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Exploring the role of networks and proximity for communication satisfaction in an academic library

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Exploring the Role of Networks and Proximity for Communication Satisfaction in an Academic Library

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Abstract

Researchers tie communication satisfaction within organizations to job satisfaction, productivity, and commitment, and yet supporting communication satisfaction remains a challenge for workplaces. This study proposes that network centrality and proximity both are related to communication satisfaction. Further, this study proposes that proximity actions—voluntary actions which increase proximity with co-workers—relate to network centrality. As employees increasingly work at a geographic distance from their co-workers, they increasingly experience proximity barriers to the already difficult task of staying informed through informal communication channels. This study is a mixed methods case study within an academic library.

Findings include the value of mixed methods studies for studying the topic as well as the importance of supporting proximity actions within the organization. The study also suggests multiple avenues for future research including additional qualitative data gathering to explore high-impact behaviors which support satisfaction with organizational communication between departments.

Keywords: organizational communication; communication satisfaction; network analysis; communication network; informal communication; proximity, virtual proximity

Chapter 1: Introduction

Researchers have formally studied satisfaction and organizational communication beginning in the 1970s and yet achieving employee satisfaction with communication remains a challenge for workplaces. A survey of 400 large corporations by the Grossman Group, for instance, found that communication barriers cost them $26,000 per employee each year through lower productivity (Grossman, 2011). Supporting effective organizational communication, though, is no simple matter. Information flows throughout an organization formally through the organizational hierarchy and through official newsletters, as well as informally from employee to employee. Each of these communication channels combine with the others to create an organizational communication culture (Spillan, Mino, & Rowles, 2002). To address effectiveness of organizational communication, organizations must consider each of these communication channels.

One aspect of organizational communication is the communication that occurs informally across the organizational chart among co-workers, also referred to as lateral communication, horizontal communication, or informal communication. Spillan, Mino, and Rowles (2002) state that as much as "75% of all organizations' practices, policies, and procedures are shared laterally through interactions between and among...peers at the same hierarchical levels" (p. 97). These informal networks of communication are typically different from the formal communication networks represented by organizational charts, are not readily apparent, and in knowledge-based organizations, are how "to get a job done" (Kadushin, 2012, p.95). In this perspective, the flow of information throughout an organization is only as strong as the ties among the people

who communicate. The perception that each employee has about organizational communication is specific to the individual and their personal communication network within the context of the larger network of their organization. To improve satisfaction with organizational communication, organizational leaders must also consider how to support the informal communication network.

Within an organization, relationships between individuals serve as the channels through which information flows as well as an influence on attitudes and behaviors, further complicating an analysis of organizational communication. Network analysis, which studies the ties that exist between pairs of individuals, helps researchers to better understand the flow of information and knowledge within context of these other relationships forces (Granovetter, 1973; Granovetter, 1983; Hansen, 1999; Haythornthwaite, 2002; Wasserman & Faust, 1994). Combining structural network data with qualitative descriptions from research participants serves to provide further insights for a more complete understanding of the communication environment and strategies for improvement.

Another important reality for organizational communication is the proximity in which employees work in relation to one another. Employees increasingly work at a distance from their colleagues and yet the geographic proximity of two employees influences both the ability for them to exchange information (Allen & Henn, 2007) as well as form informal networks (Kadushin, 2012). An oft-cited 2001 study of more than 2,000 adults who were either full-time employees in companies with 500 or more employees, or family members of employees, found that a third worked outside of a central office on a regular or frequent basis (Richman, Noble & Johnson, 2002). In that

same study, 7% of the respondents regularly telecommuted, and an additional 15% telecommuted on an ad hoc basis (Richman, Noble & Johnson, 2002). Between 2005 and 2011, estimates showed an increase from 1.5 million to 2.4 million employees who telecommuted several days a week ("Let them wear," 2013). A 2015 international survey of 375 employees found that more than 50% of their employers allowed regular telework arrangements—and many more allowed ad hoc telework arrangements (WorldatWork, 2015). Even when employees all come to a central office, co-workers may be located on multiple floors of a building or dispersed through the same floor, reducing the free flow of information (Allen & Henn, 2007). The modern workplace, then, presents an environment where employees work further away from each other than ever before, increasing the barriers to information flow.

Organizations with geographically dispersed employees must find new ways to ensure that information flows throughout the entire organization. Rapid advances in web conferencing, learning management systems, social networking, and groupware attempt to overcome the communication barriers for geographically-dispersed work groups. One focus for developers of online collaboration tools, for instance, is increasing a sense of being in the same geographic space through real-time or near-real-time information about availability status and current activities, also known as “awareness” (McAfee, 2006). Increasingly, designers build these awareness features into enterprise-level tools intended to support the communication and coordination of large groups of co-workers. The awareness afforded by these tools is similar to the awareness one gains by being in the same physical location of a coworker, gaining incidental information about availability

and ability to communicate. Through both physical and virtual supports, the organization attempts to keep informal communication channels active and free-flowing.

In these ways, organizational communication is important but complicated. Multiple factors contribute toward both the effectiveness of the communication itself and employee's perception of that communication. Prominent among those factors are the employee's communication network and the employee's ability to span geographic distances between themselves and their co-workers.

Problem Statement

Employees within the studied organization report a range of satisfaction with organizational communication. First, this study considers that satisfaction within context of network centrality—or the number of people with whom the employee exchanges information helpful for the job. The employees in this organization, like much of the modern workforce, is geographically dispersed which theoretically influences communication satisfaction. Second, this study considers communication satisfaction and proximity to other employees. Finally, employees may voluntarily participate in actions which increase their contact with their colleagues. Examples include gatherings which increase their geographic proximity with their colleagues, and online tools which increase their virtual proximity with their colleagues. Third, this study examines the intersection between those proximity actions and network centrality. This study, then, explores possible relationships amongst four interrelated concepts: communication satisfaction, communication networks, proximity, and proximity actions.

Purpose and Significance

I embarked on this study to contribute to the understanding of how an individual's position within the informal communication network relates to organizational communication satisfaction in a geographically-dispersed workplace—and the possible impact of individual voluntary actions. My interest started from employee satisfaction surveys within the organization which suggested low satisfaction with organizational communication, and follow up root cause analysis studies which suggested a relationship between satisfaction with organizational communication, social network ties, and individual actions such as participating in social events and taking advantage of existing online communication tools. I hope that these findings will provide practical guidance to the individual employees within the organization who seek high-impact behaviors which lead to their own improved communication satisfaction.

Potential improvements for the organization, however, extend beyond individual actions. Gray and Laidlaw encourage "…management to expand their focus from a problem-based, simplistic process approach to communication to recognizing and catering for individual differences" (2004, p.443). By attempting to connect individual actions with satisfaction and network position while considering socio-demographic variables, my study also attempts to identify support to provide at the organizational level which reaches all employees regardless of their employment classification, work location, or other demographic factors. This study, then, attempts to address organizational communication for the organization studied at both the individual and organizational levels.

Although standard texts on evaluating communication satisfaction within an organization recommend considering the results of more than one data gathering instrument (Downs & Adrian, 2004; Hargie & Tourish, 2009), few studies attempt to explore the relationship between communication satisfaction and network position. A notable exception is that of Zwijze-Koning and de Jong (2015) which statistically correlated results from Hazen and Downs' Communication Satisfaction Questionnaire and network analysis supplemented with Critical Incident Technique in three organizations. The current study attempts to respond to Zwijze-Koning and de Jong's call for more research using network analysis as a communication audit instrument in combination with other audit instruments.

Research Questions

I approached this topic with a mixed methods case study seeking to identify relationships between network centrality, communication satisfaction, proximity, and employee actions which increase proximity. This study focuses on three proposed relationships described in the following research questions:

- Research Question 1 (RQ1): Does a relationship exist between network centrality and communication satisfaction?
- Research Question 2 (RQ2): Does a relationship exist between proximity and communication satisfaction?
- Research Question 3 (RQ3): Does a relationship exist between proximity actions and network centrality?

I expand on the literature review which led to these research questions in Chapter 2. In the next section, I briefly review the intended scope of this study.

Scope

The findings of this study are specific to the organization at a particular point in time. Clampitt and Girard (1993) in their meta-analysis of 18 case studies with more than 1,400 employees found that communication satisfaction was situational to industry. They accordingly stress the importance of considering that "different types of organizations have different communicational needs" (1993, p.98). I did not locate other published studies which examined communication satisfaction or the communication network within an academic library, so this study will examine an under-researched environment. I anticipate that the current study will contribute to other case studies already published, permitting further understanding of environments and actions which best support communication satisfaction.

Definition of Key Terms

In this section, I define key terms used in this study. In Table 1, find terms specific to this study along with synonymous and related terms also found in the literature. This study also uses the vocabulary of network analysis, with basic terms defined in Table 2. In the next section, I offer a review of the literature informing this study.

Table 1.

Key Communication Terms Defined

Term	Definition
Communication Networks	The "patterns of contact that are created by the flow of messages among communicators through time and space" (Monge & Contractor, 2003). Communication networks may carry messages specific to advice, information, innovation, and knowledge. The current study focuses on *information*.
Communication Satisfaction	Defined by Downs & Hazen (1977) as a multidimensional construct consisting of satisfaction with communication climate, informal communication, media quality, organizational integration, organization perspective, personal feedback, relationship to superiors, and relationship with subordinates. The current study focuses primarily on informal communication.
Geographic Proximity	Used to refer to physical proximity of two employees in the same place at the same time. *Propinquity* is a related term which posits that proximity leads to social ties (Kadushin, 2012; Krackhardt, 1994).
Informal Communication	Informal communication in this study refers to communication between two coworkers not in a supervisory relationship, as distinct from communication intended for the entire organization or vertical communication from supervisor to direct report (Downs & Hazen, 1977). Additional terms used by other researchers include *horizontal communication* and *lateral communication*. Popular terms include *grapevine* and *word of mouth*.
Proximity Actions	Proximity actions is a phrase created for this study to refer to voluntary behavior which an employee uses which results in increased proximity with another employee. Examples include in-person actions (e.g. attending social events with co-workers, serving on optional committees) and online actions (e.g. interacting on social media, participating in a shared calendar).
Virtual Proximity	Virtual Proximity in this study refers to the shared use of tools which allows two employees to appear to be in the same area at the same time, regardless of their physical proximity (Darics, 2014). Other researchers refer to this concept as *co-presence*, *perceived presence*, *perceived proximity*, *presence*, *simulated proximity*, and *virtuality*.

Table 2.

Key Social Network Terms Defined

Term	Definition
Actor	Each unit included in the network. In this case, actors are individual employees.
Alter	Actors to whom the ego is tied.
Dyad	Pair of actors along with the tie (or lack of tie) between them.
Ego	A focal actor of interest.
Egocentric	A network study which focuses on the ties of the respondent without attempting to identify ties among the full population. Also referred to as an egonet.
Graph	Visual representation of a network. Actors are referred to as *nodes*.
Tie	The connection between two actors. In this study, a tie represents information exchange or flow.

Note. I have paraphrased all network definitions in Table 2 from Robins, 2015.

Chapter 2: Literature Review

The literature related to this study spans three domains—communication satisfaction, communication networks, and computer-mediated communication—all within context of organizations. This section provides an overview of the relevant literature in all three domains, particularly as they relate to proximity, proximity actions, and to each other. In conducting the literature review, I searched approximately 65 abstracting and indexing databases representing social sciences, humanities, and science disciplines through EBSCO Discovery Service. In addition, I also searched *PsycNET*, *Sociological Abstracts*, and *Library & Information Science Abstracts*. I found additional relevant studies through *Scopus*, *Google Scholar*, and others' literature reviews. The literature search included seminal works if regularly cited by recent research.

Conceptual Framework

I present the four main constructs in this study—communication satisfaction, network centrality, proximity, and proximity actions—as a preliminary conceptual framework in Figure 1. I identified these concepts as relevant through initial literature reviews and sought theories and studies which anticipated relationships between each of the concepts. In the remainder of this chapter, I provide an overview of the literature which led to the refinement of my conceptual framework, research questions, and methodology. I start with organizational communication and communication satisfaction. I then discuss social network theory and network centrality as it relates to organizational communication and satisfaction with that communication. Next, I discuss the effect of proximity on both communication satisfaction and on communication networks. I review studies which highlight the role that proximity actions play in increasing network

centrality. Then, I provide an overview of theories and research related to computer-mediated communication and virtual proximity. Finally, I return to my research questions and the conceptual framework.

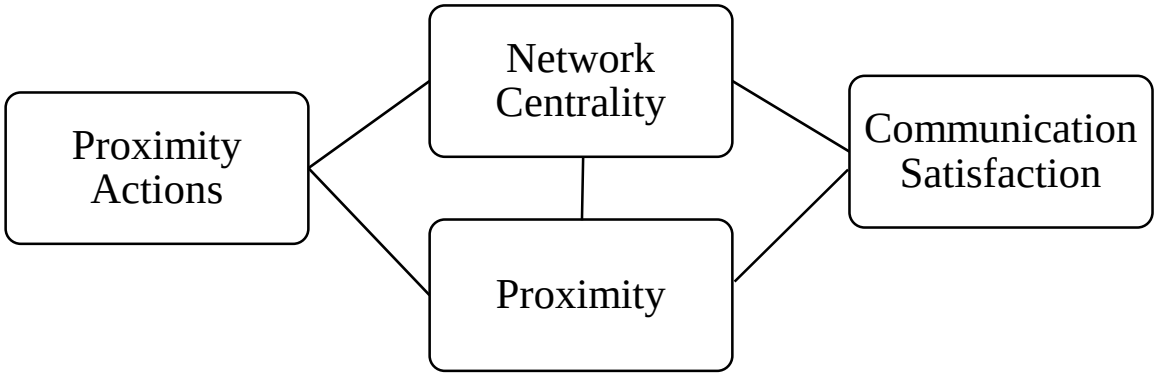

Figure 1. Initial conceptual framework

Theoretical Framework: Communication Satisfaction

I grounded my study in the theoretical concept of organizational communication and communication satisfaction. The study focuses on information flow between individuals, which researchers consider as just one aspect of organizational communication. For instance, Greenbaum, Clampitt, and Willihnganz (1988) found that instruments which measure organizational communication all attempt to measure (1) structure and flow including sources, receivers, channels, and direction; (2) climate and relationships; and (3) message characteristics (i.e. adequacy and quality) and content. Organizational communication, then, is multifaceted—and instruments measuring satisfaction with communication similarly attempt to capture that complexity.

The definition of communication satisfaction has evolved over time. The earliest definitions considered it to be a single construct (Clampitt & Girard, 1993). For instance,

Thayer's 1968 definition referred to communication satisfaction as "the personal satisfaction inherent in successfully communicating to someone or in successfully being communicated with" (Thayer, 1968, p.144). As soon as researchers began trying to measure communication satisfaction they began to define independent sub-constructs. Downs and Hazen developed the Communication Satisfaction Questionnaire (CSQ) in 1977 to explore the relationship between communication and job satisfaction. Researchers frequently cite the CSQ as the standard instrument to measure communication satisfaction (Downs, 1994). Downs and Hazen proposed that the CSQ consists of eight separate constructs, offered in Table 3. The construct Informal Communication focuses on the informal, peer-to-peer communication that is the also the focus of the current study.

The constructs within the CSQ, however, are not entirely distinct from one another and so this study does not limit data gathering to just that one construct. A much-cited study by Crino & White (1981) validated the eight constructs, yet Downs and Hazen noted in 1977 that there "seems to be some variation in the dimensionality of communication satisfaction" (Downs & Hazen, 1977, p.69). Downs more recently noted that the eight proposed factors are "not entirely discrete" (Downs, 1994, p.116). I found eight studies which use various confirmatory analyses to provide alternatives to the original constructs. Some researchers have identified fewer dimensions onto which the original eight constructs map (DeConinck, Johnson, Busbin, & Lockwood, 2008; Gray & Laidlaw, 2004; Mueller & Lee, 2002). Gray and Laidlaw (2004), for instance, proposed mapping Downs and Hazen's eight constructs to just two constructs: Informational Communication Satisfaction and Relational Communication Satisfaction.

Table 3.

Communication Satisfaction Questionnaire Constructs

CSQ Construct	Satisfaction Construct Measured
Communication Climate	Communication on both the organizational and personal level; the organization's communication is inspiring; competence of employees; information flow
Informal Communication	Activity and accuracy of information received from peers
Media Quality	Quality and quantity of official communication mechanisms such as publications and meetings
Organizational Integration	Information employees receive about their job, policies, and benefits; personnel news; departmental activities
Organizational Perspective	Goals, performance, and external impacts on the organization
Personal Feedback	Supervisor understanding of employee's challenges; performance evaluation
Relationship to Superiors	Openness, listening skills, and trust from the perspective of the subordinate
Relationship with Subordinates (items only answered by supervisors)	Information received from subordinates; subordinate receptivity to information; information overload from the perspective of the supervisor.

Some of these same and additional researchers have deleted items from the full instrument in order to create more distinct constructs (Gray & Laidlaw, 2004; Iyer & Israel, 2012; Meintjes & Steyn, 2006). Researchers have also proposed entirely new constructs using the existing or slightly modified CSQ items (Clampitt & Girard, 1988; DeConinck et al, 2008; Iyer & Israel, 2012). In other words, the CSQ is a well-established instrument to measure communication satisfaction, but the individual constructs within communication satisfaction are still up for debate. Of relevance to the current study, the informal communication construct includes items related to the strength of relationships in addition to information flow, and the other constructs also include

items related to information flow. Based on the precedent set by other researchers and my focus on informal communication about work, I relied on—but modified—the CSQ, as described in detail in the Methodology chapter.

The effort to clarify the components of communication satisfaction is more than an abstract academic exercise; researchers demonstrate that communication satisfaction has an impact upon organizational outcomes. Mueller and Lee (2002) note a robust history of inquiry by researchers successfully correlating communication satisfaction to communication behaviors, attitudes, style, team structure, assimilation processes, and use of media. Clampitt and Girard (1993) in their brief meta-analysis of studies using the CSQ note a consistently strong correlation between job satisfaction and communication satisfaction, as well as a relationship with employee productivity. More recent studies using the CSQ continue to confirm correlations of communication satisfaction with job satisfaction (Pettit, Goris & Vaught, 1997), organizational commitment (Varona, 1996), productivity (Clampitt & Downs, 1993), and strategic consensus (Desmidt & George, 2016). The importance, then, of addressing communication satisfaction is not just theoretical but is also a question of business outcomes and organizational effectiveness.

Network Centrality

Barnett offers a succinct definition of a social network: “A social network is generally defined as a system composed of a set of social actors, individually called nodes, and a collection of social relations, called links or ties, which specify how these actors are relationally tied” (2011, p. viii). This definition only hints at the strength of social network analysis to describe and study complex social dynamics such as those found within organizations. Multiple theories within the domain of social networks

provide theoretical insights into the complexity of communication networks and provided the inspiration to combine quantitative and qualitative data gathering for both breadth and depth. Granovetter (1973, 1983) distinguished weak ties from strong ties within a social network, noting that those with whom individuals do not frequently communicate provide unique information not otherwise available among an individuals' closest contacts. These weak ties, then, provide a valuable mechanism to increase information flow throughout a network. Building upon this theory, Haythornthwaite (2002) proposed that enterprise communication tools provide a rich online network of latent ties which employees can activate and convert to weak ties when they need information. Hansen (1999) proposed that strong ties—not weak ties—are important for sharing complex knowledge among separate work departments. Each of these theories and studies offer a slightly different perspective on the use of ties within an organization for information flow.

Social network theory posits that an individual's central position within their social network relates to their access to information (Kadushin, 2012; Wasserman & Faust, 1994). Social network analysis refers to the measure of the number of immediate contacts that an actor has as degrees and the measure as degree centrality. Researchers commonly consider a high degree centrality as a measure of an actor who is "where the action is" and a "major channel of relational information" (Wasserman & Faust, 1994, p.179). Researchers refer to the same measure focused only on incoming ties as in-degree centrality. A measure of in-degree centrality, within context of communication, is a directional measure that suggests how much and the variety of information an individual receives. A researcher can measure degree centrality and in-degree centrality at the egocentric level of study. These measures permit descriptive and inferential statistical

analysis (Iacobucci & Hopkins, 1994). Within this context of different types and number of ties supporting information flow, I decided to use network analysis to examine organizational communication within the studied organization.

Communication Satisfaction and Network Centrality

Social network analysis provides an avenue to combine the complexity of both communication networks and communication satisfaction. Based on my literature review, Zwijze-Koning and de Jong's study of three large secondary schools in the same school system in the Netherlands (2015) is the only published study which attempts to statistically correlate communication network position with communication satisfaction. The employees of each of the three schools held a variety of job roles, education levels, and work site locations. The researchers completed a mixed method, multiple case study, triangulating data gathered through a network analysis, critical incident interviews, and responses on the CSQ. In comparing the communication networks of the three schools with the CSQ response, they identified some expected—and not so expected—results. They found that the employees at one school were densely connected (i.e. had more communication ties among the employees) than the other schools and that these employees were significantly more satisfied with informal communication than the other two schools, logically so. The same employees were not more satisfied, however, with organizational integration or organizational perspective—two of the other constructs identified in the CSQ. Zwijze-Koning and de Jong's findings in correlating network measures with the CSQ construct of informal communication, but not with organizational integration or organizational perspective, leads directly to RQ1: Does a relationship exist

between network centrality and communication satisfaction? I illustrate this research question in Figure 2 as RQ1.

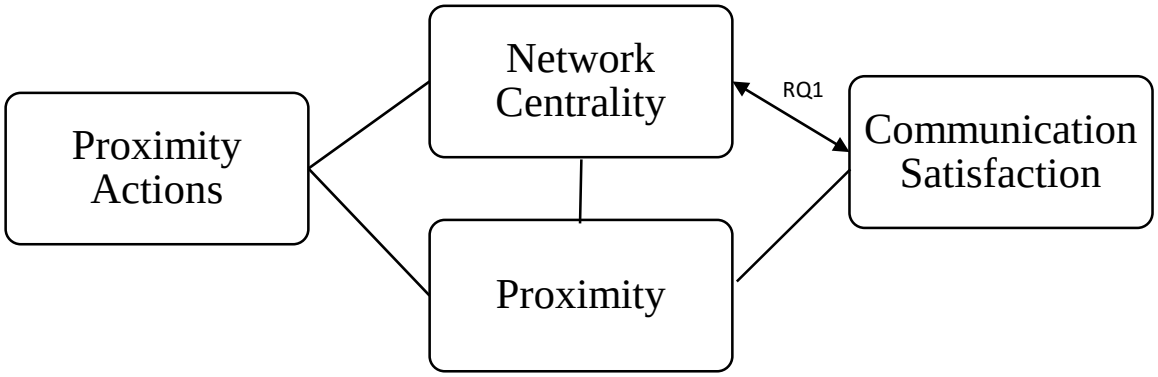

Figure 2. Conceptual framework RQ1

Communication Satisfaction and Proximity

Existing studies are mixed when considering the relationships between communication satisfaction and proximity. Zwijze-Koning and de Jong in the same 2015 study found that subgroups which were isolated from the rest of the communication network corresponded to geographically separate sites. They hypothesized that the employees in those isolated sites would express lower satisfaction with the organizational perspective construct in the CSQ. Contrary to their expectations, they did not find a statistically significant correlation (Zwijze-Koning & de Jong, 2015). Akkirman and Harris (2005) compared the communication satisfaction of virtual and traditional office workers from a single organization through a quantitative survey, and found (contrary to their expectations) that the virtual workers were more satisfied. The authors attributed the satisfaction, in part, to active use of online collaboration and conferencing tools, a virtual social space (with chat rooms, bulletin boards, games, and newspapers), and in-person

social events and meetings. These strategies included support for increasing both geographic proximity through in-person events, and virtual proximity through online tools. Interestingly, they also attributed the satisfaction of these remote workers to organizational efforts to restructure work and reduce the need for informal communication with peers (Akkirman and Harris, 2005). In other words, the organization worked to increase satisfaction by reducing the need for informal communication related to work tasks. Similarly, Fritz, Narasimhan, and Rhee (1998) compared teleworkers and traditional office employees in nine companies with a quantitative study conducted through a survey. They found that the telecommuters had higher levels of communication satisfaction than their traditional counterparts. Most of the telecommuters in their study worked only a few days a week at home, coming into the central office on the other days (similar to the population in the current study). Similar to the Akkirman and Harris 2002 study, they noted that the work of the telecommuters was more predictable and communication with coworkers was planned ahead of time or formalized (Fritz, Narasimhan, & Rhee, 1998). In contrast, Lipiäinen, Karjaluoto, and Nevalainen (2014), in their qualitative study of a multinational industrial corporation, found that online communication supported formal communication, but that face-to-face communication better supported the formation of trust relationships and informal communication. In their study, they also found that employees frequently had to use multiple tools (email, chat, and phone) to contact needed coworkers because of inconsistent use. The overall theme was a preference for in-person interaction. These studies highlight the importance of not assuming that proximity and communication satisfaction have a positive or a negative relationship.

These studies each found slightly different relationships between proximity and communication satisfaction, and pointed to the importance of variables such as the purpose of communication, varying levels of proximity, and proximity actions. These study inspired me to explore another relationship with my second question, RQ2: Does a relationship exist between proximity and communication satisfaction? I illustrate this second research question in Figure 3. These study also highlighted the need to control for type of communication, and to include both proximity and proximity actions—geographic and virtual—as important constructs in my study.

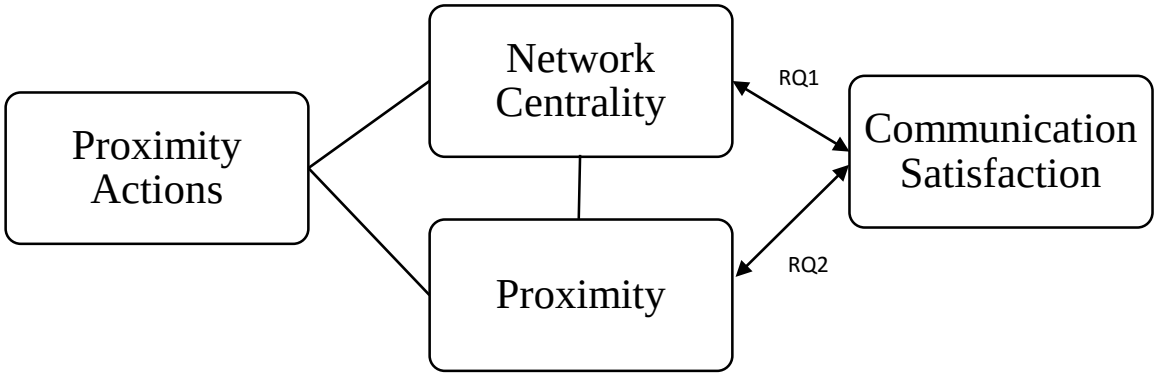

Figure 3. Conceptual framework RQ2

Proximity and Network Centrality

Geographic proximity is a well-established predictor of the formation of network ties and communication (Monge & Contractor, 2003). Within social network studies, researchers refer to this concept as the law of propinquity (Kadushin, 2012; Krackhardt, 1994). Festinger, Schachter, and Back (as cited in Kadushin, 2012) first identified the effect of propinquity in their study of friendships among adult couples living in the same building at Massachusetts Institute of Technology (MIT). They found that, contrary to

popular belief at the time, those in close geographic proximity were more likely to form relationships regardless of shared interests. Adams, Faust, and Lovasi (2012) suggest that while "this pattern holds across a wide range of samples and time periods," current research continues to explore how the propinquity effect varies according to scale, relationships, and actors (p.1).

Focused specifically on communication among knowledge workers, Allen and Henn (2007) report on multiple studies that suggest that separating co-workers by 50 meters or more—even when in the same building— "essentially results in the end of regular communication" (Allen & Henn, 2007, p.63). Further, employees infrequently communicate with co-workers when they work on different floors of a single building, or even in different wings within the same floor (Allen & Henn, 2007). They note that both departmental relationships and alternative geographic spaces such as break rooms help to support communication for these separated employees, but architects should intentionally design spaces to increase proximity and, as a result, increase information flow.

The literature offers a clear relationship between proximity and the propensity to develop network ties—both for relations and for communication. Accordingly, I added this known relationship to my conceptual framework (see Figure 4) as a dotted line without a corresponding research question.

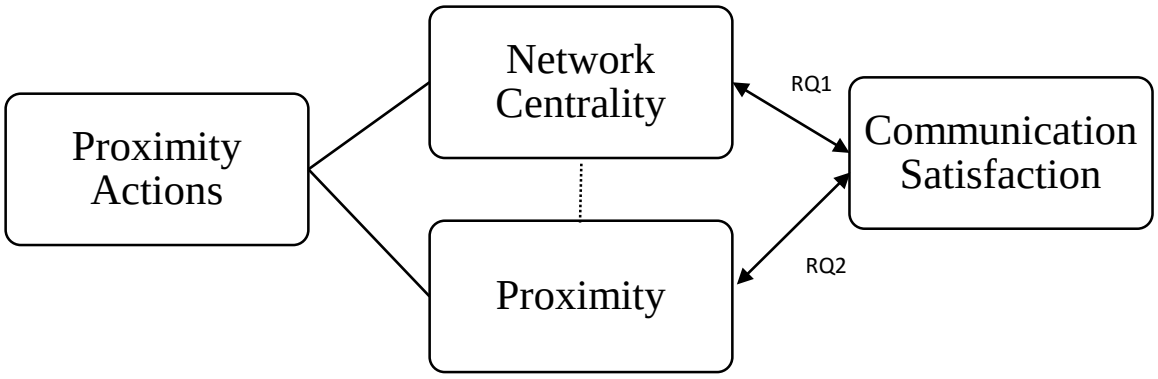

Figure 4. Conceptual framework for proximity and network centrality

Proximity Actions (Geographic) and Network Centrality

Changing the physical environment is not the only method for improving an employee's placement within the communication network: researchers also note the value of participation in organizational events and cross-department projects and learning. Srivastava (2015) examined communication among the middle and top leaders in a global information services company before, during, and after a major organizational restructuring. The study found that communication ties remained strongest during this stressful time between employees who had created relationships through task forces and employee groups—more so than the pairs who had formed relationships only through departmental affiliation and employee role. These actions—whether voluntary or mandatory—helped to create trusted relationships among those whom would not normally be strongly connected (which the researched described as "trusted weak ties") (Srivastava, 2015, p.1376). This study suggests that providing opportunities for developing trusted relationships through projects and groups supports communication and information flow during times of stressful organizational change. Also focused on

geographic proximity actions, Hatala and Lutta (2008) checked for changes in informal communication after introducing new opportunities for employee interaction such as communities of practice, small group discussion groups, and regular employee events in a mid-sized engineering firm. Measuring information seeking and receiving among peers both within work teams and between work teams with a pretest and posttest pointed to limited improvements. A limitation of their study, though, was that they completed their posttest only three months after the changes. Both of these studies suggest that organizations may be successful in facilitating the creation of communication ties among colleagues through providing opportunities for geographic proximity actions. This concept of employee participation in voluntary activities led directly to my consideration of in-person activities and network centrality within RQ3: Does a relationship exist between proximity actions and network centrality?

Proximity Actions (Virtual) and Network Centrality

The growth of virtual workplace teams has produced a considerable body of research which focuses specifically on the impact that using online tools has on communication in the workplace. Leonardi (2013) explored how and when social network structures within organizations change when those organizations introduce new technology, with a focus on not just the availability of specific features—but the use of those features. Ou, Sia, and Hui (2013) compared use of instant messaging, email, and an intranet discussion forum with the formation of social networks and communication within an international bank. They found the use of instant messaging with many others increased an individual's network centrality and noted the importance of tools which provided one-to-one, private communication. Van den Hooff, De Ridder, and Aukema

examined employees' willingness to share information and their use of information technology, finding that those who already had an inclination to share took advantage of the efficiencies offered by communication technology (2004). Carlson, Carlson, Hunter, Vaughn, and George (2013) similarly noted that the use of instant messaging within virtual teams correlated with openness in team communication. All of these studies considered the voluntary use of features of the tools themselves—or virtual proximity actions—not just the availability of the tools.

Just as studies about proximity and communication satisfaction have different findings depending on the purpose of the communication, studies about the use of online tools and network centrality also have considered the purpose and types of communication. Fay (2011) analyzed informal communication messages through various media between 100 intensive teleworkers and their central office co-workers and found themes similar to what one would expect in face-to-face exchanges: personal disclosure, sociality, support giving and getting, commiserating or complaining, and business updates or exchanges. This study suggested that the virtual proximity actions supported a range of communication purposes. In contrast, Jarrahi and Sawyer (2013) interviewed knowledge workers to uncover the common purposes for their use of online tools and found an emphasis on finding answers to problems and socializing to maintain relationship ties. Their findings also included the distinct value of using particular types of tools (i.e. email, instant messaging, phone, microblogs, intranets, social networking, etc.) as well as a variety of tools. These studies, in combination with the ones connecting proximity to communication satisfaction, led me to focus on one type of communication—information required for one's job.

Social networking tools for the workplace, referred to as enterprise social networking tools or ESNs, offer integrated suites of functionality similar to Facebook. Their emergence has produced a parallel stream of research related just to their impact on social and communication networks. Studies of popular social networking sites suggest that such sites strengthen social network ties (Burke & Kraut, 2014), support efficient dissemination of information (Luarn, Yang, & Chiu, 2014), and effectively mobilize social movements (Benjamin, Chen, & Zimbra, 2014; Theocharis, Lowe, van Deth, & García-Albacete, 2015). Researchers have sought to understand if ESNs provide similar communication benefits within the workplace. Ellison, Gibbs, and Weber (2015) explored the use of ESNs for multi-national organizations, highlighting both the positive benefits of ESNs in expanding social networks as well as the confounding impact of employees selectively withholding information to protect reputations. Similarly, Gibbs, Rozaidi, and Eisenberg (2013) explored the tension between ESNs increasing communication and knowledge sharing while simultaneously promoting covert behavior. Friedman, Burns, and Cao (2014) analyzed the use of a well-established ESN within one multinational firm and found that those in the middle level of the organizational hierarchy used it most, with a significant amount of communication occurring between employees in different countries. Cardon and Marshall (2015) found that former business students who used ESNs for team communication considered in-person meetings and conversations (or phone calls) more effective than the ESNs, again highlighting the importance of considering the purpose of communication.

Two social network studies comparing collocated and dispersed work teams deserve particular mention in context of the current study. Suh and Shin (2010) compared

teams with high and low geographic proximity and their knowledge sharing, trust, and reciprocity, and found that the number and frequency of online interaction with other coworkers contributed to increased knowledge sharing and social capital for the online teams. Further, they proposed that the online interactions for the online teams served to compensate for the lack of face to face socializing and meetings. The same was not true for the teams with high geographic proximity. Similarly, Suh, Shin, Ahuja, and Kim (2011) studying online communication tools in the workplace found that when individuals could meet in person but instead relied on email and instant messaging, their communication was more task-oriented and impersonal—and associated with weaker network ties within the group—when compared to similar use among employees who did not have the option to meet in person. They found that when the employees were dispersed, the same tools effectively led to more closeness within the group. They also found that the use of these tools helped the dispersed team members to establish ties outside of their group for "more diverse, relevant, and timely information and knowledge" (Suh, Shin, Ahuja, & Kim, 2011, p.378). These two studies again demonstrate the need to consider the complexity of how employees use the tools available to them, including the physical and social context of the individuals using them.

These studies about virtual proximity actions emphasize that technology *can* support informal communication at work, but *only if* the employees actually use the technology to bridge the geographic distances. They also complement the studies about geographic proximity actions which discuss not just the availability of in-person events but the strengthening of network ties through employees voluntarily participating in those events. This concept of voluntary, individual actions—both geographic and virtual—and

their possible relationship to the development of network ties led directly to both geographic and virtual aspects to RQ3: Does a relationship exist between proximity actions and network centrality? I add a line and this research question to the conceptual framework in Figure 5. The definition of proximity actions inherently includes the relationship to proximity—they are actions which increase proximity—and so I complete the conceptual framework in Figure 5 with a dotted line illustrating the understood relationship between proximity actions and proximity. This study proposes relationships among these variables but does not attempt to identify predictive relationships.

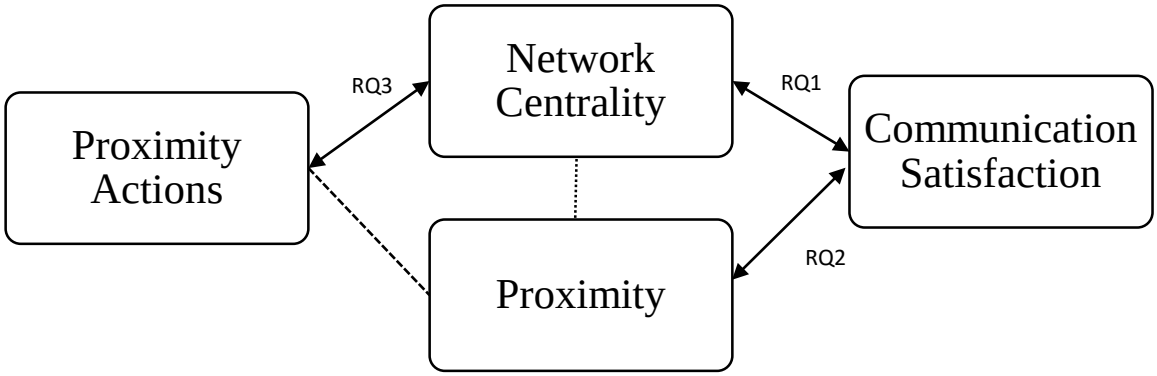

Figure 5. Complete conceptual framework (with RQ3)

Virtual Proximity, Awareness, and Availability

I conclude this literature review with a brief overview of the literature about virtual proximity and awareness because I returned to these two concepts throughout the instrument development and analysis of the data. In addition to the literature that I review in this section, I also recommend the literature review about awareness research by Gross (2013) for a fuller discussion.

One of my early questions related to this study was whether or not the use of online tools which captured and displayed activity to others without user interaction had the potential to bridge geographic proximity distances. The way that researchers think about proximity is rapidly changing as the sophistication and ubiquity of online tools begins to simulate geographic proximity by providing continuous awareness of others without being intrusive. Just as an employee is aware of a co-worker in a nearby office through seeing the lights being on and the person walking down the hallway, an employee can gain computer-mediated awareness of a co-worker also online. The importance of awareness to software development is evidenced by efforts to classify types of awareness. For instance, Antunes, Herskovic, Ochoa, and Pino (2014) identified six types of awareness—collaboration awareness, location awareness, context awareness, social awareness, workspace awareness, and situation awareness. Malhotra and Majchrzak (2014) proposed that effective online communication for virtual teams should distinguish between the types of awareness (e.g. task knowledge awareness versus presence awareness). Similarly, Leonardi and Meyer (2015) distinguished types of awareness by proposing that enterprise social networks provide an ambient awareness which facilitates one employee contacting another employee to seek new knowledge.

Software developers and organizations have implemented awareness in ways as diverse as public video displays (Vyas, van de Watering, Eliëns, & van der Veer, 2007), abstract representations of room activity (Pederson, 1998), moving toys as co-worker surrogates (Greenberg & Kuzuoka, 1999), ambient sound (Isaacs, Walendowski, & Ranganathan, 2002), virtual worlds (Tan, Tan, & Teo, 2012), and even networked furniture (Patel, 2003). Focused specifically on teams using an instant messaging tool,

Darics (2014) identified the display of availability information and a persistent transcript as supporting a sense of virtual proximity as employees used the tool throughout the day. The rich media experience and continuous connection made possible through modern reliance on networked handheld devices provide new options for computer-mediated awareness (Chen, Tao, & Zhang, 2013). These studies and experiments have focused on ways to create multiple types of awareness without also being intrusive—minimizing the needed action on the part of both colleagues in order to be aware of each other.

Teams within the studied organization have experimented with similar tools to support communication. One unit with members in two separate buildings maintained a public video display in common work areas for both social and work-related communication. Another team experimented with providing technical support through a virtual world environment from employee's desktops. At the time of this study, products from Microsoft were used within the organization. These tools interact with each other to display availability information gathered from Microsoft Outlook Calendar within Skype for Business, Email, and SharePoint. In the analysis of qualitative comments about use of these tools, I sought themes related to my research questions, and secondarily looked for examples of users describing awareness.

In virtual proximity, awareness is only possible if other employees are visible in that virtual space—just as working close to others is not enough if an employee keeps the door shut and turns off the lights. Within the context of informal information sharing in a knowledge-intensive organization, Cross and Borgatti noted that an individual sought information from another employee if the information seeker had, among other factors, timely access to that person (2004). This finding suggests that for an employee to be a

source of information, they must be visibly available when the employee needs information. Birnholtz, Bi, and Fussell brought together the concepts of awareness and visibility when considering communication within virtual teams: “In initiating conversation, we can think of individual actions in terms of gathering information about others’ availability” (e.g. awareness) and “signaling, or displaying, interest in interaction” (e.g. visibility) (2012, p. 1765). Treem and Leonardi similarly suggested that one affordance of social network sites is visibility, defined as the ability to make “behaviors, knowledge, preferences, and communication network connections that were once invisible (or least very hard to see) visible to others in the organization” (2012, p.10-11). Treem and Leonardi proposed that visibility becomes possible within social media tools like Facebook through a combination of features including status updates, profiles, comments, popularity voting, lists of connections, recommender algorithms, and archived content. O’Leary, Wilson, and Metiu (2014) compared perceptions of proximity with actual geographic distance among employees working apart from each other. They found that individuals who frequently communicated their availability reinforced a shared identity and increased the perceptions of proximity with others.

The availability and visibility of the employee, then, is another component to virtual proximity as are the features of the technology which support awareness. These studies focusing on the mechanics of virtual proximity led me to create survey questions about proximity that emphasized availability and visibility to others in both geographic and virtual locations. They also reinforced the need to consider complexities such as perceived usefulness of tools rather than just if a person opened up a webpage. In the

creation of the survey, then, I included open-ended questions to allow the respondents to volunteer this richer data.

Literature Review Summary

In summarizing my literature review and development of research questions, I approached my study following earlier findings within the areas of communication satisfaction, network centrality, proximity—both physical and virtual—and proximity actions. This literature review led to my three research questions.

RQ1: Does a relationship exist between network centrality and communication satisfaction? In addition to noting similar proposed relationships from other researchers, my underlying logic for RQ1 is that the more co-workers who share information with an employee, the more likely that adequate and accurate information reaches the employee. Receiving information from multiple sources allows the employee to construct complete information when individual information sources only have partial information, and triangulate multiple information sources when faced with contradictory information.

RQ2: Does a relationship exist between proximity and communication satisfaction? Although geographic proximity has a well-established relationship to the formation of network ties (Monge & Contractor, 2003), the literature does not demonstrate a consistent correlation between proximity and communication satisfaction. Various studies propose factors having an influence on the relationship including purpose of the communication and the use of technology.

RQ3: Does a relationship exist between proximity actions and network centrality? Mixed findings in the literature about the impact of attendance at in-person

events on the creation and strengthening of communication network ties suggest a need to explore this relationship more. Similarly, mixed findings in the literature about the impact of online tools to span geographic barriers—and the ways in which they do so through awareness and availability—also suggest a need to explore this relationship more. In both instances, I am interested in employees' perceptions of the impact of their individual behaviors along with the actual outcomes.

In the next section, I describe my research methodology designed to address these research questions.

Chapter 3: Methodology

My study gathered quantitative and qualitative data from 47 employees of a mid-sized academic library organization through an online survey focused on communication satisfaction, communication network, proximity, and proximity actions. This section describes my research design, population and sampling, constructs and instrumentation, collection procedures, data analysis, protection of human subjects, and methodology limitations. The instrumentation and data analysis sections both discuss each construct in turn, with the data analysis section also describing statistical tests.

Research Design

This mixed methods case study combines quantitative and qualitative data gathering and analysis in a triangulation design (Creswell & Plano Clark, 2007). I sought to identify trends across the entire population through the quantitative data, with the qualitative data providing validation of the quantitative data and additional insights into underlying perspectives, attitudes, and motivations. My data gathering survey emphasized quantitative data while collecting additional qualitative data. I used a parallel design rather than a sequential or convergent design for practical time constraint reasons (Creswell & Plano Clark, 2007; Hollstein, 2014). During the data analysis, I analyzed the quantitative data, analyzed the qualitative data, and then combined the findings into a single interpretation. The resulting validating quantitative data model attempted to combine the generalizability of quantitative methods with the rich details only available through qualitative methods (Creswell & Plano Clark, 2007).

This study also follows the advice of standard texts for diagnosing communication problems through the use of multiple types of data (Downs & Adrian,

2004; Hargie & Tourish, 2009). Combining data serves to both validate findings through triangulation as well as identify theoretical reasons and interventions to address communication problems. Zwijze-Koning and de Jong (2005; 2015) advocate for combining network analyses with other methods, describing the CSQ as a tool to measure satisfaction and network analysis as a tool to measure information flow. They caution, however, that "network relations must not be mistaken for effective information exchange" (Zwijze-Koning & de Jong, 2015, p.48). Network analysis is just one more method of gathering information about communication. Combining network analysis with additional quantitative and qualitative data helps to tell a more complete story.

Population

I studied the population of an academic library within a public university in the United States. The total population of the organization at the time of the study was 139 employees. The reporting structure consisted of approximately 21 departments in four administrative units consisting of 20 to 52 people each. Employees frequently collaborated across classifications, departments, and units. The organization was a subset of a larger university, and functioned in many ways as a self-contained entity with its own subordinate mission statement, strategic plan, and organizational culture. Similarly, the organization had a range of expertise and employment categories in a microcosm of the larger university.

At the time of the study, most employees maintained offices in one of three locations across campus, but many employees also worked in additional locations. Richman, Noble, and Johnson (2002) identified the following types of off-site workers: ad hoc tele-worker, regular tele-worker, remote worker, mobile worker, and customer site

worker. The studied organization included all but one of these types of employees at the time of the study. Some employees frequently moved throughout campus, some maintained secondary offices elsewhere on campus, and some employees worked from home one day a week or on an ad hoc basis. None of the employees worked entirely remotely. To maintain service hours to the campus community, some employees also worked non-traditional work hours such as in the evening, early morning, and weekends. Because of size, geographic locations, and service hours, no employee in the organization saw all other employees on a daily basis. Employees optionally served on internal committees and task forces, attended social events and training events with co-workers, and otherwise engaged with each other in activities beyond their primary work tasks.

The employees worked in a technology-rich environment, supporting others in the use of technology and information resources. Employees in the organization had experimented with a range of online tools to support communication across this distributed environment including the use of situated displays, virtual worlds, and chat rooms. Many employees were connected to each other informally through personal social networking sites such as Facebook, Twitter, and LinkedIn, and some used those same sites for promoting services to users.

Since 2008, the organization had gradually and formally adopted a suite of online tools to support organizational communication. The organization adopted a policy of using a shared calendar in 2008; at the time of the study, the selected tool was Microsoft Exchange typically viewed with Outlook. In 2012, the organization formally adopted Microsoft Lync (later rebranded as Skype for Business) as a shared tool for instant messaging and videoconferencing, and Microsoft SharePoint as a shared platform for

communication and collaboration. University policy prescribed Microsoft Exchange for work-related email. The organization added all employees to one or more email listservs—one for the entire organization and additional ones based on employment classification or other attributes. The result was a workforce with complex organizational communication needs and landscape, and a familiarity with a common suite of tools creating the potential of multiple venues and tools in a multiplex communication network.

Sampling

My study includes two types of quantitative data—traditional social science data about attitudes and behaviors and social network data—as well as qualitative data, each with different standards for sampling. Following the advice of Fraenkel, Wallen, and Hyun (2015) for correlational studies, I sought a minimum of 30 responses in order to generalize to the entire organization. For social network studies, researchers typically conduct either a full network study in which all subjects in a population participate through a census in order to study the entire network, or an egocentric study in which selected subjects report on their ties with others (Borgatti, Jones, & Everett, 1998; Hanneman & Riddle, 2005). Data about at least 60% of the entire network permits a full network study and robust analysis for both the individuals' placement within the network and the attributes of the full network (Costenbader & Valente, 2003; Smith & Moody, 2013). An egocentric study, instead, focuses on the ties of the respondent without attempting to identify ties among the full population (Robins, 2015). I planned my network data analysis appropriate for an egocentric study while leaving open the possibility of receiving enough response for additional analysis. Finally, the qualitative

data seeks to add additional insights and validation of the quantitative findings to allow generalization to the population even with a modest response rate.

In the next section, I review my constructs followed by a description of how I created the data gathering instrument.

Constructs and Instrumentation

I created an online data collection instrument consisting of 93 items for each of the studied concepts—quantitative and qualitative questions to study communication satisfaction, network questions to study network centrality, questions about availability in physical and virtual spaces to measure proximity, and quantitative and qualitative questions to explore proximity actions. I summarize each of these constructs and associated measures in Table 4. The survey also included socio-demographic questions, as listed in Table 5. See the Appendix for the full instrument.

Pilot Testing. I conducted a series of pilot tests using a concurrent think-aloud protocol with five members of the study population. I included this step to increase validity and reliability of the instrument—especially since so many of the questions were original. These pilot testers represented a diversity of the socio-demographic traits including different employment classifications, years of tenure in the organization, education levels, gender, and work teams. Three others outside of the studied organization, including two members of my thesis committee, also reviewed my survey instrument and provided feedback. This review and revision process addressed multiple non-response threats including lack of clarity and respondent discomfort for individual questions, and shortened the overall length of the instrument. In the following sections, I

provide more details about the construction of the instrument, including specific changes made in response to pilot testing.

Table 4.

Construct Definitions

Concept	Instrument	Measures
Communication Satisfaction	Likert response to items modified from Communication Satisfaction Questionnaire (Downs & Hazen, 1977)	Mean response for all items
Network Centrality	Identification of co-workers from whom the respondent regularly receives information "which helps you do the requirements of your job"	In-degree centrality—the number of actors from whom a person receives information Degree centrality—the number of actors to which a person is directly tied by either sending or receiving information
Proximity	Questions about locations in which respondent regularly is available Questions about frequency of participation in virtual spaces	Number of locations in which the respondent is available weekly
Proximity Actions	Questions about frequency of participation in in-person events Questions about frequency of participation in virtual spaces (same as above) Open ended questions about which best connects respondent to co-workers	Frequency of participation in in-person events and in virtual spaces

Socio-Demographics (Instrumentation). I included socio-demographic questions in the instrument in order to judge the extent to which the respondents reflected

the full population and as control variables for the constructs studied. Existing research suggests demographic attributes which are likely to correspond with responses regarding communication satisfaction. Clampitt and Girard (1993) in their meta-analysis of 18 studies with 1,411 respondents found that age, time in position, and organizational tenure all correlated with either overall communication satisfaction or with one or more of the constructs found within the CSQ. Gray and Laidlaw (2009) also found correlations between part-time employees and full-time employees in their ratings of CSQ constructs and selected items. Multiple studies additionally found correlations, albeit in opposite directions, with education level (Clampitt & Girard, 1993; Gray & Laidlaw, 2009). Neither Clampitt and Girard's 1993 meta-analysis nor Gray and Laidlaw (2009) found any differences related to gender. Based on these studies, I included questions about age, education level, time in position, time in organization, and part-time status in order to control for these variables.

I expected socio-demographic attributes to correlate with inclusion in communication networks through the concept of homophily. This concept states that two people who are similar to each other in traits that are otherwise not common in the larger population will be more likely to forge social network ties (Kadushin, 2012). Within the studied population, for instance, only 39.6% of the population is male and only 29.5% are classified as faculty. Homophily would suggest that the men may be more likely to create ties with other men, and faculty members may be more likely to create ties with other faculty members. Accordingly, I included questions in order to control for age, educational attainment, employment classification, gender identity, and supervisory role.

Employees also may have more reason to communicate with others in their immediate work group; frequently employees within a shared department accomplish similar tasks and share similar skill sets. Although all employees in this organization have a work group identified by the organizational chart, the organization does not use consistent language (i.e. department or unit) to refer to this work group, and some individuals work in multiple work groups concurrently or have worked in multiple work groups over the past year. The survey, then, included an open-ended self-reported work team question which I then planned to code to a department and unit. As described in the literature review, geographic proximity supports the creation of network ties. I included questions about work group and work location in order to control for both. Table 5 offers the list of socio-demographic variables and their potential influence on network centrality and communication satisfaction.

Table 5.

Socio-Demographic Variables

Variables	Potential Influence on
Age	Communication Satisfaction
Education level	Communication Satisfaction
Employee Classification	Network Centrality
Gender Identity	Network Centrality
Job Tenure	Communication Satisfaction
Office Location	Network Centrality
Org Tenure	Communication Satisfaction
Part Time/Full Time	Communication Satisfaction; Network Centrality
Supervisory Role	Communication Satisfaction, Network Centrality
Work Team	Network Centrality

Communication Satisfaction (Instrumentation). To create a measure of communication satisfaction, I started by adapting two instruments: an internal employee satisfaction survey and Downs and Hazen's Communication Satisfaction Questionnaire (CSQ). In both instances, I selected items from the larger instrument rather than using the entire instrument. Although in both instances respondents answer the original surveys anonymously, in order to correlate the communication satisfaction responses with the network analysis, my study collected individuals' names. Sensitive to the lack of anonymity for the current study, I removed selected questions which the pilot testers considered sensitive. I edited wording of items from the CSQ following input from the pilot tests. I modified the 7-point scale proposed by Downs and Hazen to match the 5-point scale currently in use for the internal employee satisfaction survey. I used labels for the ends of each scale—Very Dissatisfied (1) to Very Satisfied (5) for the CSQ items and Strongly Disagree (1) to Strongly Agree (5) for the internal survey. Ratings 2 through 4 on both instruments were unlabeled.

The internal survey from which I selected items consisted of 144 questions in 10 domains: Job satisfaction, Acknowledgement, Collaboration, Resources and Compensation, Organizational Effectiveness, Supervisor Relations, Administration Relations, Professional Development, Diversity, and Health and Physical Safety. Representatives from the studied organization and the university's assessment office developed the instrument collaboratively, modeling it on a similar instrument developed by The University of Virginia (Work Life Satisfaction Survey Committee, 2015). The organization administered the full instrument in 2012, 2013, and 2014. The eight items that I selected from this instrument for the current study related to communication, and I

included them without modification following successful pilot testing. As described in the data analysis section, below, I anticipated that the response to these items would be similar to the response to the CSQ items. The actual response, however, was skewed negatively in comparison to the CSQ suggesting that the two sets of items were not congruent. I ended up excluding the response to these items in the measure of communication satisfaction. These eight items (found in the Appendix as items 12a through 12h) remained in the survey and may have influenced response to other items; I include them in my findings discussion where relevant.

I adapted the remaining 25 items for communication satisfaction from the CSQ. The full CSQ consists of 40 Likert items and one open-ended question about communication satisfaction, plus two additional questions about job satisfaction. Practitioners and researchers cite this survey as easy to administer and brief to complete (Clampitt, 2009; Downs, 1994; Gray & Laidlaw, 2004). Of the major communication audit instruments, the CSQ is the only one which focuses on individual perceptions of satisfaction (Clampitt, 2009; Greenbaum, Clampitt, & Willihnganz, 1988).

I adapted the survey rather than using the entire instrument in an effort to increase participant response and validity. First, although the instrument is relatively brief—requiring between 10 and 30 minutes to complete (Clampitt, 2009; Downs, 1994)—when added to the questions for my other constructs, it produced a lengthy instrument. Second, in addition to the 40 core questions rated on a Likert scale, the survey includes open-ended and self-rating questions about job satisfaction and productivity. I removed these additional questions since they were excluded in the instrument's analysis of constructs and were potentially sensitive. Clampitt (2009) advises that employees generally need to

be guaranteed anonymity if a communication audit survey includes the potential of critical comments about a supervisor. Accordingly, I removed most of the questions about relationship to supervisor to increase the response rate. Finally, the current study focused on informal communication networks, primarily consisting of peer to peer communication. Accordingly, I removed the set of questions reserved for supervisors to answer. These questions primarily focused on supervisor relationship with subordinates, another potentially sensitive topic. These changes reduced the survey length and removed many sensitive questions.

Based on findings in the pilot testing, I made additional modifications to the items. I reinstated one item about communication from supervisor based on testers asking why the survey ignored the supervisor dimension to satisfaction. I made additional modifications to items to match a non-profit environment (*e.g.* changing "company" to "organization"). I divided items which pilot testers noted contained two concepts (*e.g.* "Extent to which communication with other employees at my level is accurate and free-flowing." became one item for "accurate" and one item for "free-flowing"). Multiple testers noted negative connotations toward the word "grapevine" in an item about "extent to which the grapevine is active." Testers noted a similar item which contained two concepts: "Extent to which informal communication is active and accurate." I changed these two items to "extent to which informal communication is active" and "extent to which informal communication is accurate."

The resulting items used in my study mapped to six of Downs and Hazen's original eight constructs as seen in Table 6. The items that related most directly to my selected area of focus for the network analysis— "receiving information which helps you

accomplish the requirements of your job"—are discussed in more detail in the Findings section.

Table 6.

CSQ Constructs Represented in Survey Instrument

CSQ Construct	Survey Items (as Found in Appendix)
Communication Climate	11a, 11b, 11c, 11e, 11f
Informal Communication	11g, 11h, 11i, 11l, 11o
Media Quality	11d, 11j, 11k, 11m, 11n, 11p
Organizational Integration	10a, 10b, 10c, 10f
Organizational Perspective	10d, 10e, 10g, 10h
Personal Feedback	10i

Network Centrality (Instrumentation). I created the network portion of the questionnaire based on best practices found in the literature about network analysis instrument design. The respondent selected names of "those from whom you regularly receive information which helps you accomplish the requirements of your job." This name generator question provided the respondent with a roster of all employees (other than themselves) working within the organization. Thaden and Rotolo (2009) concluded from their study comparing rosters with respondent recall that a roster accurately identifies more individuals in the network. Per recommendations from Robins (2015) the prompt for the name generator attempted to restrict the number of alters selected by providing qualifiers—in this case, "regularly" and "requirements of your job." Zwijze-Koning and de Jong (2007) advise increasing accuracy by indicating "in general" or "a typical workday" instead of a restricted time period. Also following the advice of Zwijze-

Koning and de Jong (2007) for increasing accuracy of the response, my survey sought a specific type of communication— “receiving information which helps you accomplish the requirements of your job”—rather than general communication. I selected both the time period and the qualifier through testing variations during the pilot testing, noting that a qualifier of “important information” created confusion, and a prompt which requested “all communication in the last two semesters” produced an unmanageable list of names for the follow up questions.

A name interpreter question displayed all the names chosen in the name generator question, and asked for frequency of receiving information. During my pilot testing, I observed the respondents systematically reviewing each name in turn, and then reviewing all their responses before proceeding to the next screen. This observation suggested that the format of the question provided more validity than alternative formats by allowing the respondent to compare their frequency responses across all of their informants. During the pilot testing, I also included a parallel question asking the respondent to indicate everyone to whom the respondent sent information useful for the recipient’s job. Feedback from a pilot tester suggested that such a question measured the respondent’s perception about the importance of their own information rather than the flow of information required for job. I removed this portion of the survey from the final instrument.

Proximity and Proximity Actions (Instrumentation). Researchers have created a number of creative ways to measure spatial distance as well as perceptions of proximity but have not settled on a standard measure (adams, Faust, & Lovasi, 2012; O’Leary, Wilson, & Metiu, 2014). For proximity and proximity actions, I considered the specific

context in relation to my research questions. All employees in the study population have an office of record, but many of them work from multiple locations including service desks within the main work buildings, auxiliary offices within other buildings on campus, and from home during selected hours. In addition, the two most populated work locations distribute office locations across three floors in each building, an architectural barrier to information flow (Allen & Henn, 2007).

For geographic proximity, I asked respondents to provide the number of hours of availability in 10 specific locations in which this organization's employees work. The list separated each floor of multistory buildings, following Allen and Henn's observation that employees on different floors of a building do not exchange information as often as those on the same floor (2007). I wanted to identify hours during which the respondent would be visible to others in the same proximity as other employees. Testing of the geographic proximity question during the pilot testing led to multiple revisions. Despite these changes, the resulting data demonstrated that this question remained problematic. As reported in the data analysis section, I ended up using the response to the geographic proximity question in an unintended way—replacing number of hours with number of locations.

The survey also sought to identify frequency of voluntary actions which increased proximity to other employees. The survey offered a list of specific websites and online services, and a more general list of voluntary in-person events and meetings. Pilot testing revealed a validity threat related to social desirability when the lowest frequency of participating in virtual spaces was "Never." Changing the lowest frequency to "Not in the Last 12 Months" increased pilot testers' comfort with selecting an accurate answer, even

if it was the lowest frequency. I provided an a priori list of in-person options based on my own and the pilot testers' experiences in the organization. I provided a list of virtual space options based on lists found online of the most popular social networking sites plus internal tools currently in use. Both questions offered "Other" with the option to provide additional examples. I used these two questions as measures for proximity actions. I also used the virtual space question to create a measure for virtual proximity, using a count of locations similar to the physical proximity measure.

An open-ended question seeking more insights into which actions "best enable you to connect with co-workers you do not regularly see in person" followed each of these proximity action questions. These questions sought to go beyond simply identifying frequency of participating by seeking information on the anticipated outcomes of that participation—particularly as it related to establishing and maintaining network ties.

Collection & Procedures

I administered the online survey created with Qualtrics through an employee email listserv, with two follow-up email reminders and a flyer distributed to most of the employee mailboxes or to offices. I also held two events with brief presentations about social networks and organizational communication, followed by questions from employees. Others in the organization voluntarily encouraged colleagues to participate through an internal newsletter. To increase participation, I attempted to appeal to both what's in for me (WIFM) and what's in it for the organization (WIFO)—both suggested by Clampitt in context of communication audit surveys (2009). I offered respondents the option to receive individualized feedback regarding their own location in the communication network of the organization. Additionally, I proposed that the overall

results could benefit the organization by leading to recommendations for changes to organizational communication practices used by individuals and the organization collectively.

Data Analysis

This study employed both quantitative and qualitative data analysis. I used UCINET (Borgatti, Everett, & Freeman, 2002) to derive network measures and NetDraw (Borgatti, 2002) to create visualizations of egocentric networks. I managed data and completed all analysis through Excel, SPSS, UCINET, and NetDraw, requiring frequent confirmation of data consistency in each location through visual inspection. More details follow on data analysis specific to each of my measures and research questions.

Socio-Demographics (Data Analysis). For socio-demographic questions, I examined all text entry responses, identifying them as falling within one of the offered categories, and coded them accordingly. For work team, some respondents indicated membership in more than one department. I coded all teams by their parent unit based on the organizational chart at the time of the survey. If an employee served in two units, I selected a primary unit based on the proximity of the employee's office to others in the same unit.

Communication Satisfaction (Data Analysis). I included thirty-three items from two existing instruments—an internal survey and the CSQ—in the survey. All items for communication satisfaction used 5-point Likert scales. I calculated a mean score for the combined response to all CSQ items following the practice found in studies using the instrument (Gray & Laidlaw, 2002; Meintjes & Steyn, 2006; Zwijze-Koning & de Jong, 2015). Similarly, I calculated a mean score for the combined response to the items from

the internal survey. Responses to the items from the internal survey had a slightly greater negative skew than those from the CSQ, indicating a possible difference in the constructs measured by the two instruments. I also noted that the statements which the respondents rated most positively all originated with the CSQ instrument, and the statements which the respondents rated least positively all originated with the internal survey. These contrasts suggested a lack of congruence validity. Because the items derived from the CSQ instrument had originally been created to measure communication satisfaction and were used in other studies, I proceeded with analysis using just items originating with the CSQ to measure communication satisfaction. I used SPSS to identify cases 1.5 times above the interquartile range as outliers for communication satisfaction. I evaluated the variable for violations of the assumption of normality by comparing skewness and kurtosis z-scores to the critical value of 1.96 (Field, 2013). To identify confounding variables related to communication satisfaction, I conducted a series of partial correlations (Field, 2013) for communication satisfaction and variables identified in the literature review—age, organizational tenure, supervisory role, and part time status. I also computed means for items which mapped to each of the five subscales originally identified by Downs and Hazen for the CSQ to be used to further explore possible correlations.

Network Centrality (Data Analysis). To create network centrality measures, I followed UCINET procedures as described by Prell (2012). I converted the survey data into a case-by-case adjacency matrix, as required by UCINET. I then converted the values (which ranged from 1 to 3 according to frequency of communication) to binary values (Prell, 2012). I computed in-degree centrality with this binary adjacency matrix.

The study requested information about receiving information in order to identify the in-degree centrality—that is, the number of incoming ties. I used the responses from all subjects to identify degree centrality—that is, the number of incoming and out-going ties—as well. To compute degree centrality, I converted the binary, directed ties to undirected ties using UCINET's symmetrize command, replacing any value from either actor with the minimum value (Prell, 2012). I then calculated degree centrality on this transformed data. In this way, degree centrality considers both incoming and outgoing ties equally. A person with only two incoming ties (i.e. receiving information from two people) gains a tie if nominated by another person as providing information. I examined both in-degree and degree centrality data for outliers by investigating the boxplots. I also evaluated both centrality variables for violations of the assumption of normality by comparing skewness and kurtosis z-scores to the critical value of 1.96. To identify confounding variables related to in-degree centrality and degree centrality, I did a series of partial correlations with supervisory role, part time status, employee classification, and work unit.

Proximity (Data Analysis). As described earlier for geographic proximity, I wanted to identify hours in specific locations during which the respondent would be generally visible to others incidentally in the same proximity. The resulting data indicated a lack of reliability through what appeared to be different interpretations of the question. Some respondents—even those in similar types of positions—indicated less than 2 hours of availability a week while others indicated more than 40 hours. In each case, however, the location with the most hours listed was also the location of the respondent's primary office. I decided that respondents interpreted the diversity of locations in a similar

manner. To create a measure for proximity through availability, I counted the number of locations with any indicated hours rather than summing all available hours. In counting locations, I ignored any location where no other employees worked on the same floor. If an employee worked in a building without any other employees on the same floor, that employee would need to visit another building where other employees physically worked to receive at least a 1 for geographic proximity. I examined this measure for outliers by investigating the boxplots, and evaluated the variable for violations of the assumption of normality by comparing skewness and kurtosis z-scores to the critical value of 1.96.

To create a measure for virtual proximity through availability, I counted the number of all virtual spaces in which a respondent participated weekly if at least two employees participated weekly as well. My rationale for creating a virtual proximity measure using just these most popular locations rather than the list of 34 was that these were analogous to the physical locations where clusters of employees work. Similar to ignoring locations where no other employee worked on the same floor, I ignored virtual spaces where only one employee participated on a weekly basis. I examined this measure for outliers by investigating the boxplots, and evaluated the variable for violations of the assumption of normality by comparing skewness and kurtosis z-scores to the critical value of 1.96.

Proximity Actions (Data Analysis). Respondents reported voluntary participation in events and meetings which were likely to bring them into closer proximity to other employees. I reported the responses for this question with frequencies rather than attempting to create a measure to be used in further analysis. Similarly, I

reported the response to the virtual proximity question described in the previous section as frequencies.

Correlational Analysis. My first research question was: RQ1 Does a relationship exist between network centrality and communication satisfaction? The measures for communication satisfaction and network centrality allowed for the testing of the following hypotheses for RQ1:

- Hypothesis 1 (H1): An employee's network centrality correlates positively with communication satisfaction.
- Hypothesis Null (H0): An employee's network centrality has no correlation with communication satisfaction.

Network analysis inherently attempts to study the ties of individuals across an entire network. Prell (2012) cautions that a typical statistical test "assumes that each of your cases…is considered separate and independent from one another" (p.200). As such, researchers commonly analyze full network data with permutation tests such as spatial autocorrelation (Prell, 2012; Robins, 2015). Following the procedures described by Hanneman and Riddle (2005), I conducted two spatial autocorrelation tests to identify the extent of relationship between the communication network data and communication satisfaction for each participant. Moran's *I* originates in geography and is common within social network analysis (Hanneman & Riddle, 2005). Moran's *I* ranges from -1 (perfect negative correlation) to 1 (perfect positive correlation) with 0 indicating no correlation. Geary's *C* is an alternative spatial autocorrelation test also recommended by Hanneman and Riddle (2005). Geary's *C* has a value of 1.0 when there is no association, with values less than 1.0 indicating a positive association and values greater than 1.0 indicating a

negative association. I conducted the tests with an adjacency matrix using frequency data, after I symmetrized all tie values using the maximum value as recommended by Hanneman and Riddle (2005). I removed the nodes for non-responding alters for both spatial autocorrelations because they lacked a communication satisfaction measure. Doing so, however, created a serious limitation in this otherwise preferred analysis. By removing non-respondents from the dataset, both centrality measures considered only ties between the 47 respondents rather than the ties these respondents reported that they had with non-respondents. For this reason, I then considered additional correlational tests which included the ties between respondents and non-respondents.

The two network measures I used are egocentric—that is, they focus on the ties directly with the respondent rather than relying on measures across the entire network. Accordingly, I conducted a one-tailed bivariate correlation producing Pearson's correlation coefficients to assess the relationship between the in-degree centrality and communication satisfaction. I conducted the same test to assess the relationship between degree centrality and communication satisfaction. I created subgroups based on confounding variables (identified earlier through partial correlations) and repeated the one-tailed bivariate correlations to test H1 for subgroups. Finally, I conducted additional bivariate correlation data analyses pairing each of the five communication satisfaction subscales originally identified by Downs and Hazen with the in-degree centrality measure and then with the degree centrality measure. I used an alpha level of .05 for all statistical tests.

In the findings chapter, I provide cross tabulation and frequency tables for additional data which I did not statistically correlate.

Qualitative Analysis. The survey included four qualitative questions. I attempted to reduce researcher bias in my analysis of qualitative comments by completing all data analysis—including for the qualitative data—with identification numbers rather than respondent names. Two questions sought additional information about the proximity actions which "best enable you to connect with co-workers you do not regularly see in person." I counted each type of proximity action mentioned within the comments. I then identified themes that emerged for each of the types of actions. Finally, I reviewed the themes overall for their connection to communication networks and the concepts found in the literature about awareness.

The survey included two opportunities for the respondents to offer general observations about communication in the organization: "Do you have additional thoughts about communication practices in the organization?" and "Do you have any additional observations about the topics addressed in this survey?" As with the other qualitative data, I attempted to reduce researcher bias through using data with only identification numbers rather than respondent names. I identified themes which emerged in the data. I also compared the themes with the results from the quantitative data to enhance and validate my quantitative findings.

Protection of Human Subjects

Studying social networks within an organization includes risks to the participants beyond the typical risks associated with social science research. Borgatti and Molina (2005) provide a comprehensive discussion of these additional risks, which I have summarized here. Inherent in research conducted within a single organization is the risk that managers will use the data for personnel management or changes, or that managers

will coerce employees to participate. Social network analysis, specifically, seeks information about ties between individuals. The participants must provide their own and others' names so that the researcher may identify reciprocal relationships. The studies usually include names of non-respondents in the respondent's network, regardless of their informed consent. Even when reporting only de-identified data, the small populations found in many organizations may allow for easy identification of individuals through guesswork.

Following the advice of Borgatti and Molina (2005), the proposed study employed the following safeguards to reduce risk to the participants, and to ensure that they were fully informed of the remaining risks. I confirmed with the senior administrator a mutual understanding that the research would only provide unidentifiable data to the administration and to the organization. To reduce coercion from supervisors to participate, I called for volunteers directly without help from supervisors and emphasized that participation was voluntary. The informed consent form for the participants included an example of a network diagram. The survey itself avoided any questions regarding dislike or interpersonal friction, focused on communication relationships rather than interpersonal relationships, and did not inquire about adherence to policy related to the use of online tools. In all reporting of results, I took care to prevent accidental guessing of individuals through department size or demographic data. These steps worked to mitigate many of the risks to participants and informed them of the remaining risks.

Limitations

Earlier in this chapter, I discussed generalizability to my population, attempts to increase the validity and reliability of the survey instrument, and safeguards for the

participants which served to increase participation. As with any research which asks individuals to self-report their behaviors and their perceptions, the conclusions of the study depended on the accuracy of the self-reported data. The remainder of this chapter focuses on additional limitations specific to this study methodology.

This study has the potential for researcher bias through the researcher being a member of the studied organization. This risk exists for both the creation of the survey instrument and analysis of responses, particularly the qualitative responses. For the creation of the survey instrument, I attempted to identify and remove my own bias through the pilot study. For example, I edited the lists of possible proximity actions to match the language and additions suggested by the pilot testers. I also sought testers who were different from me in their work location, work unit, gender, age, and employment classification. As mentioned earlier, I attempted to reduce my bias when analyzing the qualitative data by working only with coded data so that I would not allow the names of the respondents influence my interpretations. I confirmed that the themes appeared in the quantitative data, as well, as a safeguard against my own bias. Even with these safeguards, I was not able to completely eliminate researcher bias for this study.

My dual role as researcher and a member of the population also presented a risk based on, ironically, the influence of social networks. I am known to most of the population under study as a member of the organization and as an advocate for organizational communication through both in-person events and online tools. The social network aspect of the study meant that the survey response was not anonymous, including responses about communication satisfaction and proximity actions. I expected that my dual role would lead some potential respondents to exclude themselves from the

study, and could lead those who did participate to moderate their responses creating a social desirability bias. My study, too, only gathered minimal communication network data about each of the respondents in an effort to keep the survey non-threatening. In doing so, I intentionally limited my data gathering and the potential ability to identify confounding variables. Additionally, the participants in the study were volunteers who were likely to be interested in strengthening their communication ties; they may have more readily created new communication ties than non-volunteers.

In summary, this section described my research design, constructs, population, and sampling considerations. I also offered details of my instrument design, collection procedures, data analysis, protection of human subjects, and limitations. The next section presents the findings of my study.

Chapter 4: Findings

This section reports the results of the data analysis. First, I provide descriptive statistics for the respondents overall. I then provide descriptive statistics for each of the constructs—communication satisfaction, network centrality, proximity, and proximity actions—along with findings for each of my research questions.

Socio-Demographic (Findings)

This section provides descriptive statistics for the sample overall, compared to the full population where possible. Forty-seven employees out of the 139 staff in the organization responded for a response rate of 34%. I provide descriptive statistics in Table 7 through Table 9. Where available, I also provide the proportion of the variable in the overall population to provide a comparison of my sample's characteristics to the population. The sample was predominantly female (64%), similar to the full population. The sample was highly educated with all participations having at least some undergraduate coursework, and 61% having graduate level degrees. Compared to all employees, my sample included more supervisors, full time employees, and faculty than expected.

Table 7.

Demographics of Sample and Population

Variables		# Respondents	% Respondents (n=47)	% Population (n=139)
Gender	Female	30 (28)	63.8%	60.4%
	Male	17 (18)	36.2%	39.6%
Age	20-29	8	17.0%	Unavailable
	30-39	16	34.0%	
	40-49	11	23.4%	
	50+	12	25.5%	
Highest Level Education	Undergrad coursework	2	4.3%	Unavailable
	2- or 4-year degree(s)	18	38.3%	
	Master's degree(s)	24	51.1%	
	Doctoral degree	4	8.5%	

Table 8.

Employment Characteristics of Sample and Population

Variables		# Respondents	% Respondents (n=47)	% Population (n=139)
Supervisory	No	28	59.6%	73.4%
	Yes	19	40.4%	26.6%
Work Status	Full Time	41	87.2%	73.4%
	Part Time	6	12.8%	26.6%
Classification	Classified/Wage	29	61.7%	70.5%
	Faculty	18	38.3%	29.5%

Table 9.

Employment Tenure of Sample

Variables		# Respondents	% Respondents (n=47)
Organization Tenure	Less than 1 year	4	8.5%
	1 to 4 years	18	38.3%
	5 to 8 years	15	31.9%
	9 years or more	10	21.3%
Job Tenure	Less than 1 year	9	19.1%
	1 to 4 years	17	36.2%
	5 to 8 years	16	34.0%
	9 years or more	5	10.6%

Table 10 shows the respondent's primary work unit in comparison with the full population. The sample included proportionately more employees in Unit B than expected, and fewer employees in Unit C and Unit D than expected. Table 11 offers the primary work location of each respondent by building. The sample closely matched the population for primary work location by building.

Table 10.

Primary Work Unit of Sample and Population

Work Unit	# Respondents	% Respondents (n=47)	% Population (n=139)
Unit A	18	38.3%	37.4%
Unit B	20	43.6%	25.9%
Unit C	5	10.6%	22.3%
Unit D	4	8.5%	14.4%

Table 11.

Primary Office Location of Sample and Population

Primary Office Location	# Respondents	% Respondents (n=47)	% Population (n=139)
Building A	38	80.9%	74.8%
Building B	7	14.9%	20.9%
Other Buildings	2	4.2%	4.3%

Measure: Communication Satisfaction (Findings)

I measured communication satisfaction through 25 items from Downs and Hazen's Communication Satisfaction Questionnaire (CSQ) and also included eight

additional items from an internal survey which I removed for correlational analysis. All but one respondent rated all 33 items. As described in the Methodology chapter, I used 25 items from the CSQ for my measure of communication satisfaction. I provide means and standard deviations for this measure as well as the corresponding subscales from the original CSQ in Table 12. I kept only a single item for the subscale of Personal Feedback, for which I do not report mean because it is only a single item rather than a scale.

I examined the communication satisfaction measure for outliers by investigating the boxplots and found no outliers. I evaluated the variable for violations of the assumption of normality by comparing skewness and kurtosis z-scores to the critical value of 1.96. The values were not significantly different from zero ($p < .05$).

Partial correlation tests between communication satisfaction and each of the control variables identified in the literature review (age, organizational tenure, supervisory role, education level, and part time status) found no significant correlations. I proceeded with the analysis using the mean of the response to the entire instrument as my measure for communication satisfaction, and the mean of each of the subscales as measures for additional analysis (as shown in Table 12).

Table 12.

Communication Satisfaction Means and Standard Deviations

Measure (n=47)	Mean	*SD*
Communication Satisfaction	3.55	.59
Subscale: Communication Climate	3.37	.75
Subscale: Informal Communication	3.60	.70
Subscale: Media Quality	3.54	.65
Subscale: Organizational Integration	3.61	.65
Subscale: Organizational Perspective	3.68	.68

When comparing the subscales, the mean for communication climate was markedly below the mean for overall communication satisfaction while the other subscales were similar to the overall mean. See Figure 6 for the items found in communication climate. Of particular note for the items within this subscale is the relatively positive response (66% positive) to receiving information needed to do my job in a timely manner. This item is similar to the question I asked within the survey to identify network centrality. The lowest rated item within this subscale is about the handling of conflicts with only 37% of respondents satisfied, and 32% of respondents indicating dissatisfaction. This item about handling of conflicts, in fact, received the most negative response of all the items derived from the CSQ.

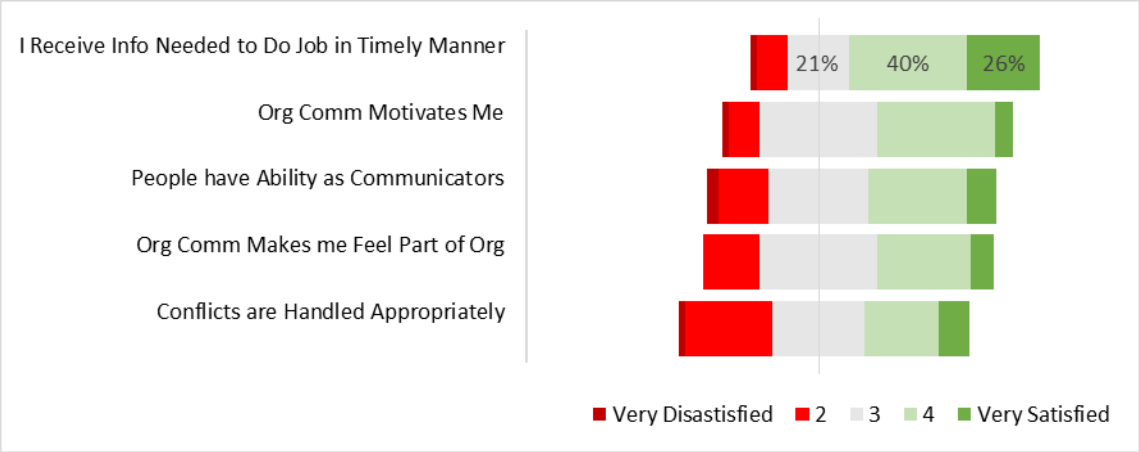

Figure 6. Communication climate items and response including positive response for receiving information and negative response for handling of conflicts.

Measure: Network Centrality (Findings)

I computed in-degree centrality and degree centrality as described in the Methodology chapter. I examined in-degree centrality for outliers by investigating the boxplots using SPSS, identifying one case that was 1.5 times above the interquartile range. I also examined degree centrality for outliers by investigating the boxplots using SPSS, and identified the same case that was 1.5 times above the interquartile range. I conducted my analysis with the case as well as without. Neither analysis produced significant correlations. The job responsibilities of this one case were for an unusual job responsibility in this organization. I report the correlations and frequencies throughout this findings section with the outlier case excluded to best represent the majority of positions within the organization. I offer network centrality measures with the one outlier removed in Table 13.

Table 13.

Network Centrality Means and Standard Deviations

Measure	Mean	*SD*
In-degree Centrality (n=46)	20	12.50
Degree Centrality (n=46)	23	11.74

To conceptualize the difference between the minimum and maximum degree centrality in this study, see Figure 7 for an actor with a degree centrality of 3, and Figure 8 for an actor with a degree centrality of 51. Figure 7 shows an employee (the white node) who regularly exchanges needed job information with three others (the black nodes). Two of those alters regularly communicate with each other, represented by the connecting line between two of them. In contrast, Figure 8 shows a respondent in the center of a busy, communication network. The employee is connected to 51 alters with ties, and those alters also reported ties to each other. Both figures include partial ties between actors beyond the sample, as reported by the respondents in this study. In other words, these ties are only some of the existing ties—additional respondents would have revealed more ties.

Figure 7. Actor with centrality measure of 3. A white node represents the actor. The actor exchanges information with three alters, represented by black nodes. Two of those alters also exchange information with each other.

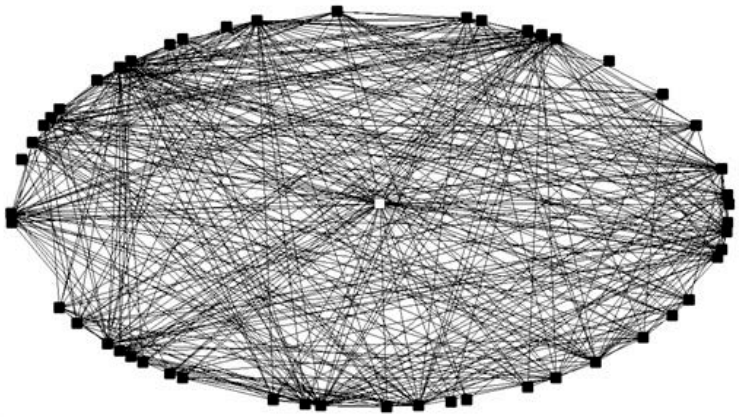

Figure 8. Actor with centrality measure of 51. A white node represents the actor. The actor exchanges information with 51 alters, represented by black nodes. Many of those alters also exchange information with each other.

I conducted a series of partial correlation tests between in-degree centrality and control variables and found a significant relationship between in-degree centrality and part time versus full-time status ($r(44) = -.352$, $p = .008$) and supervisory role ($r(44) = -.363$, $p = .007$). I conducted a second series of partial correlation tests between degree centrality and control variables and found a significant relationship between degree centrality and part time versus full-time status ($r(44) = -.451$, $p = .001$) and supervisory role ($r(44) = -.381$, $p = .004$). These relationships are logical; both full-time employees and supervisors have the opportunity and theoretical need to receive and exchange information with a larger number of co-workers than part-time employees or non-supervisors.

I evaluated both centrality variables for violations of the assumption of normality by comparing skewness and kurtosis z-scores to the critical value of 1.96. The values were not significantly different from zero ($p < .05$), so I proceeded with analysis.

RQ1: Communication Satisfaction and Network Centrality

With the two measures just described, I now present my findings for my first research question and my hypothesis:

- RQ1 Does a relationship exist between network centrality and communication satisfaction?
- H1: An employee's network centrality correlates positively with communication satisfaction.

My analysis included correlational tests and descriptive statistics for the quantitative data, and themes identified in the qualitative data.

I conducted two spatial autocorrelation tests to identify the extent of a statistical relationship between the communication network data and communication satisfaction for each participant. Moran's *I* analysis showed no significant correlation between the two variables, $I = -.073$, $n = 46$, $p = .072$. The Geary test showed no correlation between the two variables, $C = .979$, $n = 46$, $p = .426$. I then conducted a one-tailed bivariate correlation producing a Pearson's correlation coefficient to assess the relationship between the in-degree centrality and communication satisfaction, and then between in-degree centrality and each of the five communication subscales. I found no significant correlation between the two variables. I conducted a one-tailed bivariate correlation to assess the relationship between degree centrality and communication satisfaction. I found no significant correlation between the two variables. I conducted bivariate correlations with each of the degree centrality measures and the mean for each of the five communication satisfaction subscales, and found no significant correlations. See Table 14

and Table 15 for the results of each of these tests with all respondents minus the one outlier.

I proceeded with additional analysis controlling for confounding variables. Based on the significant relationship identified for part time versus full time status, and supervisory role, I created two subgroups: full time employees in a supervisory role (n = 15), and full time employees not in a supervisory role (n = 25). I conducted one-tailed bivariate correlations producing a Pearson's correlation coefficient to assess the relationship between the in-degree centrality for each subgroup and communication satisfaction and each of the five subscales. See the results of this series of correlations in Table 14. I repeated these analyses using degree centrality, as shown in Table 15. As shown in the table, none of the correlations were significant at .05. I found no statistical evidence of a positive correlation between an employee's in-degree centrality and communication satisfaction, nor between an employee's degree centrality and communication, even after considering controlling variables and communication satisfaction subscales. I failed to reject the null hypothesis, and I rejected H1.

Table 14.

Communication Satisfaction Correlation with In-Degree Centrality

Measure	FT Supervisory (n=15)		FT Nonsupervisory (n=25)		All (n=46)	
	r	*p*	*r*	*p*	*r*	*P*
Communication Satisfaction	-.018	.474	-.111	.299	-.064	.337
Subscales						
Communication Climate	-.041	.442	-.074	.363	-.077	.306
Informal Communication	.105	.355	-.212	.155	-.136	.183
Media Quality	-.088	.377	-.085	.343	-.072	.318
Organizational Integration	.042	.441	-.110	.300	.042	.390
Organizational Perspective	-.111	.347	.013	.475	.009	.476

Table 15.

Communication Satisfaction Correlation with Degree Centrality

Measure	FT Supervisors (n=15)		FT Nonsupervisory (n=25)		All (n=46)	
	r	*p*	*r*	*p*	*r*	*p*
Communication Satisfaction	-.052	.427	-.203	.165	-.120	.214
Subscales						
Communication Climate	-.087	.379	-.201	.168	-.151	.159
Informal Communication	.094	.370	-.302	.071	-.177	.119
Media Quality	-.115	.342	-.180	.194	-.131	.193
Organizational Integration	-.016	.478	-.167	.212	.008	.479
Organizational Perspective	-.096	.367	-.007	.487	-.016	.457

Although all items in the survey were about communication satisfaction, some of them were more closely tied to the concepts of receiving information required for job through informal communication. The individual items about communication satisfaction shown in Figure 9 were directly related to receiving information related to job and/or informal communication—and so most closely tied to the intersection for RQ1 of

communication satisfaction and receiving information required for one's job. The figure includes selected items which originated with the internal survey, as well, which I excluded from the correlational analysis in the previous section.

When looking at the data in this way, a number of findings emerge. Respondents are relatively satisfied with information about the requirements of their job (72% positive) and receiving information needed to do their job in a timely manner (66% positive) while less so for information important to their job in a timely manner (57% positive) and the sufficiency of information within the organization (57% positive). Respondents were even less positive about being aware of changes in other departments that affect their job—only 47% responded positively and 35% responded negatively. In contrast, respondents responded to a similar item at the organization-wide level "Information about organizational changes" (not shown) with 53% positive and only 13% negative response. Although the respondents are relatively positive about knowing who to ask in other departments when they need help (57% positive and only 17% negative), respondents indicate a mutual lack of familiarity with each other's' jobs. This contrast could be explained by having a single contact within a department, or knowing to ask the supervisor in the department when they need help. The survey data indicates less satisfaction with receiving important information (as opposed to needed information) and information from other departments.

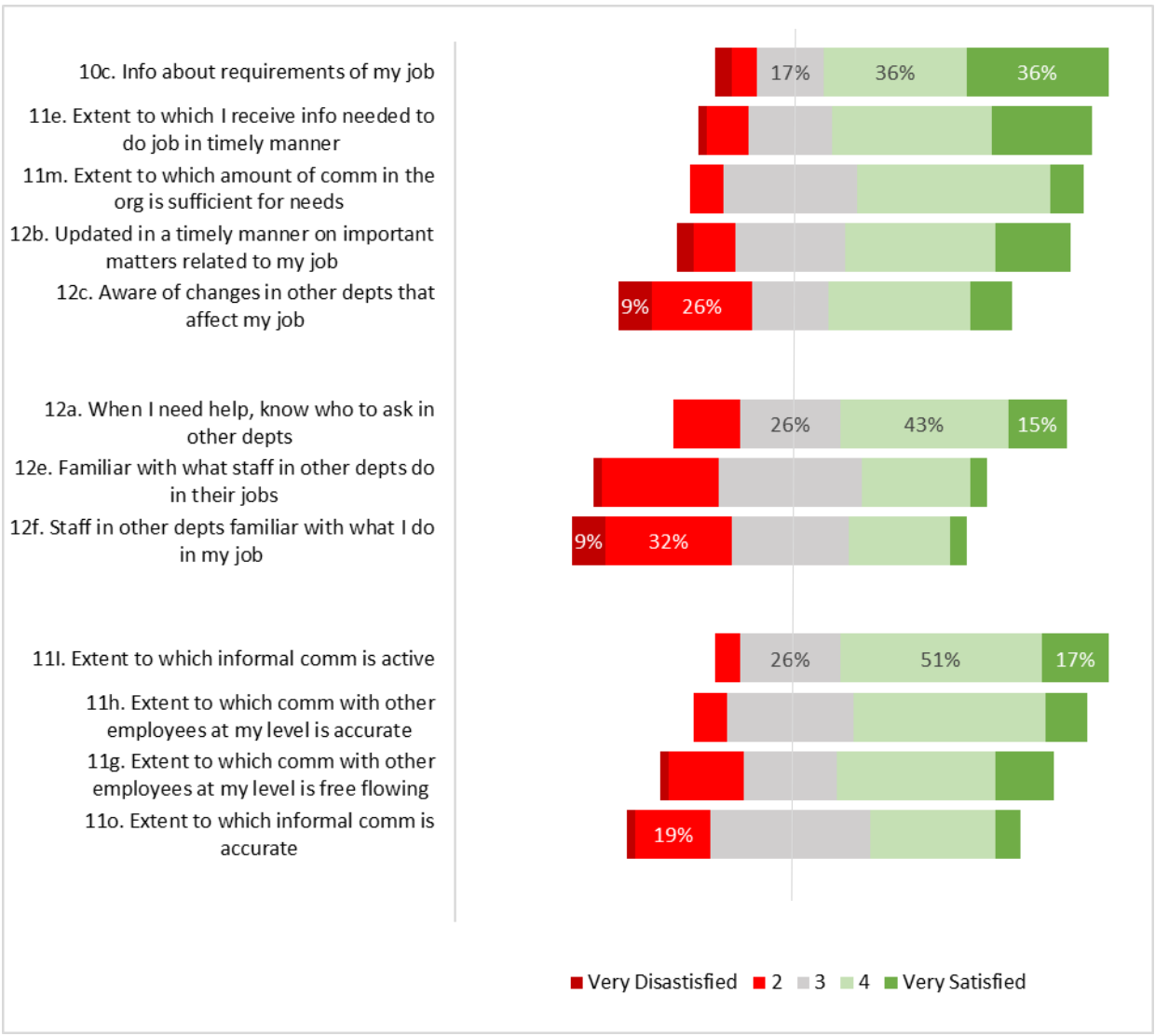

Figure 9. Communication satisfaction and receiving information required for job from peers. Item numbers correspond to those found in the Appendix. Item numbers starting with 10 or 11 originated with the CSQ. Item numbers starting with 12 originated with the internal survey.

The responses also indicate a difference in perception about accuracy versus activity, and for "other employees at my level" versus "informal communication." Four similar items about accuracy and activity are also shown at the bottom of Figure 9. When the question was about "informal communication," the respondents offered their perception that it was active (68% positive, 6% negative) but not accurate (only 38%

positive, 21% negative). When the question was about communication with "other employees at my level," the respondents indicated that it was accurate (60% positive, 9% negative) but less "free flowing" (55% positive, 21% negative). I sought a possible explanation for this difference in the qualitative data but am not able to offer additional insights related to this finding.

The survey included two opportunities for the respondents to offer general observations about communication in the organization. Eighteen respondents answered the two questions. I analyzed the comments together and two themes relevant to this first research question about communication satisfaction and network centrality emerged. These qualitative findings support the descriptive, quantitative findings.

The first of the themes I identified supported a relationship between communication satisfaction—expressed negatively as not learning important information—and connections with others. Four comments, in particular, elaborated on this relationship. One respondent described the challenge as one of connections: "some changes/actions are communication [to] well-connected groups but then are announced later to the organization at large [resulting] in a complete surprise to the less-connected audience." Another respondent similarly noted that information shared is "completely based on the individual(s) who hold the information." This comment agrees with a quantitative response to an item: only 15% of the respondents agreed with the statement "Communication is consistent across the organization." A third respondent acknowledged the difficulty in identifying stakeholders in a growing organization, suggesting a challenge for both communicators and stakeholders if they are not well-connected. This comment echoed the quantitative response to statements about others' familiarity with

what they do or their own familiarity with what others' do for their job. Respondents offered three possible, complementary solutions to this problem. One respondent proposed that others should err on the side of over-communicating, allowing the receivers to identify the relevant portions. Another respondent reported that their supervisor effectively explained the organization-wide communication in context to the respondent's job. A third respondent proposed that "individuals in the workplace bear some responsibility to seek out information." These three comments taken together suggest the responsibility of three roles—the sender, an intermediary, and the receiver—for providing, conveying, and seeking out relevant information to stakeholders.

The second theme centered on whether communication was most satisfying at the departmental or at the organizational level. One respondent described themselves as "extremely satisfied with all thing pertaining to communication within my department" noting that issues arise with communication from the larger organization. Another respondent described communication "in the organization at large to be mostly satisfying" but that communication at the department and unit level needed improvement. At first glance, these statements appear in direct opposition. The quantitative response, however, highlights challenges with communication between departments. In addition to the previously discussed awareness of changes in other departments that affect my job (47% positive), respondents also shared low satisfaction about how information about other department policies and goals are communicated (23% positive). The survey also found high satisfaction with supervisors effectively communicating information with the respondent (66% positive) and compatibility within workgroups (70% positive). Additionally, respondents noted that "communication from the administration has greatly

improved" and that "there has been an effort made to increase transparency." Formal mechanisms instituted over the past 2 years—meetings and posting minutes to the intranet—were also noted as positive changes improving communication. Comments indicated a hopefulness that open and transparent communication would continue from the senior management and increasingly spread throughout the organization. Taken together, the qualitative and quantitative responses suggest more of a challenge with the flow of information between departments, rather than intradepartmental communication or organization-wide communication originating from central administration.

Measure: Proximity (Findings)

For geographic proximity, I counted the number of locations with any indicated hours. I examined this measure for outliers by investigating the boxplots, and found one outlier. I removed the outlier, and evaluated the variable for violations of the assumption of normality by comparing skewness and kurtosis z-scores to the critical value of 1.96. The skewness value for physical proximity was significantly different from zero, meaning the assumption of normality was not met, so I proceeded with descriptive analysis including the outlier. I report the mean and standard deviation in Table 16. Respondents reported, on average, two physical locations in which they were regularly available. The mode was one location with 47% of all respondents reporting. Nine respondents (19%) reported four to seven locations.

The respondents also reported how often they participated in each of 34 websites and online services in which they believed other employees of the organization also participated. To create a measure for virtual proximity through availability, I counted the number of all virtual spaces in which a respondent participated weekly if at least two

employees participated weekly as well. I examined this measure for outliers by investigating the boxplots, and found two outliers. I removed the two outliers and evaluated the variable for violations of the assumption of normality by comparing skewness and kurtosis z-scores to the critical value of 1.96. The skewness value for virtual proximity was significantly different from zero, meaning the assumption of normality was not met, so I proceeded with descriptive analysis including the two outlier cases.

Respondents reported, on average, seven virtual spaces in which they participated once a week or more. The mode was five locations, reported by 10 respondents (21%). Respondents reported from two to 18 virtual locations. I provide the mean and standard deviation in Table 16.

Table 16.

Proximity through Availability

Measure	Mean	*SD*
Weekly Number of Physical Locations (n=47)	2	1.50
Weekly Number of Virtual Locations (n=47)	7	3.66

RQ2: Communication Satisfaction and Proximity

With the proximity measures just described, I now present my findings for my second research question: Does a relationship exist between proximity and communication satisfaction? Table 17 shows mean communication satisfaction for each of the geographic and virtual proximity scores. I grouped virtual proximity locations at the higher end to combine measures with only one respondent. For geographic proximity,

those working in a single location on a weekly basis reported higher communication satisfaction than the mean of all respondents. Respondents participating in six of the virtual locations on a weekly basis reported a higher communication satisfaction than the mean of all respondents.

Table 17.

Communication Satisfaction Mean and Proximity

Number of Locations	Mean for Geographic Proximity	Mean for Virtual Proximity
1 Location	3.72 (n=22)	
2 Locations	3.40 (n=12)	2.94 (n=2)
3 Locations	3.34 (n=4)	3.64 (n=4)
4 Locations	3.50 (n=5)	3.56 (n=9)
5 Locations	3.62 (n=2)	3.44 (n=10)
6 Locations	3.76 (n=1)	3.81 (n=6)
7 to 10 Locations	2.52 (n=1)	3.53 (n=8)
11 to 18 Locations		3.62 (n=8)
Any Number	3.55 (n=47)	3.55 (n=47)

The qualitative data offers an additional finding reinforcing a relationship between communication satisfaction and proximity. One employee offered an observation about “over the years and consistently” being “forgotten” and attributed it, in part, to an office that was geographically remote from many other offices. These findings

connecting communication satisfaction to proximity are preliminary and suggest future research opportunities.

Measure: Proximity Actions (Findings)

Respondents reported voluntary participation in events and meetings which were likely to bring them into closer proximity to other employees. I report the frequency of these activities in Figure 10, excluding those who responded "not in the last 12 months." Written-in events included film making, a daily trivia contest held over Skype, and informal conversation within the office area.

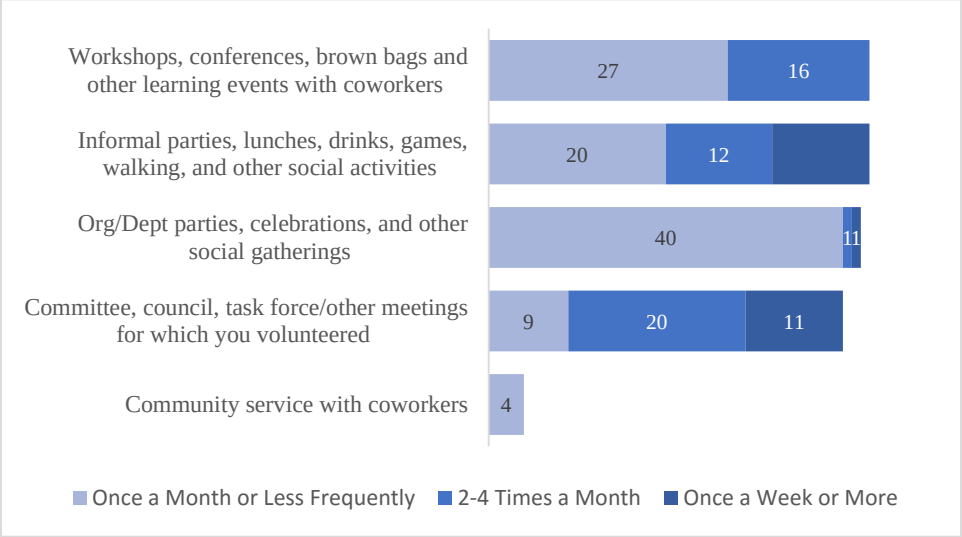

Figure 10. Bar chart showing geographic proximity actions by frequency

As discussed earlier, the respondents also reported how often they participated in each of 34 websites and online services if they believed other employees of the organization also participated. Each of the listed options was used by at least one respondent within the last 12 months. All respondents indicated using Outlook/Exchange Email once a week or more, while 45 (96%) respondents indicated using

Outlook/Exchange Calendar weekly, 29 (62%) used SharePoint weekly, and 28 (62%) used Lync (Skype for Business) weekly. The organization provides and encourages use of these applications. See Figure 11 for the frequency of the ten most popular of these virtual spaces, excluding those who responded "not in the last 12 months." Four respondents also added other tools: SpringShare (LibChat), a commercial suite of applications used in libraries; and When to Work, a commercial employee scheduling website.

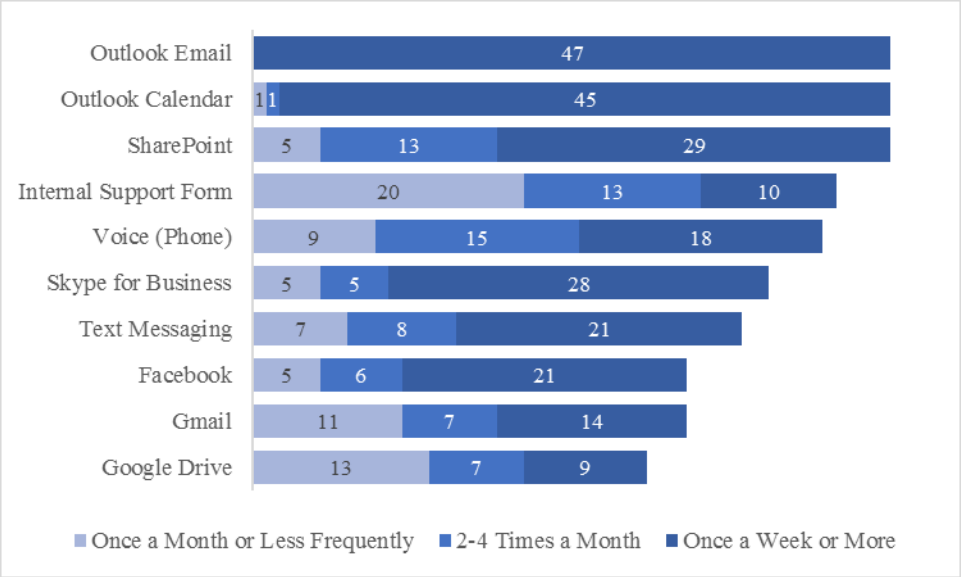

Figure 11. Bar chart showing virtual proximity actions by frequency

RQ3: Network Centrality and Proximity Actions

The next research question (RQ3) explored: Does a relationship exist between proximity actions and network centrality? In this section, I report on the quantitative and qualitative findings related to geographic proximity actions and network centrality, followed by a similar comparison for virtual proximity actions and network centrality.

See Table 18 and Table 19 for comparisons of means for in-degree centrality and degree centrality and geographic proximity actions. When considering the average in-degree centrality (*M*=20) and average degree centrality (*M*=23) for these respondents, note the higher than average mean for those participating in informal social events two to four times a month. Those who attend informal social events two to four times a month reported, on average, 30 incoming ties—or 30 co-workers who regularly provided them information useful for their job on at least a monthly basis, and 32 either incoming or outgoing ties—or 32 co-workers with whom they exchange information useful for jobs at least on a monthly basis. Similarly, respondents reporting participation in learning events two to four times a month also reported higher than average in-degree centrality (*M* =25) and degree centrality (*M* =29). Those who reported participating in committee service once a week or more also reported a higher in-degree centrality (*M* =26) and degree centrality (*M*=28) than the average.

Table 18.

Geographic Proximity Actions and In-Degree Centrality Mean

Proximity Actions	Mean for Not in the Last 12 Months	Mean for Once a Month or Less	Mean for 2-4 Times a Month	Mean for Once a Week or More
Learning Events (n=46)	14 (n=4)	17 (n=26)	25 (n=16)	
Informal Social Events (n=46)	10 (n=4)	16 (n=19)	30 (n=12)	18 (n=11)
Organizational Social Events(n=46)	9 (n=4)	21 (n=40)	15 (n=1)	9 (n=1)
Committee Service (n=46)	16 (n=7)	16 (n=8)	19 (n=20)	26 (n=11)
Community Service (n=46)	20 (n=42)	21 (n=4)		

Table 19.

Geographic Proximity Actions and Degree Centrality Mean

Proximity Actions	Mean for Not in the Last 12 Months	Mean for Once a Month or Less	Mean for 2-4 Times a Month	Mean for Once a Week or More
Learning Events (n=46)	14 (n=4)	21 (n=26)	29 (n=16)	
Informal Social Events (n=46)	13 (n=4)	20 (n=19)	32 (n=12)	23 (n=11)
Organizational Social Events (n=46)	12 (n=4)	25 (n=40)	22 (n=1)	14 (n=1)
Committee Service (n=46)	18 (n=7)	19 (n=8)	24 (n=20)	28 (n=11)
Community Service (n=46)	23 (n=42)	23 (n=4)		

To explore this relationship further, the survey included the following open-ended question: “Of the types of meetings and events listed above, list three that best enable you to connect with co-workers you wouldn't normally see in person. Please describe how these events help you with these connections.” Forty respondents provided an answer, providing findings related to the perceived and distinct benefits of each of the listed actions.

Twenty-six respondents (65%) listed informal parties, lunches, drinks, games, walking, or other social activities either generally or specifically. Notably, having lunch with co-workers—whether in a break room or elsewhere—was common. Some respondents described the benefit of gathering spots such as the break room for games during lunch or a coffee area. The respondents reported that these activities provided a low pressure means to share both work and personal interests, and strengthen relationships that already exist. The frequency with which respondents listed this type of

event among the “three that best enable you to connect with co-workers” corroborates the quantitative findings which suggested an increase in network centrality when attending informal social events 2 to 4 times a month. Of particular note is that the network centrality measure used for this study focused on work-related information, while the comments about this type of event mentioned both social and work interests, and emphasized the strengthening of existing relationships. This finding suggests that these types of events may help to support both work-related informational and social, relational communication.

Twenty-two respondents (55%) listed serving on committees, councils, task forces, and other voluntary meetings as best enabling connections. The respondents cited the opportunity to build deeper relationships with co-workers from across the organization. Of particular value was the regular interaction while focused on a common task.

Twenty-one (52.5%) listed workshops, conferences, brown bags and other learning events. The beneficial traits most mentioned included structure (with activities) and low pressure. One respondent cited casual learning events as the “best of both worlds—I get to learn something and also usually have time to socialize.” Another respondent echoed this observation, describing brown bags as “more structure than a lunch but less of an agenda than a meeting.” A common theme for learning events was also the serendipity of who else attended and meeting someone because of a similar interest.

Seventeen respondents (42.5%) listed organizational or departmental parties, celebrations, and other social gatherings. These activities—especially at the organization-

wide level—do not occur as frequently, but respondents consistently mentioned them as the way to see everyone. Most people mentioned that these events were low pressure, but the sheer size of the full-organization events was overwhelming to others or, while positive, didn't allow the freedom to step outside of a "work persona." Respondents mentioned department-sponsored events—particularly a trivia game held daily within one unit split between two buildings—as valuable in maintaining relationships.

In reviewing the comments overall, the respondents' emphasis for these activities was for establishing and strengthening relationships rather than information exchange. This finding is in contrast to the findings for the virtual proximity actions. Additionally, two respondents who work away from colleagues—either through an isolated office or through work tasks which do not require collaboration with colleagues—described their almost-exclusive reliance on social events and projects to connect them with their colleagues. The comments, overall, provide evidence of the value of organizational and departmental social events, informal social events, committees and project work, and learning events—each offering a different value to creating and maintaining connections.

The second part of RQ3 explored the relationship between network centrality and virtual proximity actions. I provide a comparison of network centrality means in each of the 10 most popular virtual spaces in Table 20 and Table 21. The average in-degree centrality was 20 and degree centrality was 23 for these respondents. The low number of respondents in many of the frequencies limits the ability to compare centrality by the virtual proximity actions.

Table 20.

Virtual Proximity Action and In-Degree Centrality Mean

Proximity Actions	Mean for Not in the Last 12 Months	Mean for Once a Month or Less	Mean for 2-4 Times a Month	Mean for Once a Week or More
Outlook Email (n=46)				20 (n=46)
Outlook Calendar (n=46)		34 (n=1)	27 (n=1)	19 (n=44)
SharePoint (n=46)		30 (n=5)	17 (n=14)	19 (n=27)
Skype for Business (n=44)	24 (n=8)	23 (n=4)	11 (n=5)	18 (n=27)
Text Messaging (n=46)	19 (n=11)	26 (n=7)	15 (n=7)	20 (n=21)
Facebook (n=45)	19 (n=14)	22 (n=4)	11 (n=6)	22 (n=21)
Voice (Phone) (n=45)	17 (n=4)	26 (n=9)	17 (n=13)	19 (n=19)
Gmail (n=45)	21 (n=13)	19 (n=11)	16 (n=7)	21 (n=14)
Internal support form (n=45)	19 (n=4)	23 (n=19)	14 (n=12)	20 (n=10)
Google Drive (n=44)	25 (n=14)	11 (n=12)	21 (n=7)	19 (n=11)

Table 21.

Virtual Proximity Action and Degree Centrality Mean

Proximity Actions	Mean for Not in the Last 12 Months	Mean for Once a Month or Less	Mean for 2-4 Times a Month	Mean for Once a Week or More
Outlook Email (n=46)				23 (n=46)
Outlook Calendar (n=46)		36 (n=1)	28 (n=1)	23 (n=44)
SharePoint (n=46)		32 (n=5)	22 (n=14)	22 (n=27)
Skype for Business (n=44)	26 (n=8)	26 (n=4)	19 (n=5)	21 (n=27)
Text Messaging (n=46)	22 (n=11)	29 (n=7)	18 (n=7)	24 (n=21)
Facebook (n=45)	22 (n=14)	24 (n=4)	19 (n=6)	24 (n=21)
Voice (Phone) (n=45)	21 (n=4)	28 (n=9)	20 (n=13)	23 (n=19)
Gmail (n=45)	23 (n=13)	23 (n=11)	19 (n=7)	25 (n=14)
Internal support form (n=45)	23 (n=4)	25 (n=19)	20 (n=12)	22 (n=10)
Google Drive (n=44)	27 (n=14)	16 (n=12)	24 (n=7)	23 (n=11)

As with the geographic proximity actions, the survey included an open-ended question about virtual proximity actions: “From the websites and online services presented above, list the top three that best enable you to connect with co-workers you do not regularly see in person. Please describe how these sites and services help with these connections.” Rather than identifying the number of online sites or frequency, this question sought details on the outcomes of that participation. I counted each type of proximity action (using the list provided to the respondents). I then identified themes that emerged for each of the specific tools. Finally, I reviewed the themes overall for their connection to communication networks as well as any mention of using the online tools to increase geographic proximity or awareness. Forty-six respondents (98%) provided an answer to this question.

Of this lengthy list, the respondents listed five tools most often for connecting with geographically distant co-workers: Outlook Email (n=38), Lync (Skype for Business) (n=26), Outlook Calendar (n=17), SharePoint (n=15), and phone (n=14). Although some using a phone may use a personal phone, the organization provides all of these tools. The software tools are all available on multiple platforms, as well—as clients for the desktop and laptop workstation or with mobile access. Without surprise, the respondents most often mentioned that these were the default tools in use either for the entire organization or for those with whom the respondent most frequently communicated. In this way, these offered a great amount of reliability and efficiency.

The comments related to email included the reliability and immediacy of response. Respondents also cited email as a good way to reach a group of people. More than any other tool, respondents mentioned that email created a record that could be

referred to later in a personal archive or that allowed the respondent to reply when convenient. These latter comments appear to reflect the “persistence” affordance of social network tools cited by Treem and Leonardi (2012). Respondents also cited email as a tool which supplemented the features of other tools such as scheduling complex meetings with the shared Outlook calendar and receiving alerts related to file collaboration in SharePoint. Overall, email was easy, quick, and efficient.

The benefit of a tool used in common by the entire organization was particularly evident in the discussions about Skype for Business. Respondents described this tool as best for easy and quick communication. Respondents cited Skype for Business most often as offering awareness of another’s availability through its compatibility with Outlook Calendar. Respondents mentioned the variety of features—videoconferencing, screen sharing, text messaging—as among the ways Skype for Business helped to stay in contact with others. Examples of use mentioned included both private, one-on-one conversation and group meetings. Respondents noted a lack of access to those who do not use this tool—notably Mac users who have experienced technical problems. Another respondent offered the chat functionality found within SpringShare as a top tool, in part because it was used regularly to provide reference service, and because it was easier to use than Skype for Business.

Respondents mentioned the anticipated uses of Outlook calendar to schedule and to check availability of another person. They cited Outlook calendar as consistently effective because, in part, most coworkers used the tool. Respondents cited SharePoint as offering the ability to edit content, share files, collaborate, and align the organization to goals—all with a group audience. Respondents highlighted the value of phone

conversations for ease and immediacy, as well as delivering complex, confidential, or ambiguous messages. In this way, the phone was the only tool for which the data suggested an aspect of maintaining a relationship, although respondents only implied this aspect through their comments.

In reviewing the comments overall for their connection to communication networks, the respondents' purpose for these virtual proximity actions regularly referred to communicating, collaborating, or locating someone, rather than for creating relationships. This finding is in contrast to the findings for the geographic proximity actions and reinforces the importance of considering the different purposes of communicating discussed within the literature review chapter. Respondents mentioned all of the tools as useful when telecommuting as well as within the office, in contrast to the study by Suh, Shin, Ahuja, and Kim (2011) which found disadvantages—at least to trust relationships—when using online tools when in-person mechanisms were available. Based on personal experience, I expected to see mention of using Skype for Business or Outlook Calendar to identify if someone was immediately available for an in-person conversation. No respondents mentioned this use of any of the tools, although one respondent did mention preparing for a meeting with a person by reviewing recent work documented in SharePoint. As mentioned earlier, respondents frequently mentioned the value in all co-workers using the same tool—or at least, all the co-workers with whom the respondent anticipated communicating, collaborating, or locating.

In this section I presented the findings of my mixed-method study investigating the relationships amongst communication satisfaction, network centrality, proximity, and

proximity actions. In the next chapter, I offer an overview of my findings, discuss the implications for practice, limitations, and recommendations for future research.

Chapter 5: Discussion and Conclusion

This section provides a brief overview of my study and key findings, along with implications for practice, limitations, and recommendations for future study.

Overview of Key Findings

This study explored relationships amongst four interrelated concepts: communication satisfaction, communication networks, proximity, and proximity actions. It did so within a population of 139 faculty and staff working in an academic library in order to better understand the communication environment in this particular organization.

I explored the descriptive findings for both communication satisfaction and for network centrality. When looking at the subscales for communication satisfaction, respondents reported the least satisfaction with communication climate. Closer examination of the construct revealed that respondents rated receiving information needed to do my job in a timely manner positively (66% positive) while the lowest rated item within this subscale, handling of conflicts (37% positive) was also the lowest rated CSQ item in the survey. Descriptive analysis of the in-degree centrality revealed that the number of incoming ties ranged from 3 alters to 51 alters—a dramatic difference. I found that full time employees as well as supervisors both had higher in-degree centrality and degree centrality. In short, they received information useful to their jobs from more people, and exchanged information useful to jobs with more people.

I followed with correlational analyses examining the relationship between communication satisfaction and network centrality, as well as qualitative data analysis on the same intersection of constructs. I was not able to find a statistical correlation between variables which supported my hypothesis of a positive correlation between the two

constructs. These findings in part support and in part are contrary to the earlier findings of Zwijze-Koning and de Jong (2015) in their correlational analysis comparing communication satisfaction constructs with network density. My findings agreed with their findings of no apparent correlation between organizational integration or organizational perspective and network ties. My study did not find a correlation between informal communication and network ties either, while their study did. My qualitative findings, however, did find a relationship with respondents referring to connections and connectedness as to whether or not—and when—others share information.

Next, I explored the relationship between communication satisfaction and proximity, primarily through frequencies and qualitative data. I considered both geographic and virtual proximity, measuring each through availability in number of building floors and number of virtual spaces. Respondents reported an average of two physical locations in which other employees also worked during an average week, and an average of seven virtual locations in which they believed other employees also visited. I found a relationship between working in a single location and higher communication satisfaction, as well as participation in six virtual locations on a weekly basis and higher communication satisfaction. One of the few respondents commonly working remote from the most-populated work locations contributed the only qualitative finding related to this relationship, citing consistent exclusion from communication networks. Most respondents worked within proximity to others, possibly explaining why this observation was the only one focused on the intersection of communication satisfaction and proximity.

Next, I explored the relationship between geographic proximity actions and network centrality through frequencies and qualitative data. I found likely relationships of

higher network centrality and attendance at informal parties two-to-four times a month, attendance at learning events two-to-four times a month, and participation in committee service once a week or more. Comments corroborated and enhanced these findings by most often listing informal parties and learning events as the best ways to stay connected with colleagues, and providing examples of purposes of communication that each type of event best supported. The finding that committee work helps participants to build relationships supports the earlier finding by Srivastava (2015) who found that semi-formal structures such as committees supported the formation of trust relationships and increased communication.

I explored the relationship between virtual proximity actions and network centrality through frequencies and qualitative data. I did not identify a quantitative relationship between virtual proximity actions and network centrality. The qualitative analysis, however, identified the value of virtual spaces when consistently used by others, and the value of a shared chat tool and calendar for providing awareness of the availability of others. Of the five most-cited tools best for staying connected with colleagues, respondents listed all organization-provided tools. The comments highlighted specific uses for email, phone, and the intranet based on message, immediacy, and audience. When comparing the qualitative comments for physical proximity actions compared to virtual proximity actions, a finding emerged that supported previous literature such as Lipiäinen, Karjaluoto, and Nevalainen (2014)—the physical actions supported establishing and strengthening relationships while the virtual actions supported communicating information.

Implications for Practice

My study supported the value of using a mixed methods case study and multiple instruments to develop an understanding of communication satisfaction and practices within an organization (Downs & Adrian, 2004; Hargie & Tourish, 2009; Zwijze-Koning and de Jong, 2005). By combining organizational satisfaction perceptions, communication network data, and qualitative data, I was able to use the strengths of each type of data to support the other two. The responses to the communication satisfaction quantitative items highlighted areas of success and challenges for this particular organization, while the qualitative questions elaborated on both in the respondents' own words. An emergent finding that may have been missed otherwise were the challenges of communication between departments in a growing and changing organization, where employees do not know and perhaps should not be expected to know the individual job responsibilities of others. The descriptive data suggested that the respondents perceive communication organization-wide—such as about goals or policies—positively, which presents an opportunity to learn from and apply successes to other levels of the organization. An implication for practice is to focus on possible solutions through additional mixed methods data gathering and testing of hypotheses to develop recommendations to employees and organizational leadership about how to best improve communication satisfaction to stakeholders interdepartmentally.

Among the emergent findings was also the frequency with which most of the respondents voluntarily attended learning events and organizationally-sponsored social events. The qualitative comments indicated that these neutral grounds provided opportunities for interacting with others with whom employees may not otherwise meet.

Similarly, the number of websites and online tools in which employees participated was also high. The respondents provided insights about the value of participating in particular events and virtual spaces, and differentiated among them. Each opportunity afforded the participant a slightly different benefit which brought them closer to co-workers they did not normally see. The findings of high voluntary participation in informal social events, learning events, and organizational social events suggests that these have a valuable role in the organization for establishing and maintaining social ties. Similarly, the high use of enterprise tools such as a shared chat tool and calendar, and the comments about the value in wide participation, suggests that these also have a valuable role in the organization. An implication for practice based on the high use and perceived benefits expressed by these respondents is that this organization should ensure availability of these events and online tools for all employees and encourage wide participation.

Limitations and Recommendations for Future Study

Limitations of the study related to the complexity inherent in organizational communication, and the data gathering instrument may have obscured relationships amongst communication satisfaction, communication networks, proximity, and proximity actions. These limitations lead directly to recommendations for future study in other organizations as well as within this same organization.

Further descriptive analysis at the item level for communication satisfaction revealed some emergent findings that may explain these discrepancies and lead to new research directions. Survey respondents rated their satisfaction as relatively high for receiving information about the requirements of their job as well as receiving information required to do their job. The response was relatively low for awareness of changes in

other departments and familiarity with others' jobs. These emergent findings suggest a new direction for data gathering that focuses on information sharing across departments rather than all information useful for the respondent's job.

Descriptive analysis at the item level for communication satisfaction also revealed an interesting difference between informal communication and "communication with peers at my level"—rating satisfaction with each type of communication differently for accuracy and for activity level. My study addressed neither qualities of interpersonal communication such as accuracy, honesty, or openness, nor qualities of social ties such as friendships or friction. Similarly, this study addressed information for the respondent's job rather than gossip or advice. Additional analysis of the existing data could provide further insights, as could further data from this or another organization.

Another avenue for future study could focus on the perception of communication in context of network theories of contagion. Contagion theories posit that contact with attitudes and beliefs of others influences those attitudes and beliefs (Monge & Contractor, 2003). A future study could explore more explicitly the perception of communication compared with actual information flow, or the clustering of perceptions within specific groups within the organization. The current data did not permit additional analysis by subgroups, but additional data gathering could expand the analysis opportunities. The findings about interdepartmental communication suggests, in fact, that developing new research questions focused on the groups rather than individuals could lead to important findings for this organization.

Another limitation of this study and possibility for future research would be to focus on the proximity construct more. The differing interpretations of the geographic

location data in the current study's survey limited the potential for further analysis. I could develop a different method of measuring proximity based more closely upon the previous studies which had identified both positive and negative correlations between distance from colleagues and communication satisfaction (Akkirman & Harris, 2005; Fritz, Narasimhan, & Rhee, 1998; Lipiäinen, Karjaluoto, & Nevalainen, 2014).

I believe that the most promising opportunity for exploring communication satisfaction within this particular organization is a second phase of qualitative data gathering focused on high-impact practices which support communication satisfaction with information sharing between departments. The respondents indicated through both their quantitative and qualitative responses that this organization was successful in many aspects of organizational communication, and had areas for improvement. The findings also suggest that behavior of the sender, an intermediary, and the receiver can all work together to support communication satisfaction—not just the behavior of the receiver. Based on the complexity of organizational communication identified in the literature and confirmed by these research findings, a researcher is likely to uncover a richer understanding of communication satisfaction within this organization through interviews. This proposed follow-up study would then build upon the current one in an attempt to provide practical guidance for individuals throughout the organization and leadership. The anticipated goal would be identifying high-impact behaviors of the interviewee and of others which appear to best support communication satisfaction.

Conclusion

This study explored possible relationships amongst four interrelated concepts: communication satisfaction, communication networks, proximity, and proximity actions.

I provided an overview of literature about communication satisfaction, communication networks, and proximity—both geographic and virtual, and proximity actions. I used a series of pilot tests to create my survey, and considered quantitative and qualitative data in the analysis. My findings suggest immediate implications for practice—the value of mixed methods studies as well as the importance of supporting proximity actions—as well as multiple avenues for future research including additional qualitative data gathering within this organization exploring possible high-impact behaviors which support satisfaction with organizational communication between departments.

Appendix

Data Collection Instrument

Introduction

This is a social network study which includes mapping out who communicates with whom in [the organization]. The communication network map created from the survey responses will look similar to this one: [sample image of network map removed]

Your identity will be replaced with a code (as above) and your demographic information will be represented through the use of shapes and colors. Each line connecting two shapes represents communication between two people.

The survey will request your name and the names of others to create the map. The researcher will keep your responses in strict confidence by replacing each name with an identification code prior to data analysis, and will use the identification codes when reporting or discussing data with all others. The identification key will be destroyed at the end of the research project (in one year).

1. You have the option to discuss the results of this study with [the researcher], gaining possible insights for your own communication network. Other names will be held in confidence. Would you like to discuss the results with [the researcher] after she has completed the study?

   __Yes

   __No

   __Maybe. Contact me later to ask.

Communication Network Questions

This section will ask for specific names, including your own, in order to better understand [the organization]'s communication network. All responses will be held in strict confidence by the researcher.

2. Select your name from the list of employees at [the organization].

   [roster of employees in the organization]

3. Select the names of those from whom you regularly receive **information which helps you accomplish the requirements of your job**.

   - "Regularly," for this question, is once a month or more often.
   - “Requirements of your job” should exclude voluntary committees and task forces on which you may serve.
   - Consider all possible pathways for communicating including verbal, in-person communication and technology-enabled communication such as email, phone, and online tools.
   - Include one-on-one communication as well as communication shared with a group.

   In the next question, you will get an opportunity to indicate how frequently you communicate with each person you select.

   [names not-selected from previous question carried forward and displayed]

4. Please provide more information about your communication over the course of the year with the people you just selected. As in the previous question, consider all possible pathways for communicating including verbal, in-person communication and technology-enabled communication such as email, phone, and online tools.

   How often do you receive information from this person which helps you accomplish your job?

   Choices: Once a Month or Less Frequently, 2 to 4 Times a Month, Once a Week or More

   [names selected from previous question carried forward and displayed here]

Proximity and Proximity Action Questions

The next set of questions is about places, either at work or outside of work, where your co-workers may regularly see you.

5. For each of your regular campus locations, please provide approximately how many **hours** you are available in that location each week. This question is about your availability, which may not be the same as the total hours you work in a week.
   - Include hours in each location where you could be interrupted to be asked a question (in person or with technology) by a colleague within [the organization]. Examples to include are available time spent in your primary office, a shared office, a service desk, the stacks, public areas, a staff lounge, or moving

throughout a building. Include time spent traveling if you can be reached to be asked a question (in person or with technology) during that time.

- Exclude time spent in meetings, teaching classes, or consultations unless you are regularly interrupted by [the organization] colleagues during that time.
- If your schedule varies throughout the year, consider your hours per week averaged over the course of a typical month.

_____ Building A Floor 1

_____ Building A Floor 2

_____ Building A Floor 3

_____ Building A Floor 4

_____ Building B Floor 1

_____ Building B Floor 2

_____ Building B Floor 3

_____ Building B Floor 4

_____ Building B Floor 5

_____ Building C

_____ Other Campus Buildings

_____ Telecommuting/Working from Home

_____ Traveling

_____ Other Locations

6. How often do you participate in the following websites and online services with other employees of [the organization]?

- "Participate" is defined here as communicating with others, updating your own availability or status, contributing content, or commenting on others' availabilities, statuses, content, or comments.
- Include websites and online services only if you anticipate at least one other employee of [the organization] notices that you participate. For example, other employees of [the organization] may comment about your posts within the site or comment to you in person, or you may both be commenting on the same content contributed by someone else.
- Consider both work-related and social use.

  Choices: Not Used in the Last 12 Months, Once a Month or Less Frequently, 2-4 Times a Month, Once a Week or More

  a. Basecamp
  b. Blackboard Collaborate
  c. Canvas
  d. Dropbox
  e. Facebook
  f. Facebook Messenger
  g. FaceTime
  h. Fitbit
  i. Flickr
  j. Gmail
  k. Goodreads
  l. Google Calendar
  m. Google Drive (including Docs, Sheets, Slides)
  n. Google+, Hangouts, or Google Chat
  o. Instagram
  p. LinkedIn
  q. Lync (also known as Skype for Business)
  r. Outlook Calendar/Exchange Calendar
  s. Outlook Email/Exchange Email
  t. Pinterest
  u. Remedy Support
  v. Skype

w. SharePoint
x. Snapchat
y. Tech Support Form
z. Text Messaging (Phone)
aa. Tumblr
bb. Twitter
cc. Vine
dd. Voice (Phone)
ee. WordPress
ff. Words with Friends
gg. Yammer
hh. YouTube
Other _____
Other _____

7. From the websites and online services presented above, list the top three that best enable you to connect with co-workers you do not regularly see in person. Please describe how these sites and services help with these connections.

8. On average, how often do you attend the following voluntary meetings and events with other employees of [the organization]?
   - "Voluntary" is defined here as events where attendance is not required by your job.
   - Consider events where you anticipate other employees of [the organization] will also be in attendance.
   - Consider both on campus and off campus events.

   Choices: Not in the Last 12 Months, Once a Month or Less Frequently, 2-4 Times a Month, Once a Week or More

   a. Committee, council, task force and other meetings for which you volunteered to be a member

b. Informal parties, lunches, drinks, games, walking, and other social activities with coworkers

c. [Organization] or departmental parties, celebrations, and other social gatherings

d. Workshops, conferences, brown bags and other learning events with coworkers

e. Community service with coworkers

Other _____

Other _____

Other _____

9. Of the types of meetings and events listed above, list three that best enable you to connect with co-workers you wouldn't normally see in person. Please describe how these events help you with these connections.

Communication Satisfaction Questions

The next set of questions is focused on your satisfaction with [the organization]'s communication practices as well as your suggestions for improving them.

10. Listed below are types of information often associated with a person's job. Please indicate how satisfied you are with how each type of information is shared with you at [the organization] by checking the appropriate box.

    Choices: Very Dissatisfied (1), (2), (3), (4), Very Satisfied (5)

    a. Personnel news.

b. Information about other [the organization] departments' policies and goals.
c. Information about the requirements of my job.
d. Information about [university] changes affecting [the organization].
e. Information about changes in [the organization].
f. Information about employee benefits and pay.
g. Information about achievements and/or failures of the organization.
h. Information about [the organization] policies and goals.
i. Reports on how problems in my job are being handled.

11. Please indicate how satisfied you are with the following communication practices in [the organization] by checking the appropriate box.

    Choices: Very Dissatisfied (1), (2), (3), (4), Very Satisfied (5)

    a. Extent to which [the organization]'s communication motivates me to meet organizational goals.
    b. Extent to which the people in [the organization] have great ability as communicators.
    c. Extent to which communication in [the organization] makes me feel a vital part of the organization.
    d. Extent to which [the organization] communications are interesting.
    e. Extent to which I receive the information needed to do my job in a timely manner.
    f. Extent to which conflicts are handled appropriately.

g. Extent to which communication with other employees at my level is free-flowing.
h. Extent to which communication with other employees at my level is accurate.
i. Extent to which my work group is compatible.
j. Extent to which our meetings are well organized.
k. Extent to which written reports are clear.
l. Extent to which informal communication is active.
m. Extent to which the amount of communication in [the organization] is sufficient for my needs.
n. Extent to which [the organization] communications are helpful.
o. Extent to which informal communication is accurate.
p. Extent to which written reports are concise.

12. Please indicate your agreement with the following statements about communication practices within [the organization] by checking the appropriate box.

    Choices: Strongly Disagree (1), (2), (3), (4), Strongly Agree (5)

    a. When I need help, I know who to ask in other [the organization] departments.
    b. I am updated in a timely manner on important matters related to my job.
    c. I am aware of changes in other departments that affect my job.
    d. Communication is consistent across [the organization].
    e. I am familiar with what [the organization] staff members in other departments do in their jobs.

f. [The organization] staff members in other departments are familiar with what I do in my job.

g. My supervisor effectively communicates information with me.

h. The administration effectively communicates information with me. (Administration refers to the Dean and Associate Deans.)

13. Do you have additional thoughts about communication practices in [the organization]?

Socio-demographic Questions

14. How long have you worked at [the organization]?

___ Less than 1 year

___ 1 to 4 years

___ 5 to 8 years

___ 9 years or more

15. How long have you worked in your current job?

___ Less than 1 year

___ 1 to 4 years

___ 5 to 8 years

___ 9 years or more

16. What is your gender identity?

___ Female

___ Male

___ _____

___ Prefer not to answer

17. What is your age?

___ Under 20

___ 20-29

___ 30-39

___ 40-49

___ 50-59

___ 60+

___ Prefer not to answer

18. Are you responsible for staff as a manager or supervisor?

___ Yes

___ No

19. Which best describes your highest level of formal education?

___ Did not finish high school

___ High school or GED

___ Attended college but have not graduated

___ 2-year college degree(s)

___ 4-year college degree(s)

___ Master's degree(s)

___ Doctoral degree)

___ Other _____

20. Your work status over the previous year was mostly:

___ Full Time

___ Part Time

21. Your primary employee classification over the previous year was:

___ A/P Faculty

___ Classified Staff

___ Instructional Faculty

___ Wage

___ Other/Not Sure

22. Your primary work team(s) over the previous year was/were: _____

23. Do you have any additional observations about the topics addressed in this survey that you would like to offer? If yes, please elaborate below.

24. Would you be interested in sharing more insights about communication in [the organization] through a second phase of this research project? The anticipated format would be a follow-up interview with [the researcher] in summer 2016.

    ___ Yes

    ___ No

    ___ Maybe. Contact me later to ask.

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