of media richness theory which suggests that a chosen medium's capabilities to convey information should match its abilities. For a number of participants, where the chosen medium proved too challenging to gain the information necessary to resolve the technical issue at hand, then an alternative medium was selected. As an example, where the interrogative dialogue via e-mail became too unwieldly, then the medium was changed from e-mail to telephone which allowed greater agility through quicker interaction. Variations on the use of language were cited by only two participants. In their cases, language was catered to the end-user where its context was more appropriate. For example, casual language was used for shop-floor labourers and more formal language was used for executives.

Development of Secondary Findings

The next five segments detail the notions which stand out as supplementary to me as I developed this research study. Unattainable certainty suggests that uncertainty can never be avoided, but the confusion associated with its presence can be mitigated as best possible. Multiple viewpoints on the same perspective, which appears as a paradox, hints that looking at the same thing from varying prospects helps to attain the shared understanding between technical support workers and their end-users necessary to reach resolutions of technical issues. Limitations of virtualized troubleshooting reveals that an in-person, face-to-face presence can never be fully virtualized by virtue of its physical limitations. Synchronous communications are not always preferable because they invite undue pressure into the technical support interaction where the technical support worker is pressed to provide solutions where insufficient or inadequate information is not yet available to render a valid assessment. And, converged media affords combined media channels in a single application or tool facilitating ease of use.

Certainty is Unattainable

The reduction of uncertainty is a central tenet of media richness theory where media are chosen for their ability to convey the information necessary to reduce uncertainty. While this notion is supported in this study, the problems surfaced by tacit knowledge which remains hidden from view from technical support workers suggests that uncertainty can rarely be reduced to a level which is acceptable. Examples offered by the research particpants in this study purport that certainty must be evaluated continuously. To be sure, in troubleshooting efforts where causes

and effects are in constant flux, certainty in one scenario might not be realized in another. For this reason, certainty is an unattainable state which demands ongoing consideration.

Multiple Views of Same Perspective

Pentland (1995) suggests a reciprocity of perspectives where alternative views should reveal the same prospect. In this study, this practice is affirmed by the research participants in their performance of technical support work and extended further in collaborative work. In two instances cited, collaborative efforts by external technical teams were hindered by crucial tacit knowledge which, had it been externalized and shared, would had saved some problematic troubleshooting efforts. The question of both the appropriateness and the completeness of available information comes into play. Is the information that has been extended appropriate to the situation at hand? Does the information it conveys influence the troubleshooting efforts? What is the degree of completeness of the information offered? Does it paint a full or partial picture? For this paper, multiple views of the same perspective is an important notion which allows space for processes to surface reciprocal views leading to shared understanding.

Limitations of Virtualized Troubleshooting

Physical limitations will always present themselves as a barrier to effective troubleshooting in virtualized environments. Complete assurances can never be guaranteed that what is emulated in a virtualized view represents a full picture of what it purports to represent. Remote desktop can't quite fully present a full and accurate picture of what an end-user experiences. A tenuous network connection or a broken scroll-wheel on a mouse or split liquid on a keyboard cannot be

fully experienced unless affirmed in-person.

Synchronous Communication is Not Always Ideal

Two research participants mentioned that when communications are synchronous, they experience undue pressure to provide solutions without having had sufficient time to investigate the problem. It was further suggested that in these instances, they prefer the slower, more asynchronous channels of communication such as e-mail, for example, because it affords more opportunity to investigate the issue and perform some preliminary analysis before answering the client. Here, this finding was surprising because this researcher presumed that faster, synchronous communications would always be ideal for it would afford a more engaged dialogue with the end-user. In this case, delayed dialogue is preferable over an engaged dialogue.

Converged Media

The use of converged media – single application tools encompassing multi-variant media – was an unexpected finding. Where this researcher anticipated a finding where one media was used in conjunction with another media (i.e., remote desktop used in conjunction with telephone,) it was surprising to learn that converged media applications were readily in use. One research participant had been using a new-to-market application – Microsoft Teams – in practice which allowed for the sharing of documentation and images while allowing online chat or voice-mails within the same interface.

Summary

This research study explored how technical support workers approach, connect, and engage mediated communication in their work of delivering technical support. In the 15 identified themes, this study revealed that technical support workers are natural troubleshooters who solve technical problems instinctively. Using structuration to scaffold about them the tools and techniques required in their work, technical support workers evaluate the cues they encounter for the feedback they surface in identifying technical problems and their respective solutions. They embrace natural language to develop rapport when unravelling the socio-cultural constructs which conceal tacit knowledge useful to developing technical solutions. Whenever and wherever possible, physical presence facilitates technical issue resolution reducing the appearance of sequela. Through personal focus, uncertainty and equivocality are reduced and resolved about technical problems, respectively, as a means by which commutuality is negotiated collaboratively.

This study affirms the validity of media richness theory (MRT) to support mediated communications in technical support work, but reveals that MRT does not go far enough. Elaboration on the role which dialogue plays as it traverses mediated communication suggests user agency and the need for structuration on the part of the technical support worker. Helping to expand user agency, grounding in communication (GIC) theory can extend the theoretical framework around which technical support communications can improve through interactive dialogue while structuration provides flexibility in the tools and techniques most appropriate to the situation at hand.

Conclusion

Technical support interactions are influenced by the mediated modes of communication through which they are facilitated. To understand these influences, this study undertook research to explore how technical support workers use mediated communications in their work of delivering technical support.

This conclusion summarizes this research paper's findings, looks at their placement within the broader field of communications, and suggests areas of future study to further scholarship in the field of communications and technology.

Summarize Findings

This paper embarked upon an exploration of the use of mediated channels of communications in technical support work. The use of cues and feedback are crucial in the attainment of shared understanding necessary in technical support work. However, the availability of cues and feedback when facilitated through mediated modes of communication must be extrapolated through the use of purposeful dialogue. In-person, face-to-face support interactions present cues directly to the technician where, conversely, they must be extracted across mediated communications. Dialogue plays a crucial role here, too, when used to facilitate remote troubleshooting activities by proxy when enacted by surrogates. Local users are engaged as onsite proxies of the remote technical support worker serving as local eyes, hands, and ears. Purposeful dialogue is necessary to locate the appearance of cues in the determination of their

feedback and their meaning in context. Structuration extends the opportunities necessary to surface the appropriate cues and unfold the contexts in which their meaning manifests for troubleshooting of technical issues.

Technical support work applies fixes to problems. Where the problem is not correctly identified, an inappropriate fix might apply the wrong solution to the wrong problem. Of crucial import in this paper is the attainment of shared understanding about the problem between the end user and the technical support worker which is negotiated through dialogue where cues signal relevant feedback.

In their work of delivering technical support, technical support workers approach mediated communications strategically using the appropriate mediums which offer the necessary cues that provide the required feedback about the issue at hand. This study revealed predominantly a mixed use of individual mediums, most notably telephone with remote desktop, for verbal dialogue with visual and tactile cues, to identify, troubleshoot, and resolve technical problems. Technical support workers connect using a blend of mediums which provide cooperatively the most efficient and effective means of communication about the problem and delivery of the relevant solution. Recognizing the challenges present in their use of mediated communications, technical support workers often prefer in-person, face-to-face interactions whenever and wherever possible. Where not feasible, they persist and persevere using the connections available to them accepting the limitations imposed by a reduction in cues. They engage the end users they support through interactive dialogues where they evaluate, troubleshoot, and resolve technical problems. Comprehension, expectations, and capability are barriers to engagement when

facilitated through mediated communication which influence the effectiveness and efficiency of delivering technical support solutions.

Place Findings in Context

Existing research on the use of mediated communications in technical support work excluded the use of remote deskop in the current literature. Current scholarship presents findings on the limitations imposed by various mediated modes of communication, but bypasses ways in which these challenges can be overcome. My study introduces research on the use of remote desktop in the work of delivering technical support solutions. Its use as a provider and consumer of visual cues and feedback is used in tandem with audio cues and feedback extended by the telephone. Together, these two mediums, when used cooperatively, enhance the verbal dialogues between the end user and the technical support worker with visual and tactile cues which, to varying degrees, are a reasonable facsimile of in-person, face-to-face technical support interactions.

Further, the findings in this paper suggest that technical support work using current technology to facilitate its communications should look at the processes around which the communications are extended through the various mediums. The information does not move without user intervention and, in this case, the user intervention could be more purposeful in both consuming and providing shared understanding. Introducing Clark and Brennan's (1991) grounding in communication theory for its use of dialogue to work in concert with Daft and Lengel's (1986) media richness theory for its articulation of the ways in which mediated communications transmit information as well as applying Orlikowski's (2008) structuration theory where

technologies are adapted for use as the situation demands them, a more robust theoretical framework is constructed through which technical support communications can leverage both technical capabilities and user agency.

Adapting current practices in the field for interactive dialogue which is structured purposefully about achieving shared understanding signalled by cues and transmitted by feedback through mediated channels appropriate to the situation at hand can improve the use of technical support. Use of technical support will extend a more promising prospect when both end-users accessing it and technical support workers offering it leverage mediated communications to its fullest advantage.

Improved communication practices in the training of technical support workers on the job warrants more attention on the human components of technical support interactions and less on the technical work. My research shows that more time and energy should be spent on communications than technology.

Comment on Future Direction

This study was limited to a small sample set of six research participants. Its exploration was not exhaustive of all technical support interactions, but merely representative in scope limited to business environments only. Where separation between remote computing and distant technical support resources is vast in business environments, the distance is immense in consumer situations. As much as for corporate technical support, further study for consumer technical

support is needed also.

Where the responses of this research study's participants seemed to indicate an ad-hoc use of cues and feedback with intermittent application, I suggest that a prime area of future study would be a development of a systematic approach to the use and creation of cues plus interpretation and taxonomy of feedback within a structured matrix of available mediated modes of technical support communications. Where technical support interactions, more or less, follow a set pattern of progression from problem assessment to troubleshooting of possible solutions to solution identification, the study researching the development of a set of operating procedures detailing the application of which mediums best suit which technical support issues under a certain environmental conditions could be beneficial to the technical support community.

Artificial intelligence applications for technical support interactions could be tangentially applied to the progressive pattern of problem assessment to troubleshooting possible solutions and solution identification wherein interactions across mediated communications could be automated. A development of a taxonomy articulating the cues which arise under particular circumstances could align relevant feedback to the issue at hand. In these situations, artificial intelligence could be used, say, in chat-bot scenarios of technical support environments where technical support efforts are automated.

Conversational styles in the dialogues which ensue in technical support interactions could be a crucial area for further research. This paper looks at the import of dialogue in technical support work. Given the variances of conversational styles available in everyday conversations, it

follows that investigations in styles particular to technical support interactions would also be apt.

The above three future areas of research could all be well-contained within further studies using interaction analysis and/or hierarchical task analysis. Query et al. (2009) use interaction analysis to capture the sequencing of messages within directed conversations which is the premise of troubleshooting. Caird-Daley et al. (2013) expand hierarchical task analysis to surface tacit knowledge in physical and cognitive task work which, again, speaks to the nature of troubleshooting work.

Summary

Technical support is the service used to resolve technical issues. Sometimes, however, resolving the technical issue can become a problem of its own. The technology itself might not be faulty; the communication *about* the technical issue may be at fault.

Technical support interactions falter when the communications about them match an inappropriate fix to the wrong problem. Shared understanding about the problem is a necessity. End-users and technical support workers engage cooperatively to reach a mutual understanding of what the problem is in order that the right solution to the problem at hand can be applied. The necessary tools and the appropriate techniques emerge through dialogue as the situation unfolds. Each technical support issue is unique given its equipment, its participants, and the environmental conditions under which it occurs thereby requiring purposefully constructed dialogue to contain the collaborative troubleshooting. When facilitated through mediated modes

of communications, purposeful dialogue which activates the cues giving rise to relevant feedback guides and shapes the technical support interactions appropriately.

Technical support is an integral part of any technological implementation. Its role is crucial to ensuring the longevity of our relationships with our technology in order that they continue to serve us effectively and efficiently. Relationships with our technologies, as facilitated through our interactions through technical support, demand supportive and nurturing dialogue.

Appendices

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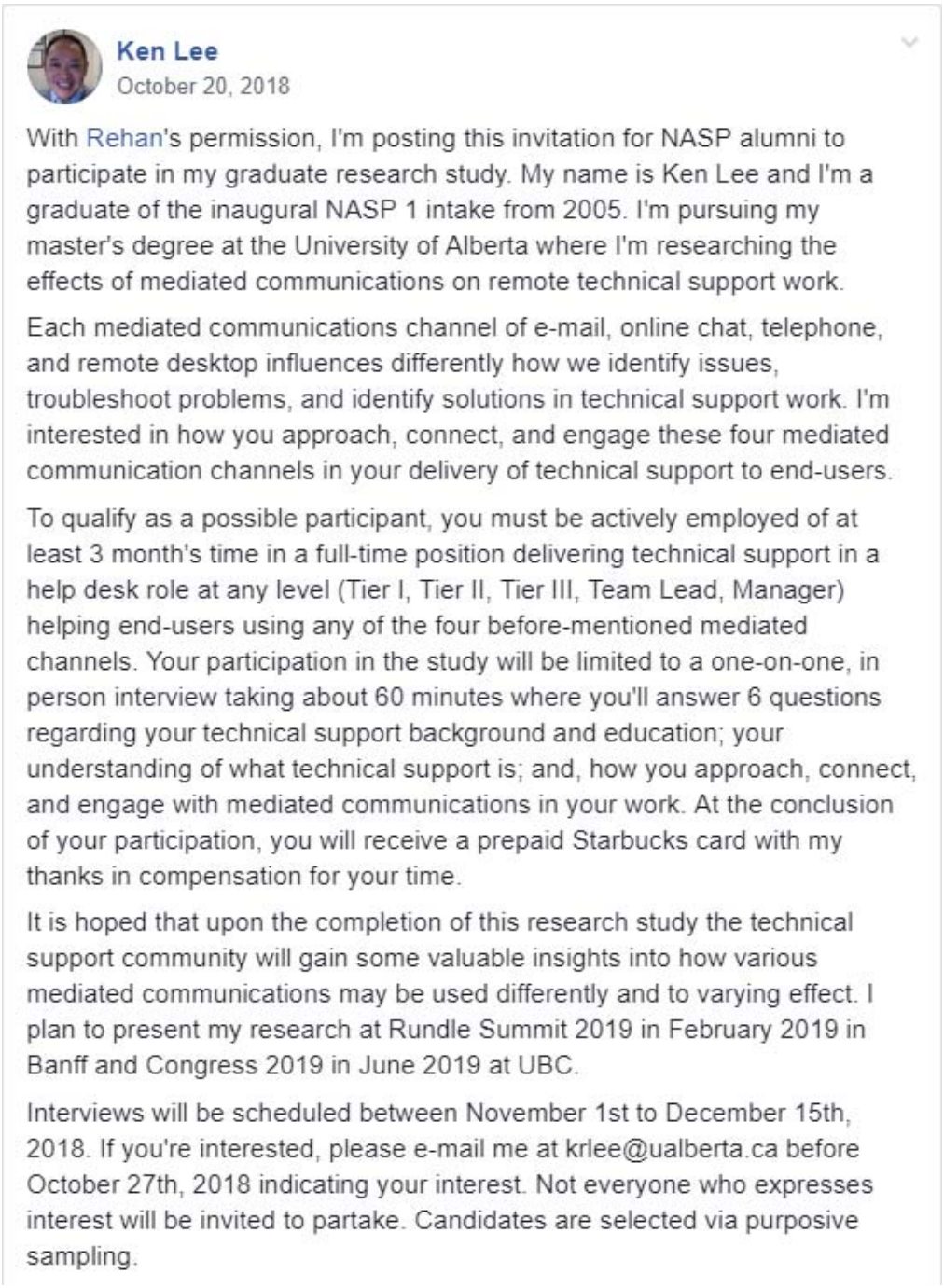
Recruitment Post to Facebook Group

This post appeared in the UBC/BCIT: Network Administration and Security Professional (NASP) Facebook group to recruit potential candidates.



Ken Lee
October 20, 2018

With Rehan's permission, I'm posting this invitation for NASP alumni to participate in my graduate research study. My name is Ken Lee and I'm a graduate of the inaugural NASP 1 intake from 2005. I'm pursuing my master's degree at the University of Alberta where I'm researching the effects of mediated communications on remote technical support work.

Each mediated communications channel of e-mail, online chat, telephone, and remote desktop influences differently how we identify issues, troubleshoot problems, and identify solutions in technical support work. I'm interested in how you approach, connect, and engage these four mediated communication channels in your delivery of technical support to end-users.

To qualify as a possible participant, you must be actively employed of at least 3 month's time in a full-time position delivering technical support in a help desk role at any level (Tier I, Tier II, Tier III, Team Lead, Manager) helping end-users using any of the four before-mentioned mediated channels. Your participation in the study will be limited to a one-on-one, in person interview taking about 60 minutes where you'll answer 6 questions regarding your technical support background and education; your understanding of what technical support is; and, how you approach, connect, and engage with mediated communications in your work. At the conclusion of your participation, you will receive a prepaid Starbucks card with my thanks in compensation for your time.

It is hoped that upon the completion of this research study the technical support community will gain some valuable insights into how various mediated communications may be used differently and to varying effect. I plan to present my research at Rundle Summit 2019 in February 2019 in Banff and Congress 2019 in June 2019 at UBC.

Interviews will be scheduled between November 1st to December 15th, 2018. If you're interested, please e-mail me at krlee@ualberta.ca before October 27th, 2018 indicating your interest. Not everyone who expresses interest will be invited to partake. Candidates are selected via purposive sampling.

Recruitment Post to Facebook Page

When my potential resource for possible candidates at BCIT fell-through, I posted this personal note on my personal Facebook page.

Research Ethics Board (REB) Approval Letter

UNIVERSITY OF ALBERTA

RESEARCH ETHICS OFFICE

308 Campus Tower
Edmonton, AB, Canada T6G 1K8
Tel: 780.492.0459
Fax: 780.492.9429
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Notification of Approval

Date:	November 21, 2018
Study ID:	Pro00075673
Principal Investigator:	Kenneth Lee
Study Supervisor:	Gordon Gow
Study Title:	Face-to-Face to Interfaced: Facilitating Mediated Communications in Technical Support Work
Approval Expiry Date:	November 19, 2019

Thank you for submitting the above study to the Research Ethics Board 1. Your application has been reviewed and approved on behalf of the committee.

A renewal report must be submitted next year prior to the expiry of this approval if your study still requires ethics approval. If you do not renew on or before the renewal expiry date, you will have to re-submit an ethics application.

Approval by the Research Ethics Board does not encompass authorization to access the staff, students, facilities or resources of local institutions for the purposes of the research.

Sincerely,

Anne Malena, PhD
Chair, Research Ethics Board 1

Note: This correspondence includes an electronic signature (validation and approval via an online system).

Recruitment Letter

RECRUITMENT LETTER

Dear Invitee:

My name is Ken Lee and I am a masters student at the University of Alberta in the Communications and Technology graduate program. I am kindly requesting your participation in a graduate research study that I am conducting entitled **Face-to-Face to Interfaced: Facilitating Mediated Communications in Technical Support Work**. The goal of the study is to better understand how technical support workers approach, connect, and engage mediated communications (e-mail, online chat, telephone, and remote desktop) in their delivery of technical support to end-users.

If you work in IT (information technology) on a help desk at any level (tier I, tier II, tier III, team lead, team manager,) I am interested in talking to you about your experiences. You must be actively employed, working full-time with a minimum of 3 months' experience using one or more of the mediated channels of e-mail, online chat, telephone, or remote desktop in your work. The end-users you support are business/corporate customers rather than consumers. You could be a recent graduate from a technical school with only 3 months' experience or you could be a senior engineer with over a decade of experience. As long as you work end-to-end with business/corporate customers, you could be an ideal candidate for this research. Participation is completely voluntary and you may withdraw from the study at any time. The study is completely confidential, therefore, I will not reveal your name or professional position in the published results. If you qualify, interviews will take place from November 15, 2018 to December 31, 2018. You will be asked to participate in a semi-structured interview that will last approximately 60 minutes.

If you wish to participate in this study, please e-mail me at krlee@ualberta.ca expressing your interest. Depending on the number of respondents, not all applicants will be accepted for the study. If accepted, you will be furnished with further information on the research study and provided with an initial consent form to review. If you agree, then an interview will be scheduled. Qualifying participants who complete the study will receive a $20 Pre-paid Starbucks card.

Thank-you!

Ken Lee
Graduate Student
Master of Arts in Communications and Technology
University of Alberta
krlee@ualberta.ca

Information Letter and Consent Form

INFORMATION LETTER and CONSENT FORM

Study Title: FACE-TO-FACE TO INTERFACED: FACILITATING MEDIATED TECHNICAL SUPPORT COMMUNICATIONS THROUGH MULTI-MODAL CHANNELS

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Background: You are being invited to participate in this research study because of your professional experience working in technical support. You must be or have been employed in a professional capacity of supporting end-users physically in-person and/or remotely via mediated communications (i.e., e-mail, telephone, online chat, or remote desktop). You are: A graduate of either the Technical Support Professional (TSP) certificate program or the Network Administration and Security Professional certificate program at the British Columbia Institute of Technology (BCIT) or introduced to the researcher through a professional acquaintance. The results of this study will be used in support of my graduating thesis/capstone project for my Master of Arts in Communications and Technology (MACT) degree program at the University of Alberta.

Purpose: Technical support work is performed either in-person and/or at a distance from the end-user using a mediated channel (i.e., telephone, e-mail, online chat, or remote desktop.) Mediated channels introduce an added layer of complexity in the form of communications challenges which may not necessarily be present with in-person technical support work. My research explores how different media are used by technical support technicians in their work to identify the different approaches and strategies used in practice.

Study Procedures: You will be invited to participate in the study if you've worked professionally in technical support. You will participate with me in an individual, one-on-one, online Skype interview of approximately 60 minutes in length. You will be invited to answer 6 questions ranging from general information on how you

Study Title: FACE-TO-FACE TO INTERFACED: FACILITATING MEDIATED TECHNICAL SUPPORT COMMUNICATIONS THROUGH MULTI-MODAL CHANNELS

became involved in IT to specific information on how you approach technical support interactions through various mediated channels. The Skype interview will be audio/video recorded from which a transcript will be prepared and observations noted. You will be invited to review the transcript to check accuracy and correct any errors or omissions. Your privacy and confidentiality are assured through anonymized data, password-protected and encrypted computer files. Upon completion of the study, all video/audio recordings and transcripts will be destroyed.

Benefits: You are not expected to receive any direct benefits from this study. However, you may indirectly receive feedback on how you use mediated communications in your technical support work which may or may not influence your professional practice. It is hoped that upon the completion of this research study the technical support community will gain some valuable insights into how various mediated communications may be used differently and to varying effect. Upon your acceptance and validation of the written transcript, you will receive a $20 Pre-Paid Starbucks Giftcard in compensation for your participation and time in this research study.

Risk: There are no expected risks to you for your participation in this study. However, not all risks can be identified at the outset. There may be risks to participating in this research study that are not known. If any risks are identified during the course of this research study, then you will be notified straight-away.

Voluntary Participation: You are under no obligation to participate in this research study. Your participation is completely voluntary. You are not obliged to answer any of the specific questions in the interview even if participating in the study. You can opt out from this research study at any time without penalty and can ask to have any collected data withdrawn and not included. If you opt out of the study, then all correspondence between myself and you will be destroyed, all video/audio recordings will be destroyed, plus all transcripts and noted observations will be destroyed.

Confidentiality and Anonymity: Your privacy, confidentially, and anonymity are assured. Only myself and my thesis/capstone project supervisor will have access to this research study's records. You will not be personally identified in any transcripts, published theses/dissertations, research articles, presentations, teaching materials, or web postings. Where appropriate, a pseudonym will be used. The safeguards in place to protect your privacy, confidentially, and anonymity are password-protected computer files stored on encrypted hard drives and

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network storage devices. At your request, you may receive a copy of the completed research study. It is possible that this research study may be used for a future unspecified research study. If so, it will have to be approved by a Research Ethics Board (REB).

Further Information: If you have any further questions regarding this research study, please do not hesitate to contact:

Research Investigator:	**Supervisor:**
Ken Lee, Graduate Student	Dr. Gordon Gow, Associate Professor
University of Alberta	Director, Master of Arts in Communications and Technology
1195 West 7th Avenue	University of Alberta, Faculty of Extension
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The plan for this research study has been reviewed by a Research Ethics Board at the University of Alberta. If you have questions about your rights or how research should be conducted, you can call (780) 492-2615. This office is independent of the researchers.

Consent Statement: I have read this form and the research study has been explained to me. I have been given the opportunity to ask questions and my questions have been answered. If I have additional questions, I have been told whom to contact. I agree to participate in the research study described above and will receive a copy of this consent form. I will receive a copy of this consent form after I sign it.

_____ _____

Participant's Name (printed) and Signature Date

_____ _____

Name (printed) and Signature of Person Obtaining Consent Date

Form Date: 10/15/2018

Interview Script

INTERVIEW SCRIPT

1) Tell me how you got your start in IT.

2) Complete this thought: Technical support is …

3) In what ways have you delivered technical support and describe your experience of working with them.

4) Describe a prior experience in delivering technical support where the assessment of the situation, troubleshooting the issue, and identifying the solution was challenging.

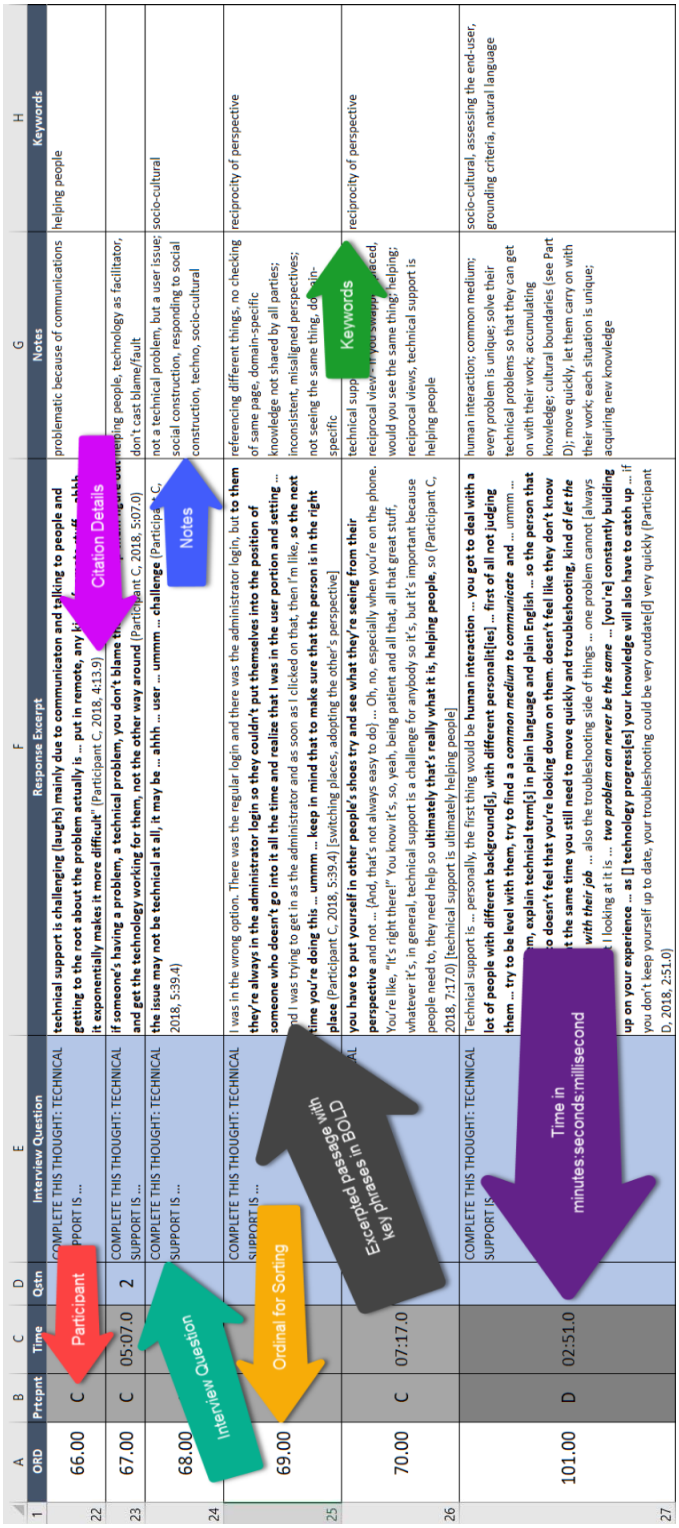
5) Describe how you might adapt the previously described experience in Question 4 using other forms of mediated communications.

6) Having described your experiences of delivering technical support through various forms of mediated communications and reflected on those experiences, how might your response to Question 2 completing the thought "Technical support is …" change?

Working Table of Interviews

Ordinal	Code	Pseudonym	Initials	Notes	Interview Date	Created	Modified	Length	Sent	Consent Form	Digital Copy	Provided Original	Method	Recording	SBX Sent	SBX Opnd
0	0	Test	RD	Interview located at researcher's home. Private space. Audio recorded.	11/27/2018	11:29	12:19	50m57s	12:19	Signed	Scanned	Declined	Express Scribe	Interview_Pilot_20181021 2018 10 21 07 37 03 by ken-iph-06	10/21/2018	10/21/2018
1	A	Adam	DM	Interview located at boardroom of researcher's place of work. Large boardroom with seating for 25 people. Sat across from each other at corner of large boardroom table.	11/27/2018	10:13	10:29	51m33s	12:38	Signed	Scanned	Declined	Express Scribe	Interview_A_20181127-1014 2018 11 27 10 13 36 by ken-iph-06.dct	11/27/2018	11/30/2018
2	B	Brad	DL	Interview located in seating area of public conference centre. Sat across from one another at tall table with bar-stool seating. No other people in immediate area other than 3 others sat at low couches on opposite side of partition. Large open space.	11/28/2018	9:04	11:30	36m53s	12:56	Signed	Scanned	Declined	Express Scribe	Interview_B_20181128-0904 2018 11 28 09 04 20 by ken-iph-06.dct	11/28/2018	01/12/2019
3	C	Clay	AN	Interview located in social room of interviewee's place of work. Interviewee sat in armchair with researcher sitting on sofa. Medium to large open space.	11/28/2018	11:31	11:32	39m41s	12:55	Signed	Scanned	Declined	Express Scribe	Interview_C_20181128-1131 2018 11 28 11 31 00 by ken-iph-06.dct	11/28/2018	11/29/2018
4	D	Dave	QN	Interview located at interviewee's home. Interviewee's partner at home, but not present in room. Situated in living room with researcher and interviewee sat beside one another on couch.	12/01/2018	12:40	12:41	45m23s	14:38	Signed	Scanned	Declined	Express Scribe	Interview_D_20181201-1241 2018 12 01 12 40 59 by ken-iph-06.dct	12/08/2018	12/24/2018
5	E	Eric	NH	Interview located at researcher's home. Private space. Audio recorded.	12/08/2018	10:17	10:38	62m30s	13:25	Signed	Scanned	Declined	Express Scribe	Interview_E_20181208-1030 2018 12 08 10 17 31 by ken-iph-06.dct	12/08/2018	12/09/2018
6	F	Fred	RA	Interview conducted online via Skype. Researcher located in private den at home; interviewee located in living room at his home. Interviewee's wife was present in living room at the time of the interview, but was not engaged in process.	12/23/2018	10:00	10:30	30m14s	10:30	Signed	Scanned	Declined	Skype/Camtasia/Express Scribe	Interview_F_20181223-1000.wav	12/23/2018	01/04/2019

Interview Analysis Excel Spreadsheet



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