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AN EXPLORATORY ANALYSIS: THE ROLE OF NETWORK STRUCTURES AND BOUNDARY SPANNER BEHAVIORS AS RELATED TO COLLABORATION IN INTER-ORGANIZATIONAL NETWORKS

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AN EXPLORATORY ANALYSIS: THE ROLE OF NETWORK STRUCTURES AND BOUNDARY SPANNER BEHAVIORS AS RELATED TO COLLABORATION IN INTER-ORGANIZATIONAL NETWORKS

A DISSERTATION APPROVED FOR THE
DEPARTMENT OF COMMUNICATION

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I dedicate this work to my wife for not questioning my sanity for wanting to take this educational journey in the first place and for not losing hers while traveling it with me as well as to my family and friends for their love, support, and understanding through this process.

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Abstract

Using data collected as part of a grant project funded by the National Science Foundation (NSF# 0538924), an exploratory analysis of the latent organizational structures and boundary spanner behaviors that impact perceived levels of inter-organizational collaboration among organizational employees is conducted. The importance of inter-organizational networking and collaboration is illustrated, and gaps in existing knowledge are identified. Structural and communication factors that may have a significant impact on collaborative success are explored; specifically position in organizational hierarchy, levels of communication activity, channels utilized for communication, and directional communication flow. The analysis indicates that managerialism has a significant impact on inter-organizational networking, with those in the managerial class of employees having more inter-organizational connections, networks of increased structural integrity, and higher levels of network performance than non-managerial employees. Additionally, it was found that communication behaviors and channels for communication also play a significant role in the structural and performance aspects of inter-organizational networks. The implications of these relationships are discussed, and limitations of this study are addressed in terms of the study's population, instrumentation, and potential generalization. The study concludes with a discussion of possible future directions for research, specifically focusing on research opportunities within the contexts of crisis communication and emergency management communications.

CHAPTER I

Introduction and Justification for Study

As I sit at my desk making final revisions to the write-up for this study, current events overseas serve to remind me once again of why I undertook this project to begin with and why the work it seeks to accomplish are of importance. The recent (and still unfolding) complex disaster in Japan consisting of an earthquake which lead to both a devastating tsunami and the near-meltdown of several nuclear-energy production facilities are only the most recent reminder of the extent to which our society is interconnected, inter-reliant, and therefore inter-susceptible to chaotic events.

My scholarly interests in communication began in the study of crisis communication, wandered into interests in organizational development as a means of assisting organizations with protecting against, preparing for, and responding to crises, and ultimately lead me into various areas related to organizational communication research. While the journey perhaps did not make much sense to onlookers, each of those areas of study have contributed in some way to this project and to my interests in expanding on this project to study communication in the context of emergency management and disaster response.

It is my sincere hope that the research program which is initiated in this project will ultimately prove to be useful in assisting communities in preventing complex disasters such as the one currently unfolding; should disaster prevention prove to be an unreachable goal (as I suspect it will), it is hoped that this work will at least contribute

to the goal of creating better mechanisms by which communities can respond to disaster events and protect themselves and their constituents.

The importance of inter-organizational networking can be demonstrated through an examination of both the successes related to positive inter-organizational communication efforts and the failures that result when organizations fail to work together cooperatively to protect both theirs and the larger publics interests (O'Rourke, 2001; Seeger, 2006; Tompkins & Tompkins, 2005; Adkins, 2010). On the other hand, successful collaboration with other organizations can potentially alleviate the negative impacts from a crisis situation and help an organization to mitigate the potentially devastating effects of a disaster (Foster, 2002; Gourney, 2002). In addition to the importance of inter-organizational collaboration to crises, scholarship has also demonstrated that inter-organizational collaboration is an important factor in protecting communities and societies in emergencies (Rosenberg, 2008; Gajda, 2006), and in the case of events such as terrorist attacks (Comfort, 2002; Rosenthal & Kouzmin, 1997; O'Hair, Heath, Ayotte, & Ledlow, 2008).

Clearly, successful inter-organizational collaboration has important implications; however, (as will be demonstrated in the literature review) there are also numerous gaps in our current knowledge concerning what organizational and individual factors contribute most to successful inter-organizational collaboration. As will be demonstrated in the literature review, there are multiple areas of research that provide the theoretical foundation and scholarly justification for this study and the proposed research program it is intended to support. Two of these areas in particular have been

largely understudied and are of primary concern, forming a basis for the justification of the research project.

The first of the primary under-utilized areas consists of a lack of quantitative studies applying the critical arguments made concerning managerial control and limits to democratic participation in organizational networks, and specifically the lack of these applications in terms of exploring inter-organizational collaborative efforts, which have been demonstrated to be of high importance to success in managing chaotic situations. The second understudied area concerns the communication behaviors of boundary spanners as related to collaborative inter-organizational networking, specifically as related to factors involved in determining optimal communication load and communication media selections in fostering the development of collaborative networks.

Drawing on the critical organizational scholarship of Stanley Deetz (1992, 1995) for theoretical concepts related to the latent organizational structures that constrain individual worker behaviors and communicative practices in organizations, this project consists of an exploratory analysis of several communication factors and aspects of organizational structures that potentially impact efforts at collaboration between organizations in inter-organizational networks. Other theories are utilized both as mechanisms to explain the conceptual factors involved in the study and as a means of demonstrating conflicts within the extant literature involved with those factors, but the central objectives of the study in large part seek to expand on the arguments advanced by Deetz (1992, 1995). The expansion of Deetz' work is accomplished through both

applying quantitative measures in an effort to confirm elements of his critical arguments and through applying those arguments beyond the boundaries of individual organizations to include an examination of the factors at play in inter-organizational networking efforts.

As an exploratory study, the primary goal of this project is to provide initial evidence for the structural and communication-behavior factors impacting collaboration as a preliminary mechanism to justify future development of a model for participatory collaborative networking; the significance of the relationships between the described factors being explored are therefore of central concern in this study. The importance of the stress on exploration cannot be understated; as addressed in the discussion section, there are necessary limitations to this study's findings, and it should therefore be kept in mind that the results of this study are tentative and the conclusions drawn are subject to confirmation in future research efforts. In other words, this research seeks to serve not as an end, but rather as a mere beginning to a program of research that is much broader in scope and which will be described in the final chapter of this study.

The main goals of this study are to answer several major questions (or at least to begin to seek out initial evidence for answering them). These questions include issues such as to what extent inter-organizational collaboration efforts are dominated by members of the managerial classes of employees, to what extent employees perceive differences between their personal levels of collaboration with other organizations and their organization's collaborative levels (and what differences exist in these perceptions between managers and non-managers), what differences exist in the network structures

and network performance of managers as opposed to non-managerial employees, and what aspects of communication play a significant role in either contributing to or limiting the success of collaborative efforts. By answering these questions, it is hoped that a model for promoting collaborative inter-organizational structures may eventually be developed, and that this future model can them be applied to a variety of inter-organizational networks, specifically those involved in various aspects of protecting communities from disasters and crises.

While the primary methodology utilized in this study consists of utilizing traditional quantitative methods and hypothesis testing, a combination of three analytical methods are ultimately utilized as described in the methods chapter. The questions posed in this research are drawn from works that use a variety of quantitative, qualitative, and critical methodologies; the blending of these diverse foundations allow for a more robust research project and a more in-depth understanding of the phenomena of interest. Ultimately, the goal of the overarching research program to which this study contributes seeks to offer insights and a model as to how communication in networks should be "designed" to maximize participatory collaboration and communication efforts. This study was conducted using data collected concerning the relationships in a network consisting of government agencies, higher-education research units, and private organizations which have collectively undertaken efforts to promote inter-organizational collaboration. Similarities between the network utilized in this study and other types of networks which could potentially benefit from the results of this research program are discussed in the final chapter.

One of the primary arguments examined in this study concerns the latent nature of bureaucratic structures within inter-organizational networks and the extent to which these structures contribute to or limit the development of inter-organizational collaboration and collaborative networks. Specifically, this study proposes that communication between organizations is primarily filtered through the hierarchical structures of the organizations participating in the network, with hierarchy thereby acting as a latent network structure which determines levels of inter-organizational connectedness, communication activity and perceptions of collaboration.

The second major argument advanced and explored in this study proposes that communication choices made concerning the channels utilized for inter-organizational communication represent a form of latent or hidden structure which constrains communication and perceptions of organizational collaboration. Specifically, it is argued that communication activity levels serves as a determining factor in communication channel selection and the extent to which communication is multi-directional, with channel selection and directionality of communication in turn serving as determinates of perceived collaboration levels.

Funding for the study was provided through a grant from the National Science Foundation (NSF# 0538924) as part of a larger project entitled "Advancing Biotechnology and Climatology" which examined inter-organizational networking among biotechnology and climatology-based sectors with the goal of establishing techniques for use in collaborative efforts in educational sectors. The overarching goal of the project is to increase the sustainability and performance of inter-organizational

network structures in various public, private, and mixed-sector networks that serve public interests.

The population of interest for the current study consists of the relationships between a network of organizations which had (at the time the data was collected) recently co-located to a shared campus in order to facilitate collaboration between the organizations in the network. The shared commitment to collaboration among the organizational network partners and their shared proximity created an opportunity to study the factors related to collaboration in addition to the establishment of physical proximity. The organizations in the network expressed interest in further developing their collaboration and specifically requested that this study be conducted in order to provide insights into how they could increase inter-organizational collaboration among the networked organizations; their interest provided a central, practical justification for the study.

This study was conducted utilizing a survey instrument administered to members of the organizations which are participants in the network. Respondents were asked to provide information (in a series of closed-ended questions) about their work function, their office location, their communication choices when working with members of other organizations, and their perceptions concerning both their individual levels of collaboration with the other network organizations as well as their organization's collaboration level with the other organizations in the network. After completing the closed-ended question portion of the survey instruments, respondents were asked several open-ended questions designed to provide additional insights as to

the impact the co-location had on the inter-organizational collaboration in the network and to elicit suggestions for improving inter-organizational collaboration in the network.

The closed-ended survey data collected in this study was analyzed using both traditional hypothesis-based quantitative analysis to measure the relationships between the variables of interest as well as more recently developed network mapping and network analysis techniques. The open-ended question data were utilized in this study to provide support for the arguments made concerning factors related to improving collaboration between organizations in an inter-organizational network.

Chapter II

Review of Literature

Overview

This review of the literature seeks to accomplish two purposes. First, this review develops a thematic analysis of the extant body of work on inter-organizational collaboration as a basis for grounding this study within current research contexts, for demonstrating the aspects of the current study which are unique, and for outlining some considerations to be discussed as future research directions in a proposed program of research. Second, it explores some basic concepts of several communication-based theories that provide the groundwork necessary for establishing the research questions and hypotheses that are explored in the project. This literature review is not meant to serve as an exhaustive description of all of the relevant literature; instead, the focus of this literature review is to selectively examine the research areas that best contribute to the goals outlined above and to which this project is therefore most closely aligned.

Inter-organizational networking and collaboration

Theories related to collaboration between both individuals and organizations can be found throughout the bodies of communication literature both in interpersonal and organizational communication. While acknowledging that broad potential scope, for purposes of clarity and brevity the current review is limited to those studies specifically concerned with inter-organizational collaboration.

The primary goal of this review of the inter-organizational collaboration literature is to position the current study within the context of the ongoing scholarly

conversation to which it contributes. Hence, a thematic analysis of the literature (focusing primarily on those works produced during the last decade of research) will be used to highlight certain aspects of the inter-organizational collaboration literature that have bearing on the issues that are explored in the present study and to present a broader perspective on the state of the literature in this area.

A survey of the literature on inter-organizational collaboration conducted at a mid-sized research university produced over 1,200 journal articles spanning more than 50 years, demonstrating that this area is one of both historical and continuing research interest. Seven dominant themes of interest to the present study were found in the body of inter-organizational collaboration literature; each will be summarized in the subsequent sub-sections of this review. The thematic analysis does not seek to imply a quality of mutual exclusivity nor an exhaustive approach; many of the articles contained more than one of these themes, and additional themes were identified in the literature that could be of potential interest in relation to future research in this area.

Government agencies and NGOs

The first dominant theme of interest to the present study which has been addressed in the inter-organizational collaboration literature explores the relationships between government agencies as well as the relationships between government agencies and non-government organizations (NGOs). This theme provides a foundational element for the current research, which consists of the exploration of an inter-organizational network combining organizational entities including government agencies, publicly funded research institutions, and privately owned organizations.

Several sub-themes are developed in this body of the literature. One sub-set of this literature consists of explorations of networking and information-sharing practices between public service networks (Williams, et al., 2009; Myrtle & Wilber, 1994), studies of collaborative efforts between research-oriented and policy oriented government agencies (Goering, Butterill, Jacobson, & Sturtevant, 2003), and the development of suggested frameworks for evaluating the success of inter-organizational networks in the public sector (Provan & Milward, 2001). What is clear from this body of the literature is that collaborative efforts in inter-organizational networks (perhaps particularly those which contain governmental agencies or public institutions) are problematic in nature.

A second sub-theme examines the effects of NGO (specifically nonprofit organization) centrality in network structures on NGO growth (Galaskiewicz, Bielefeld, & Dowell, 2006), and also examines the effects of organizational embeddedness and involvement on organizational influence over network partners (Hardy, 2003). Additionally, scholars have explored the potential for local authorities to act as catalysts in networks dedicated to regional sustainability efforts (von Malmborg, 2007), and the need for cross-national collaboration between agencies that are concerned with the protection of vulnerable populations (Padilla & Daigle, 1998).

Two areas which are of interest to the current study do not appear to have been addressed in this literature. First, this literature does not examine the role of bureaucratic organization and organizational hierarchy as it impacts inter-organizational networking between government agencies and other organizations. The lack of

examination of the interplay of structural elements and political forces in networks represents a potentially significant oversight as these factors are likely to act as determinants of collaborative success, particularly in networks containing highly jurisdictional or bureaucratic organizations and/or structures.

Second, the roles of individuals within their organizational hierarchies and their networking-related behaviors is largely overlooked; this is potentially significant because it is the individuals that must navigate between the pressures of the need for collaboration and the protection of their own organization's interests. These issues will be developed further in forthcoming sections of this literature review.

Finally, the studies concerning local authorities and the protection of vulnerable populations (Rosenberg, 2008; Gajda, 2006) are of particular interest to the development of the proposed research program that this study seeks to promote. Within the context of emergency and disaster management these issues are important in arguing for the need to develop truly participative and democratic network structures, and will therefore be further developed both in forthcoming sections of this literature review and in the description of the proposed research agenda outlined in the final chapter of this study.

Knowledge management and accumulation

The second major theme developed in the inter-organizational collaboration literature concerns the use of inter-organizational collaboration as a means for organizations to accumulate and manage organizational knowledge. The activities involved in these processes are commonly referred to as "environmental scanning"

(Hambrick, 1982; Costa, 1995), and are activities which are critical to organizational survival in the modern, globalized economic and competitive environment (Sutcliffe, 2001). Sutcliffe (2001) notes that "[o]rganizations acquire, interpret, and control flows of environmental information in order not to be blindsided by threats, unprepared for opportunities, or ineffective in managing interdependencies with resource controllers and other important stakeholders" (p. 197).

Recent studies concerning knowledge management in inter-organizational collaboration can also be categorized into several sub-themes or research areas. The first of these areas of research concerns the utilization of cost-benefits analysis techniques to understand how organizations exchange information while maintaining individual competitive advantages over their information exchange partners (Ding, 2010; Holland & Lockett, 1997; Davies, 2009). This area of research highlights the tensions that organizations and individuals must balance when engaging in collaborative efforts with extra-organizational entities, and is also related to Deetz' (1992) arguments concerning balancing of the concerns of the managerial class with those of the larger organization (i.e. proprietary or jurisdictional concerns) and collaborative inter-organizational communication processes.

A second area of interest is the utilization of technology to promote collaboration. This sub-theme contains research that explores the rules and issues surrounding the development of compatible technology-utilizing processes involved in the development of successful collaboration in E-Business ventures (De Backer, 2009; Andonoff, 2009; Sanders, 2007; Shen, 2007; Srinivasan, & Sundaram, 2006; Zhu,

2006), the development of technological competencies through collaboration (Steensma, 1996), and the development and maintenance of technological systems in order to facilitate information transfer and the sharing of knowledge between organizational entities in a collaborative network (Norta, 2007; Srinivasan & Sundaram, 2006; Bazijanec, 2004; Zang, 2004). Within this sub-set of the literature there appears to be a fairly common assumption that strategic technological alignment produces closer relationships and higher levels of collaboration between organizations (Huxham, 1991; Judge, 1971); however, some scholars have also explored how the actual implementation of technology systems designed to promote collaboration has been limited and problematic in nature (Jun, 2000), and how use of technology-based communication channels can be used for social control, compliance-gaining, and creating pressure to conform (Skovholt & Svennevig, 2006).

A third major topic area concerns the use of inter-organizational collaboration as a catalyst for learning, innovation and creativity. Studies in this area examine the use of localized networks for the development of innovations and innovative performance (Knoben, 2009; Willoughby & Galvin, 2005; Powell, Koput, & Smith-Doerr, 1996), and either the need for or processes relative to the implementation of collaborative strategies between organizations to promote innovation (Rondinelli, 2005; Horan, 2005; Ruddy, Audin, & Barkham, 2005; Edwards, Hall, & Shaw, 2005). Knowledge management in inter-organizational product development systems is another area of interest to researchers (Ngai, 2008; Du, 2008; Chu, 2006; Howard, 2003; Howard,

2005), as are attitudes toward collaborative inter-organizational learning (Huxham, 2008; Paavola, Lipponen, & Hakkarainen, 2004; Simonin, 2004).

One common theme between the present study and the literature cited above concerns the dynamic nature of knowledge and the need for information sharing between organizations. Of particular concern is the use of or limitations of technology in promoting the sharing of information as well as the structural factors which either promote or limit the dispersion of knowledge throughout all levels of both the network and the organizations participating in the collaborative effort. The current study is most closely aligned with those existing studies which argue that technological systems are not viable substitutes for direct interpersonal communication in fostering maximized collaboration, arguing that interpersonal communication is required to maximize the ability for members of organizations to work collaboratively across organizational boundaries.

One important but apparently unanswered question is the extent to which the flow of knowledge between organizations is impacted by issues related to power and control which may not be addressed by technological systems implementation. These issues include but are not limited to hierarchical structures within the network (in terms of power differentials between the organizations), bureaucratic structures within the member organizations, systematic communication structures including formalized communication channels, and others. The bureaucratic structures of the member organizations and the communication channels utilized by those who communicate with

members of organizations are the central factors explored in this study and are therefore of primary concern.

Structural and political factors

The third dominant theme concerns the relationship between collaborative efforts and structural/ political issues. Included in this literature is exploration of issues related to ideologically-based network organizing principles and hierarchical structures both in individual organizations in the network and in the overall network structure. Combined with the forthcoming literature review section on boundary spanners and considered in light of Deetz' (1992, 1995) work, this theme in the collaboration literature is highly relevant to the current project and will be utilized in the development of the research hypotheses which are posited in the present study.

Again, several sub-themes can be used to characterize the existing research parameters. The first of these involves a concern with the function of dynamics in network structures. These studies have explored how changes in network structures impact collaboration (Knoben, Oerlemans, & Rutten, 2006), how boundary-spanner-promoting inter-organizational structures could be facilitated (Gasson, 2005), and the evolutionary processes that guide inter-organizational network development (Wohlstetter, Smith, & Malloy, 2005).

Knoben, Oerlemans, & Rutten's (2006) literature review concerning the impacts of changes in network structures over time has links to the current study in two important ways. First, the work of these authors provides support for this study in finding that changes in dyads within the network are a central focus for researchers,

though the specific relationship between dyadic communication relationships and the over-arching organizational relationships is poorly understood (Knoben, Oerlemans, & Rutten, 2006). Secondly, their findings also support the future research called for in this study by suggesting that more work needs to be done in understanding how inter-organizational networks change over time (Knoben, Oerlemans, & Rutten, 2006), which will be discussed in detail in the final chapter of this study.

A second sub-theme can be conceptualized as those studies which are primarily concerned with organizational factors in collaborative participation. These studies include examinations of how organizational culture impacts collaboration and network structures (Kezar, 2005; Clegg, 2002) and questions concerning the tension between individual organizational governance structures and the need to develop joint inter-organizational structures (Teisman & Klijn, 2002; Phillips, 2000). Specific factors that have been identified as magnifying collaboration problems include issues related to organization size, physical distance, interdependence, competition, and commercialization (Walsh & Maloney, 2007).

A third area of research involves network-wide structural considerations. These include considerations of how governance structures impact the exercise of power in relations among the organizations involved in and management of "global value chains" consisting of structured industrial sectors which produce for global markets (Gereffi, Humphrey, & Sturgeon, 2005), examinations of how network architecture and design impacts information flow (Braha, 2004), suggestions of how increased understanding of network structural issues can lead to greater collaborative success and conflict

mitigation (Minnery, 2001), and the need for multi-level analysis in understanding network structures and dynamics (Brass, Galaskiewicz, Greve, & Tsai, 2004).

A fourth sub-theme involves network structures and their relation to power and control. Research in this area includes explorations of how extra-network politics impact factors controlling power and relationships in an inter-organizational network, and arguments advocating the need for increased centralization of control and monitoring in verifying collaborative efforts. Concerning power and relationships, Benson's (1975) work argues that inter-organizational networks consist of a political economy in which four components (domain consensus, ideological consensus, positive evaluation, and work coordination) are maintained at varying levels of equilibrium, but that extra-organizational forces which control the flow of resources (money and authority) can disrupt the equilibrium, thereby upsetting the inter-organizational relationships (Benson, 1975). Concerning the centralization of control, Sun (2009) argues that collaborative efforts are likely to fail unless three factors are monitored and controlled by the overall network: adherence to time constraints, conflicts in collaborative logic, and improper termination of relationships (Sun, 2009)

One of the primary concerns in the development of models for networking is the extent to which networks are bureaucratic or democratic in nature and the differing results of the chosen organizing ideologies represented in each. Previous studies that have focused on the political ideology of organizations in collaborative networks include examinations of how democratic structures serve as better model than authoritarian, bureaucratic, and hierarchical structures for knowledge generation and

management (de Jong & van Witteloostuijn, 2004), the need for overarching network structures to act as catalysts for the development of democratic interdependence between confederated agencies (Metcalfe, 1996), and how use of interaction-promoting technologies (i.e. group support systems) can be utilized to enhance democratic participation and decision-making (Dennis & Garfield, 2003). Specifically, the study conducted by Dennis and Garfield (2003) found that the use of group support systems resulted in challenges to leadership roles, higher levels of participation from non-leading group members, and more group-oriented project outcomes than more traditional non-mediated group communication forms (Dennis & Garfield, 2003).

These findings appear to be in conflict with other arguments in the inter-organizational collaboration literature which argue for the necessity of rich forms of interpersonal communication in order foster collaboration efforts. While not directly addressed in the current study, the implications of this tension between those who advocate for the potential of technology to foster collaboration and those who argue that technology-based communication limits true collaboration are central to the larger proposed research program, which will seek to develop a more complete model of the communication and structurally-based factors relevant to promoting inter-organizational collaboration.

Boundary spanners

The fourth relevant theme in the literature on inter-organizational collaboration concerns the roles and functions of boundary spanners in collaborative success or failure. Boundary spanners are defined as those individuals who communicate across

organizational boundaries, making connections and developing relationships with members of other organizations and them utilizing that information to improve their own organizations effectiveness (Leifer & Delbecq, 1978; Williams, 2002).

As implied by the title to this project, this theme is of high significance in relation to the current study. This area of research appears to be among the most under-developed of the collaboration literatures; a limited number of studies were found that address this important area, and it is obvious from the state of this research that much work is still needed in order to develop both practical and theoretical understandings of how boundary spanner behavior contributes to successful inter-organizational communication and collaborative efforts.

The existing research concerning boundary spanners in inter-organizational collaboration contains three primary sub-themes. The first can be characterized as being concerned with interpersonal relationships, including studies of the interplay between a boundary spanner's interpersonal networks and the formation of inter-organizational networks (Chetty, 2008; Morton, 2006), how informal social networks of boundary spanners in scientific endeavors serve as a catalyst for information sharing between institutions (Liebeskind, Oliver, Zucker, & Brewer, 1996), and the importance of trust in interpersonal relationships between boundary spanners in virtual collaboration efforts (Paul & McDaniel, 2004; Harriss, 2003).

The second theme is that of the organizational functions and necessary skills of boundary spanners and examines the central role that boundary spanners play in inter-organizational network formation and maintenance (Marchington, 2004), and

considerations of the individual characteristics and skills that lead to successful boundary spanning (Williams, 2002). Research has demonstrated that four primary stages of sense-making must be managed by boundary spanners (defining shared goals, sharing tacit knowledge, identifying external influences, and knowledge explicit generation), and the areas of expertise that boundary spanners must attain in these areas (Gasson, 2005).

The final sub-theme in this literature concerns the locations of boundary spanners in organizations and serves to highlight the importance of the factors considered in this study. Within this sub-theme, two studies of particular interest to the current research project will illustrate this importance. The first study of particular interest (in that it comes closest to addressing the current objectives) addresses how managers and managerial behaviors are utilized as network stabilizers in inter-organizational networking (Meyer, Aderhold, & Teich, 2003); however the findings of this work are limited in that only mangers and their behaviors were examined in the study; no comparison is made between boundary spanning behaviors and perceptions of management and the behaviors and perceptions of subordinate groups. A second study which contributes to the specific area of interest for the present study addresses the organizational hierarchical position of individual boundary spanners and the exercise of power in technical and administrative innovations (Ibarra, 1993); however, the specific interests of this study did not address the implications of individual hierarchical position which the present study will pursue in relation to managerial power and control over collaborative communication efforts in inter-organizational networks.

While the existing work on boundary spanners touches on some of the issues addressed in this study, there are identifiable gaps in the research on boundary spanners. Primarily, these gaps are related either directly or indirectly to the issues of managerial control of collaboration which is the central focus of the present study. By examining these previously under-explored areas, it may be possible to find new linkages between existing research findings in terms of boundary spanner behaviors and their positions in an organization's hierarchy in relation to factors impacting the success of inter-organizational collaborations.

Proximity and propinquity

A fifth dominant theme that is developed in the recent work on inter-organizational collaboration involves issues related to how actual physical proximity between organizational partners and/or technological mediation impacts collaboration across organizational boundaries. Knoben (2006) conducts a thorough review of the literature concerning proximity and collaboration and defines three conceptual areas of definition related to proximity: geographic proximity, organizational proximity, and technological proximity. Geographic proximity is defined as physical closeness, organizational proximity can be understood as the degree to which organizations are similar in interests and structure, and technological proximity concerns the similarity between the systems used to mediate communication and store information (Knoben, 2006). In contrast to technological proximity, electronic propinquity has been defined as the degree of perceived closeness created through mediated communication channels (Barnett & Choi, 1995; Korzenny, 1978).

There is a significant tension in the literature in reference to proximity and propinquity. On the one hand, there are studies located in the inter-organizational collaboration literature which argue that physical proximity is a significant factor in producing inter-organizational collaborative success (Owen-Smith & Powell, 2004), that examine the factors which limit the development of mutual knowledge in geographically dispersed inter-organizational networks (Cramtom, 2001), and that argue for the value of social information from proximate others in determining attitudes toward utilization of technology designed to enhance collaboration (Rice & Aydin, 1991). Scholars have also found evidence which indicates that computer-mediated forms of communication are less satisfying for users when working to collaborate than face-to-face communication (Anderson & Kanuka, 1997), and that workers use electronic communication channels to place distance between and shield themselves from their superiors (Quan-Haase, Cothrel, & Wellman, 2005)

On the other hand, there are those that argue that physical proximity is not significant in determining success in collaboration and innovation but that electronic propinquity can serve a substitute for proximity (Malhotra, Majchrzak, Carman, & Lott, 2001; Jankowski & Nyerges, 2001; Majchrzak, Rice, Malhotra, King, & Ba, 2000). Specifically, research has found that individual's time spent using e-mail was a significant positive predictor of collaboration (Sooryamoorthy & Shrum, 2007), and that e-mail use is associated with fewer coordination problems while neither phone nor face-to-face communication reduced problems (Walsh & Maloney, 2007). The work of Stephan Soeparman and his colleagues is applicable to both this section of the literature

review as well as to the section addressing proximity issues, arguing that physical proximity is limited in its impacts on collaborative success due to entrenched practices (a.k.a. professional routines) maintained in each agency in the network and continued even after the agencies were incorporated into the same physical space (Soeparman, S., van Duivenboden, H., Wagenaar, P., & Groenwegen, P., 2008).

Proximity operates primarily as a controlled variable in the present study; the organizations in the network being studied recently relocated to a centralized location in order to promote collaboration. Further, the organizations in this study are proximate in terms of having a singular field of interest, presenting a control for one form of organizational proximity (though their individual interests within the field of interest vary). Technological proximity is the lone uncontrolled form of proximity as defined by Knoben (2006) and it is not addressed directly at this time, though it may be addressed in future research developed as a part of the proposed program proceeding from the current project.

Soeparman, et al.'s (2008) work concerning the impact of professionalized routines on efforts at collaboration is of significant importance to the research conducted in this project, though the arguments advanced will concern limitations due to structural factors in the member organization's hierarchies as opposed to Soeparman's concern with professional routines. This body of work also addresses issues relevant to the limitations of electronic propinquity as a significant predictor of collaborative success (though Soeparman, et al. does not deal directly with propinquity); it can be argued that both professional routines and structural factors

would serve as collaborative limiters to the development of technologically-mediated closeness in much the same way as they are argued to limit the impact of proximity.

Another argument advocated by the theory of electronic propinquity which is especially significant relative to this study in light of (and contrary to) the arguments advanced by Deetz (1992) is the assertion that electronically-based, virtual forms of communicating and organizing will result in the evolution of decentralized, non-hierarchical organizational forms; however, scholars have found empirical evidence that virtual organizations still maintain hierarchical structures (Ahuja & Carley, 1998). Additionally, scholars have found that computer-mediated communication (another term used for technology-based communication forms) are often utilized by management to exert social control and enforce compliance-gaining on the part of the employee (Skovholt & Svennevig, 2006). These findings reflect those concerns already expressed in this literature review concerning the implications of technology-based communication systems on inter-organizational collaboration and managerial control of communication processes between organizations.

Media Richness and Media Selection Theories

Another important set of theories utilized in this study are rooted in studies of mass communication, interpersonal communication, and technology. These theories are utilized in conjunction with proximity and electronic propinquity theories to formulate the research hypotheses concerning boundary spanner communication behaviors. Media richness theory was originally developed as a means for explaining how communication channels differ in overcoming communication constraints such as time and space, for

transmitting complex message information, and to accurately transmit vague or ambiguous information (Daft & Lengel, 1984, 1986; Rice & Gattiker, 2001). Media richness is based on four criteria (based on media capacity to transmit information): speed, ability to transmit multiple message cues, use of natural language, and ability to convey feelings and emotions (Daft & Lengel, 1984; Fulk & Collins-Jarvis, 2001). Richness is defined as being a trait of channels with high capacities along the four criteria, allowing for communication of ambiguous messages with high accuracy (Fulk & Collins-Jarvis, 2001).

Many studies have utilized media richness theory in studying various forms of communication including mass media, computer-mediated communication in interpersonal relationships, and managerial communication practices in the workplace (Burgoon & Hoobler, 2002; Rice & Gattiker, 2001). Based on contingency theory (Rice, 1992; Mohr & Nevin, 1990), one of the primary arguments advanced in media richness theory (Daft & Lengel, 1986; Monge & Contractor, 2001) is that effective communication should be based on the selection of the form of media that is best suited to the level of ambiguity in the message being transmitted; messages low in ambiguity should be channeled through less rich media forms, while messages high in ambiguity should be transmitted via rich channels (Daft & Lengel, 1986; Rice & Gattiker, 2001). Research has provided evidence that richer forms of media between collaborators is associated with increased perceptions of credibility, increased social attraction, decreased uncertainty, and more interactional involvement that less rich forms (Nowak,

Watt, & Walther, 2005) as well as increased teamwork behaviors, perceptions of greater team performance, and fewer errors on work projects (Fletcher & Major, 2006).

The primary arguments of media richness theory have been strongly criticized, most notably for the lack of operationalization of concepts and inconsistent or exaggerated empirical support (Rice & Gattiker, 2001). Other critics have argued that media richness theory is flawed in its argument that lean communication channels do not support complex communications, arguing instead that miscommunications are due to a lack of shared understanding between individuals rather than issues related to communication technology (Dickey, Wasko, Chudoba, & Bennet Thatcher, 2006).

In contrast to media richness theory's argument concerning media selection based on message traits, media selection theories (Daft, R. L., Lengel, R. H., & Trevino, L. K., 1987) advance the argument that channel selection is based on communicator preferences and needs. In the context of organizational communication, these arguments have been advanced through studying the alignment of media selection with communicator style and organizational position (Rice, Chang, & Torobin, 1992), previous experience and comfort level with mediated communication forms and with communication exchange partners (D'Urso & Rains, 2008), and with perceived communication norms within a particular organizational setting (Turner, Tinsley, Lee, & O'Pell, 2006).

One particularly interesting use of media selection in light of Deetz's work on managerialism are those studies that have examined media selection choices made by those in managerial positions. Some of these studies have lent support to the pro-media

richness arguments, finding that highly successful managers selectively choose channels based on their appropriate richness for given messages (Daft, Lengel, & Trevino, 1987; Russ, Daft, & Lengel, 1990). Other studies have tended to support the media selection perspective, finding that higher level managers choose media channels for communication based on self-interest and personal ease of use in communication as opposed to a more other-centered approach adopted by their lower-level colleagues (Carlson & Davis, 1998), that managers tend to choose media for communication based on the need to track and control information flow (Donabedian, McKinnon, & Bruns, 1998), and to create and maintain space from their lower-level employees, especially when making decisions that were anticipated to be received negatively (Lengel & Daft, 1989).

Best practices and communication factors

The seventh and final major area of research in the inter-organizational collaboration literature concerns the development and implementation of "best practices" models for collaborative efforts between organizations and the communication factors that lead to collaborative successes or failures. The issues addressed in this area of research are of central importance to the current project, as it seeks the eventual development of a best practice model which promotes participation and democratic principles in inter-organizational collaborative practice.

Several sub-themes in the extant research in the area of best practices in collaboration have proposed a variety of models for collaborative practices based on

various concerns and perspectives. The first sub-theme concerns the strategic use of collaborative practices between organizations and addresses balancing a concern for organizational interests with those of the larger community (Di Domenico, 2009; Boonstra, 2008), suggests various means for using contingency approaches for resource allocation in implementing public policy (Meier & O'Toole, 2003), has explored the use of gifting practices in building obligations between network partners (Darr, 2003), and examines the use of network practices to respond to threats to economic viability and pressures from globalization (Forget, 2008).

A second sub-theme involves a central concern with collaborative network development, and has examined the importance of alignment between network-wide, organizational, and individual-level goals (Croteau & Hicks, 2003), has suggested the use of organic models for collaborative coordination (Farjoun, 2002), and has presented models for collaboration in research across disciplinary boundaries (Jeffrey, 2003). Scholars have also found evidence that trust building in the form of creating shared business principles or shared visions promotes virtual collaboration and that organizing should be concerned with creating rules and norms to enable and constrain actions that promote high levels of trust (Hossain & Wigand, 2004); additionally, scholars have argued that trust built in virtual spaces appears to be fragile and temporary in nature (Jarvenpaa & Leidner, 1998).

A third area of concentration in this literature involves the development of socially responsible networks and has addressed citizen-based approaches to developing collaborative care networks (Kihlstrom, 2009), has examined network structural factors

leading to coalition development in service organizations tasked with providing care to HIV/AIDS infected populations (Penner, 1995), and has identified best practices for developing environmentally friendly manufacturing processes, supply chains, and policies (Vachon, 2008; Simpson, 2007; Rondinelli & London, 2003; Milne, Easwar, & Gooding-Williams, 1996).

A fourth sub-theme involves increasing collaborative effectiveness to improve network and organizational viability. These studies include those that have examined the importance of collaboration practices to small and medium-sized companies (Danilovic, 2005), have explored the development of mechanisms for improved organizational collaboration and network-wide learning (White, 2008; Hildenbrand, 2007; Mellat-Parast, 2007; Kaufman, 2005; Feller, 2005), and have examined various problems related to supply-chain management and information accuracy (Legner, 2008) as well as potential solutions to them (Albani, 2004; Dyer & Nobeoka, 2000). The importance of inter-organizational collaboration has also been demonstrated in the area of risk and crisis communication as being a central factor in determining organizational and network success in dealing with crisis situations (Adkins, 2010; Seeger, 2006).

Of particular interest to those pursuing a communication-based perspective for developing collaborative best practices in inter-organizational networks are those studies that have pursued the application of communication theory to network collaboration. Studies focusing particularly on communication factors found in this body of literature included examinations of collaboration as a form of relational competence performance (Paulraj, 2008), the use of social capital theory to explain

success in cross-organizational resource acquisition (De Wever, Martens, & Vandenbempt, 2005) and knowledge transference (Li, 2005), as well as suggestions for reducing the tensions involving social exchange and resource dependency versus organizational political issues that limit organizational motivation to collaborate (Farmakopoulou, 2002).

As in previously examined areas of the literature, several knowledge gaps need to be addressed which are of central concern in the present study. The understudied areas include the development of best practices for individuals responsible for cross-organizational communication as well as considerations of organizational and network structures in relation to promoting open and participatory communication. These two areas are of significant interest to the current project, and both were utilized in the development of the hypotheses to be tested in this study.

The Multiple Stakeholder Model

As in the section above, it must be briefly stated here that this review is not exhaustive, but rather aimed at attaining specific objectives of summarization relevant to the current study. In summarizing this theory a primary source has been utilized, and many contributing sources and alternative versions of stakeholder models (i.e. Carroll, 1989; Freeman & Gilbert, 1988; Osigweh, 1994) are not specifically addressed. Deetz' multiple stakeholder model was chosen as the primary source for two principal reasons; first, much of the scholarly work utilizing or referring to stakeholder models of communication recognize Deetz' model as a primary source (see Eisenberg, Goodall Jr., & Tretheway, 2007; Seibold & Shea, 2001). Second, Deetz' multiple stakeholder model

was selected as a best fit within the overall contexts of the research project; since Deetz' managerial model is also utilized in the study, using Deetz' stakeholder model provides a means of integrating both models while maintaining a common link between them in terms of similarity in theoretical foundations and scholarly approach.

Another factor in the decision to utilize Deetz' multiple stakeholder model is that while Deetz' work is commonly referenced (see Eisenberg, Goodall Jr., & Tretheway, 2007; Seibold & Shea, 2001), scholars have noted that Deetz' stakeholder model and stakeholder models in general have been largely overlooked in terms of being subjected to testing and expansion efforts (Seibold & Shea, 2001; Mumby, 2001). By utilizing Deetz' work, the current project presents a potentially unique application of Deetz' model by examining some of its arguments using quantitative methods and in doing so offers a response to calls for research combining critical theory with empirical testing (Monge & Contractor, 2001; Mumby, 2001; Deetz, 2001).

As a final preliminary point of emphasis before examining Deetz' multiple stakeholder model, it should be noted that Deetz' model (and stakeholder models in general) is not free from scholarly criticism. Some of the key criticisms include the presence of a disconnect between the critical theories and their actual application in organizations; these criticisms include the arguments that models intended to increase the involvement and considerations of diverse groups of stakeholders are often actually utilized by management in organizations as a means to suppress actual stakeholder voice (Deetz, 2001; Gordon, 1988), arguments concerning observations that organizations are motivated by concerns for profit and loss and that issues which are not

directly related to organizational goal attainment are not valued in organizations (Locke & Schweiger, 1979; Seibold & Shea, 2001), and the previously cited criticism that the arguments made in the stakeholder models which are based in critical analysis methodologies need to be subjected to empirical testing and verification (i.e. statistical analysis). While the potential validity of the criticisms aimed at multiple stakeholder models is recognized, none of the criticisms concerning Deetz' model or other stakeholder models which were found in the literature are indicative of critical flaws in the theories themselves, but rather generally raise concerns about their verification and potential applications. In short, the criticisms are ones which are commonly presented against a variety of critical theories, and do not represent concerns which are seen as damaging the arguments made in the theory or otherwise impacting the utilization of the theory in the present study.

The multiple stakeholder model (as it will be described here) is drawn from the work of Stanley Deetz (1995). In his book Transforming Communication, Transforming Business: Building Responsive and Responsible Workplaces (Deetz, 1995), Deetz outlines a basic stakeholder theory that will be utilized in forming the theoretical foundation for the current study. Culminating in a case study used to demonstrate the principles of the multiple stakeholder model, this work by Deetz seeks to outline a model by which the interests and voices of all parties maintaining a vested interest in a corporation can be heard and considered in organizational decision making.

Deetz begins by describing how previous systems (specifically, managerialism) have resulted in failures in terms of corporate social responsibility, economic decision-

making, and long-term financial viability (Deetz, 1995). He then goes on to describe how various solutions including marketplace regulations and attempted government interventions have failed to successfully solve these problems (Deetz, 1995). Drawing largely from his previously cited work (Deetz, 1992), he then goes on to examine the political forces at play in the workplace that have lead to the poor decisions and outcomes observed (Deetz, 1995) prior to describing his multiple stakeholder model (Deetz, 1995).

The multiple stakeholder model advocated by Deetz is based on a re-focusing of managerial interests on the creation, maintenance, and valuation of open, participatory forms of communication between all parties with a vested interest in organizational products and outcomes (Deetz, 1995). As such, it represents a "network-wide" approach to organizational decision-making and control. Describing the model, Deetz states that "… management would be hired by all stakeholders and work to coordinate optimally the meeting of all interests as if they were interests of the corporation, thus seeking the most creative codetermination for the benefit of all stakeholders" (Deetz, 1995, p. 49).

A real-world example that can be utilized to illustrate facets of the type of organization that Deetz is advocating in the multiple stakeholder model can be found in the case of The Richards Group, an advertising agency based in Dallas, TX. This organization's philosophy illustrates the consideration of all stakeholders in an organization as called for by Deetz. According to a review by the Dallas Business Journal (Anonymous, 2009) which ranked The Richards Group as one of the top places

to work in Dallas, the philosophy and culture of the company are based on the painting "The Peaceable Kingdom" (Anonymous, 2009).

The Richards Group's culture makes a concerted effort to create a climate based on open flow of communication (stress is placed everyone having access to all company information), an open workspace where there are no doors or offices, and an open forum for communication (the stairwell) that also serves as the site for all company-wide meetings and announcements (Anonymous, 2009; Richards & Culp, 2001). Not only is there an emphasis on openness in the company philosophy; specific communication practices are emphasized. The Richards Group emphasizes communication between all parties as a means of boosting company-wide morale and stresses that communication should occur in rich forms: face-to-face if possible, then phone if necessary, and reserves e-mail communication as a last resort (Anonymous, 2009; Richards & Culp, 2001).

This exemplar serves to illustrate anecdotally one of the arguments advanced in the present study. Specifically, the emphasis on rich forms of communication and on the sharing of important information in a system-wide synchronous forum are both themes that will be further addressed in the study, particularly in the exploration of employee suggestions for increasing inter-organizational collaboration. The findings of the present study suggest that increasing both of these communication factors may provide a means by which inter-organizational collaboration may be encouraged, and also that organizational employees recognize the need for emphasis on rich, synchronous, and system-wide forms of inter-organizational communication.

Deetz specifically identifies seven stakeholder groups that should be included (in addition to the assumed traditional ownership and managerial groups) in corporate decision-making in his version of the multiple stakeholder model: consumers, workers, investors, suppliers, host communities, the general society, and the world ecological community (Deetz, 1995). He also identifies four organizational outcomes that should be used to measure organizational effectiveness under the new model: goods and services, income (re)distribution, use of resources, environmental effects, economic stability, labor force development, and lifestyle enhancement (Deetz, 1995).

The identification of stakeholder groups by Deetz provides opportunity for noting an important element of the current study. While not all stakeholders as described by Deetz are included in this study, the argument by Deetz (1995) concerning codetermination provides a foundation for examining the extent to which managers either facilitate or constrain inter-organizational communication and collaboration; in this study, the argument is advanced that while managers may espouse principles of democratic communication and processes, they actually act in subtle ways (through strategic management of inter-organizational relationship linkages) to limit the full incorporation of codetermination throughout all levels of the inter-organizational network.

Several additional concepts from the multiple stakeholder model are of interest to the current study. First, Deetz (1995) argues for the incorporation of collaboration and collaborative processes in the multiple stakeholder model he presents; this provides further means for grounding the present study of collaboration within the context of

Deetz's work. Second, he argues for a focus on the processes of negotiation as a replacement for the emphasis on consensus-building that is present in most other stakeholder models which address conflict issues (Deetz, 1995), asserting that the value of conflict lies not in the outcome but rather in the promotion of dialogue between disparate stakeholder parties (Deetz, 1995) and in the honest engagement of the process (Deetz, 1995). Finally, Deetz recognizes and incorporates the concepts of complexity in terms of communication processes, organizational structures, and organizational environments (Deetz, 1995) that will be further developed in the sections of the final chapter of this study concerning chaos theory and which form a lynchpin between the current study and the research program it seeks to initiate.

Managerialism and participatory democracy

A central driving theoretical concern of the current study and the research program it seeks to initiate consists of further development to the work of Stanley Deetz (1992) concerning increased democratic participation in the workplace. Specifically, the present study builds on the work of Deetz in relation to the development of models for promoting participatory democracy in the corporate sector- ideas which were primarily located in his work concerning how corporate structures in the form of managerial-based systems serve to limit participation in hidden forms (Deetz, 1992) through expanding the application of those ideas to the examination of the impacts of these structures on inter-organizational network forms. In his work, Deetz draws from a plethora of sources, including some of the classic work in communication studies done by Weber, Marx, Habbermas, Gaddamer, Foucault, and others. These foundational

works are neither directly utilized in the present study nor thoroughly addressed in this brief review (and thus are not cited as part of the sourced literature for this project); however, it would be remiss not to acknowledge their contributions to Deetz's work and therefore by extension to the foundations of the present study.

Many of the critical observations in relation to contextualizing Deetz' managerial model have already been noted in reference to the multiple stakeholder model; in many ways, these two theoretical areas mirror each other in terms of theoretical foundations and major criticisms. While other scholars have provided alternative versions of models critical of managerialism- most notably Rosen (1985, 1988), much of the scholarly work utilizing or referring to managerialism recognize Deetz' model as being the most complete and developed source (see Eisenberg, Goodall Jr., & Tretheway, 2007; Mumby, 2001) for utilization in the analysis of managerialism. Second, Deetz' multiple stakeholder model was selected as a best fit within the overall contexts of the research project; as previously stated, using Deetz' stakeholder model in correlation with Deetz' managerial model provides a means of integrating both theoretical models while maintaining a common link in their foundations and theoretical approach.

Another factor in the decision to utilize Deetz' managerial model is that while Deetz' work on managerialism is frequently referenced in other organizational communication scholarship (see Eisenberg, Goodall Jr., & Tretheway, 2007; Seibold & Shea, 2001; Mumby, 2001), scholars have noted that Deetz' managerial model (similarly to the multiple stakeholder model) have been largely overlooked in terms of

being subjected to testing and expansion efforts (Seibold & Shea, 2001; Mumby, 2001). By utilizing Deetz' work the present study presents a potentially unique application of Deetz' model through examining some of its arguments using quantitative methods, and in doing so represents a response to calls for research which combines critical theory in conjunction with the use of empirical testing methods (Monge & Contractor, 2001; Mumby, 2001; Deetz, 2001).

It should finally be noted that Deetz' managerial model (as with managerial models in general) is not free of criticism. Some of the key criticisms that have been leveled against Deetz' managerial model include the argument that models intended to reduce managerial influences are often actually by members of the managerial class to increase their exercise of power and control (Deetz, 2001; Gordon, 1988); observations that organizations are primarily motivated by concerns for profit and loss and that issues which are not directly related to organizational goal attainment are not valued in organizations (Seibold & Shea, 2001; Locke & Schweiger, 1979); and the previously cited criticism that the critical-methods based arguments made in managerial models need to be subjected to empirical testing and verification. Another criticism of theories critical to managerialism has been the argument largely developed by Scott (1990), who argues that managerial systems are actually utilized by lower-level employees as a means to form spaces for resistance to managerial constraints, and therefore represent an important organizational element which serves to empower lower-level employees through their exercise of resistance to management.

Finally, some critics have argued that the participatory forms which criticisms of managerialism (such as Deetz' model) as well as various employee participation programs which are utilized (particularly in North American organizations) serve not as true forums for meaningful participation, but rather as control mechanisms used by organizational management to handle employee-related problems such as dissatisfaction, absenteeism, and other issues (Bernstein, 1982; Mason, 1982; Deetz & Kersten, 1983). While the validity of the criticisms aimed at multiple stakeholder models is recognized, the criticisms located concerning Deetz' model or other managerial models are commonly presented against a variety of critical theories and do not present a significant level of concern which would discourage the utilization of the theory as described by Deetz in the present study.

In his critique of managerialism, Deetz (1992) begins by observing that corporate life has become the central dominating structure of modern society, controlling many aspects modern life. These aspects include domination over personal life, identity construction, structuring of time, and domination over other institutions in society. He observes that this domination also includes allocations of resources, technological development, construction of news and entertainment, availability of goods, and determination of interpersonal relationships. This leads to his argument that corporate domination represents a moral and ethical issue for societies, particularly those that operate under an ideology of democratic principles (Deetz, 1992).

One of the primary concerns that Deetz (1992) expresses is that non-democratic processes in modern workplaces lead to a deterioration of individual participation in

larger democratic processes. He states that "… a hardy representative democratic consciousness is poorly served by incongruent organizational practices" (Deetz, 1992, p. 38). Drawing on the work of several other scholars, Deetz demonstrates that authoritarian forms of governance in the workplace do have this effect. Further, Deetz argues that these processes lead to a loss of institutional legitimacy in democratic institutions that are charged with governing society (Deetz, 1992).

Another central argument Deetz advances is that most control in the workplace is not exercised via direct means, but rather are subversively "hidden" in the form of "institutional practices" (Deetz, 1992, p.126) that lead individuals to voluntarily shape their beliefs and behaviors to conform to expectations and desired outcomes (Deetz, 1992). Deetz then demonstrates how this rationally-based voluntary subjugation plays into the interests of those in the managerial class whose interests are differentiated both from workers and from owners (Deetz, 1992).

Deetz proceeds to describe a complex system of these largely hidden workplace controls, which form a system that he coins as "managerialism" (Deetz, 1992, p. 221-224). Much of the rest of Deetz's book is dedicated to describing systems related to and supporting managerialism, including the division of labor, negotiation practices, and technology in the workplace. Finally, Deetz turns to describing a potential system for implementing democratic practices in the workplace, which he describes as a system of "participatory democracy" (Deetz, 1992, p. 332-352) based on the reclamation of conflicts hidden by managerialism and micropractices that seek to reclaim individual identity and self-determination (Deetz, 1992).

In this study, application of Deetz's work can be seen in the argument that job functions are a rational mechanism used by members of the managerial class to constrain collaborative efforts; employees are not encouraged to view inter-organizational communication as part of their job functions, thereby "naturally" constraining meaningful inter-organizational collaboration to those groups whose job functions encompass formally working with other organizations- the members of the managerial class.

Once again, The Richards Group can serve as a real-world example of the concepts Deetz is advocating for in the proposed turn away from managerialism. The company stresses the utilization of non-bureaucratic structures (there are no job titles or segregation by job function), cross-functional teamwork (to get work done faster and foster mutual appreciation), merit-based recognition (Fridays off for those who work substantial overtime, tenure-based rewards, and a $10,000 family trip to anywhere for all employees achieving 20 years of service), and opportunities for informal socialization featuring monthly concerts featuring local artists and company-wide potluck lunches (Anonymous, 2009; Richards & Culp, 2001).

This study incorporates the ideas advanced by Deetz through applying the concepts of managerialism and participatory forms to the analysis of organizational and network structures in inter-organizational collaboration, an area to which Deetz' work has apparently not been previously applied. By examining how managerial forces (the systems supporting managerial practices, examined in this study through the exploration of hierarchical structures) impact the behaviors of individuals and organizations in

attempts to collaborate, it is hoped that an alternative model for developing truly participative networks can begin to be developed, following the participatory model for organizing advocated by Deetz.

The present study differs from and expands upon the work of Deetz in one very important way. Deetz' work focuses on how managerialism operates to constrict freedom and equitable exchange within an organization; this study explores how managerialism operating within an organization or inter-organizational network constricts freedom and equitable exchanges between organizations involved in efforts at collaboration. Drawing from the literature on managerialism and bureaucratic structures, the following hypotheses are posited concerning boundary spanners and their positions in organizational hierarchies.

The first hypothesis examined in this study suggests that managers will have contact with more organizations in the inter-organizational network than those employees who work in non-management positions:

H_1: Location in higher positions in an organization's hierarchy will be associated with more organizational network communication linkages.

This is the only hypothesis in the study which relies on individual rather than relationship level data. Position in the organization hierarchy serves as the independent variable in this hypothesis, and was measured using an ordinal scale consisting of hierarchically ordered job function categories. Organizational links represents the dependent variable in the analysis, and consisted of a ratio scale ranging from zero to fifteen organizations.

The second hypothesis examined in this study states that the relationships which managers maintain with other network organizations will have higher levels of communication than those relationships which are maintained by non-managers:

H_2: Location in higher positions in an organization's hierarchy will be associated with increased levels of communication activity.

H_2a: Location in higher positions in an organization's hierarchy will be associated with increased levels of communication frequency with other network organizations.

H_2b: Location in higher positions in an organization's hierarchy will be associated with communication with more people from other network organizations.

This hypothesis and those that follow in the analysis are designed to consider the relationship as the unit of measure, thus allowing for the expansion of the measured population from the number of people who participated in the study to the number of relationships those participants reported about. As with the first hypothesis, position in the organizational hierarchy serves as the independent variable (for both sub-hypotheses) and uses the same ordinal scale previously described, though in the case of this hypothesis and those that follow it is the relationship rather than the individual communicator which is the unit of interest for measurement purposes. The independent variable for the first sub-hypothesis associated with hypothesis two (H_2a) is frequency of communication activity, measured using an ordinal scale consisting of categories indicating the number of inter-organizational communication activities undertaken

within a given period of time. The number of people from the network organization with whom the participant has contact serves as the dependent variable in hypothesis 2b, and consists of an ordinal scale indicating the number of members from a network organization whom a relationship is maintained with.

The third hypothesis proposes that managerial relationships will be perceived to maintain higher collaboration levels with other network organizations than those relationships of non-managers:

> H_3: Location in higher positions in an organization's hierarchy will be associated with higher levels of perceived collaboration with other network organizations.
>
> > H_3a: Location in higher positions in an organization's hierarchy will be associated with higher levels of perceived individual-to-organization collaboration with other network organizations.
> >
> > H_3b: Location in higher positions in an organization's hierarchy will be associated with higher levels of perceived organization-to-organization collaboration between their organization and other network organizations.

The independent variable in H_3 is the same as the ordinal independent variable used in H_1 and H_2. For the dependent variables, identical scales were used in measuring both individual and organizational levels of collaboration, consisting of a previously utilized scale measuring perceived levels of collaboration (Frey, Lohmeier, Lee, & Tollefson, 2006). While it could be argued that these scales are ordinal in nature, in this study

these categories are conceptualized as consisting of varying degrees of inter-organizational networking and have therefore been treated as interval level data in the analysis, allowing for more robust testing of the relationships between the independent and dependent variables. Table 1 provides a breakdown of the first three hypotheses, including main hypotheses, sub-hypotheses, variables, and their associated levels of measurement.

In this study, concepts from both perspectives will be utilized along with proximity and electronic propinquity to examine the communication channels utilized by boundary spanners in the inter-organizational network. Most importantly, this study will seek to establish that communication channels, whether chosen due to a desire for richness or due to an interest in personal ease, serve largely to create a form of communication that restricts inter-organizational communication flow and serves to limit capabilities for participative and democratic inter-organizational collaboration. Drawing from these literatures from media richness and selection theories as well as those concerning proximity and propinquity, the following hypotheses can be derived.

The fourth hypothesis in this research study examines the relationship between levels of communication activity and the channels utilized by boundary spanners for inter-organizational communication:

H_4: Increased individual-to-network organization communication activity will be associated with decreased richness in communication channel selection.

Table 1: *Hypotheses 1-3*

Hypothesis	Sub-Hypothesis	IV	IV Level	DV	DV Level
H_1		Location in hierarchy	Ordinal	Number of communication links	Ratio
H_2		Location in hierarchy	Ordinal	Level of communication activity	
	H_2a	Location in hierarchy	Ordinal	Level of communication frequency	Ordinal
	H_2b	Location in hierarchy	Ordinal	Number of people communicated with	Ordinal
H_3		Location in hierarchy	Ordinal	Level of Collaboration	Interval
	H_3a	Location in hierarchy	Ordinal	Individual-to-organization collaboration	Interval
	H_3b	Location in hierarchy	Ordinal	Organization-to-organization collaboration	Interval

H_4a: Increased frequency of individual-to-network organization communication activity will be associated with decreased richness in communication channel selection.

H_4b: Increases in the number of people from other network organizations communicated with will be associated with decreased richness in communication channel selection.

The independent variable for H_4a consists of the same ordinal measure (frequency of communication) which operated as the independent variable in the analysis of H_2a. The independent variable for H_4b consists of the ordinal scale described as the dependent variable in H_2b, number of people from the other organization with whom communication is maintained. The dependent variable for H_4 is channel richness, and consists of ordinal categories indicating which communication channels are utilized in inter-organizational communication.

The fifth hypothesis examines the relationship between communication activity levels and the direction of communication flow in inter-organizational relationships:

H_5: Increased inter-organizational communication activity will be associated with decreased directionality in communication flow.

H_5a: Increased frequency of individual-to-organization communication activity will be associated with decreased directionality in communication flow.

H_5b: Increases in the number of people from other network organizations communicated with will be associated with decreased directionality in communication flow.

Both of the independent variables used in the fifth hypothesis were previously described in H_2 and H_4; the dependent variable for this analysis consists of an ordinal measure of the direction of communication flow.

The sixth hypothesis examines the relationship between the utilized for inter-organizational communication and the perceived levels of collaboration in the inter-organizational relationships:

H_6: Increased richness in communication channel selection will be associated with higher levels of perceived collaboration.

H_6a: Increased richness in communication channel selection will be associated with higher levels of perceived individual-to-organization collaboration with other network organizations.

H_6b: Increased richness in communication channel selection will be associated with higher levels of perceived organization-to-organization collaboration between their organization and other network organizations.

All of the variables utilized in H_6 have already been described in previous hypotheses; communication channel richness was utilized as the dependent variable for H_4, while the scales measuring collaboration levels were utilized as the dependent variables in H_3.

As in H_3, the sub-hypotheses in H_6 both consist of ordinal level independent variables and interval level (for the purpose of this analysis) dependent variables.

The seventh and final hypothesis for this study examines the relationship between the direction of communication flow and perceived levels of collaboration:

H_7: Increased levels of directionality in communication flow will be associated with higher levels of perceived collaboration.

H_7a: Increased levels of directionality in communication flow will be associated with higher levels of perceived individual-to-organization collaboration with other network organizations.

H_7b: Increased levels of directionality in communication flow will be associated with higher levels of perceived organization-to-organization collaboration with other network organizations.

All of the variables utilized in H_7 have already been described in previous hypotheses; directionality of communication flow was utilized as the dependent variable for H_5, while the scales measuring collaboration levels were utilized as the dependent variables in H_3 and H_6. As in H_3 and H_6, the sub-hypotheses in H_7 both consist of ordinal level independent variables and interval level (for the purpose of this analysis) dependent variables. Table 2 presents a breakdown of the final four hypotheses in this study, indicating the variables involved in each and their corresponding levels of measurement.

The literature reviewed concerning both organizational bureaucracies and boundary spanner behaviors in combination with the literature concerning the development

Table 2*: Hypotheses 4-7*

Hypothesis	Sub-Hypothesis	IV	IV Level	DV	DV Level
H_4		Level of communication activity		Communication channel richness	Ordinal
	H_4a	Frequency of communication	Ordinal	Communication channel richness	Ordinal
	H_4b	Number of people communicated with	Ordinal	Communication channel richness	Ordinal
H_5		Level of communication activity		Directionality of communication	Ordinal
	H_5a	Frequency of communication	Ordinal	Directionality of communication	Ordinal
	H_5b	Number of people communicated with	Ordinal	Directionality of communication	Ordinal
H_6		Communication channel richness	Ordinal	Level of collaboration	
	H_6a	Communication channel richness	Ordinal	Individual-to-organization collaboration	Interval
	H_6b	Communication channel richness	Ordinal	Organization-to-organization collaboration	Interval
H_7		Directionality of communication	Ordinal	Level of collaboration	
	H_7a	Directionality of communication	Ordinal	Individual-to-organization collaboration	Interval
	H_7b	Directionality of communication	Ordinal	Organization-to-organization collaboration	Interval

of best practices for inter-organizational collaboration finally serve to provide a basis for the following research question that serves as a final point of measurement analysis in this study:

> RQ_1: What organizational structures and boundary spanner behaviors impact perceived levels of individual-to-organization and organization-to-organization collaboration in inter-organizational networks?

By ascertaining the factors that impact levels of perceived collaboration, implications concerning the factors determining perceptions of overall levels of collaboration will be drawn.

Networking and inter-organizational networks

The final theoretical foundation utilized for developing the research methodologies in this study is network theory. Drawing primarily on the work of Monge and Contractor (2001), the primary goal of this review of the networking theory literature is not to describe the theory in its totality, but rather to describe some of the basic concepts of the theory and previous work that utilized it in order to develop concepts that were used in designing the research questions and hypotheses that will be explored in the current study.

As noted by Monge and Contractor (2001), the central focus of network theories and network analysis consists of analyzing the relationships between communicators (a.k.a. "entities") rather than the individual communicators themselves (Monge & Contractor, 2001). This distinction is important to the current study, as it forms the basis for the arguments advanced in the methodology concerning the power of the research

project, which primarily focuses on the relationships involved in inter-organizational collaboration rather than on the individual communicators involved in the relationships. The focus on relationships in network analysis leads to the development of a new concept, network linkages. Simply defined, network linkages "are created when one or more communication relations are applied to a set of people, groups, or organizations" (Monge & Contractor, 2001, p. 441).

Several typologies of network linkages have been developed and studied by researchers. For the purposes of this study, the typology developed by Eisenberg et al. (1985) for the study of inter-organizational networks is of highest interest and applicability. Their typology consists of two primary types: content (material versus symbolic) and linkage. The three levels of linkages defined by Eisenberg et al. (1985) include: institutional exchanges without the involvement of specific persons such as data transfers, representative exchanges between official representatives of organizations acting in their official capacities, and personal exchanges between representatives of organizations acting in a non-official or private capacity (Eisenberg et al., 1985; Monge & Contractor, 2001). The current study indirectly applies the second and third of the linkage types described by Eisenberg, et al. (1985), with the primary focus on measuring the representative exchanges while also accounting for the personal exchange level (as will be further described in forthcoming sections).

Two general types of communication network structures have also been posited and examined in studies of organizational networks, formal and emergent (Monge & Contractor, 2001). The basic nature of formal networks was described by Weber (1947)

in his work on bureaucratic systems; these networks are described as representing communication channels in which command communications were transmitted downward in the organization from managers to lower-level employees (referred to as rationalization) and information was passed upward from employees to management (Weber, 1947; Monge & Contractor, 2001). Emergent networks are defined as informal channels of communication, commonly referred to as "the grapevine" (Barnard, 1938; Follett, 1924; Monge & Contractor, 2001). Scholars have recognized the co-existence of these two networks within organizations, studying the various tensions between them and the types of communication each is used for in organizations (Stevenson & Gilly, 1991; Stevenson, 1990; Monge & Contractor, 2001). The current study seeks to examine the factors impacting communication in the formal communication networks utilized to promote inter-organizational collaboration between the network partners.

Another important conceptual development in the area of organizational network studies involves the centralization and density of network linkages; the density of a network's structure is of central importance in formulating the first of the network-based sub-hypotheses to be tested in the study. Structural density (as the term is utilized in this study) is based on two sub-components utilized for testing: interconnectedness and tie strength. Centralization refers to the position that an entity (or node) occupies in the network structure, whereas density refers to the number of linkages between nodes as compared to the possible number of linkages that could exist in the network (Shaw, 1964; Monge & Contractor, 2001). The concept of centralization is not utilized in the current analysis; however, the concept of network density is tested. Following on the

definitions supplied in Brass (1995), the concept of network density will hereafter be referred to either as "connectedness" or "interconnectedness" in this study. Based in the work of Lewin (1936) and originally applied to small groups in organizational settings, several types of network/ organizational forms have been identified including the chain, circle, wheel, and comcon (completely connected); each of these forms varies in terms of their density and centrality, with the comcon representing the most dense and least centralized network form (Bavelas, 1948; Monge & Contractor, 2001). Two findings that are of importance to this project were found in the studies of these network forms; decentralized networks are superior for tasks involving collaboration (Shaw, 1964; Monge & Contractor, 2001), and decentralized networks lead to greater levels of employee satisfaction (Shaw, 1964; Monge & Contractor, 2001), with the exception that those in power positions (i.e. managers) had greater levels of satisfaction in the centralized forms (Shaw, 1964; Monge & Contractor, 2001).

In additional to the concepts of interconnectedness, a second measure relative to a network's structure will be utilized, the concept of "tie strength". The work of Brass (1995) once again provides a definition for strength, describing it as the "amount of time, emotional intensity, intimacy, or reciprocal services" in a network relationship. Brass (1995) notes further than two concepts are often used to measure strength; frequency (how many times or how often a link occurs) and multiplexity (the extent to which network nodes are linked by more than one relationship). Given that the term frequency is currently utilized in the primary hypotheses, the tie strength measures in

the network analyses in this study will utilize the second conceptual definition (multiplexity) for measuring tie strength.

The research on network density is important to the current study in three ways. First, network analysis and network mapping are utilized in this study in order to test the sub-hypotheses included in this section that are concerned with inter-organizational network density and inter-organizational network performance indicators. Second, this study seeks to expand on the understanding of how even dense networks still maintain bureaucratic systems of control between the network nodes, thus impacting network linkages in relation to collaborative efforts. Third, the current research project expands on the work related to network linkages by seeking to develop an understanding of how the decentralization of inter-organizational networks impacts employee perceptions of inter-organizational collaboration levels, as opposed to the focus on employee satisfaction maintained in previously existing studies.

In addition to the structural density aspects of networks, a second primary concept is posited and tested in this study, referred to as "structural performance". By opening a conceptual gap between the concepts relative to density and performance in networks (a move which does not appear to have been made in previous networking literature), it is hoped that a clear distinction between network factors related to structure (seen as the physical aspects of the network) and factors related to performance (seen as the degree to which the network's structure is effectively utilized) could eventually emerge, thereby allowing for analyses of both the components of

networks and the choices made by communicators in utilizing the network's components.

A construction-based metaphor can perhaps serve to clarify the conceptual distinction being advocated. The construction of a building can be seen as consisting of two components: the design of the structure (i.e. architectural plans) and the selection of the materials used to build the building (lumber, brick, etc.). These two components (design and material) are synonymous with the concept of structural density in networks, which consists of the design of the network and the materials/ components used in building the design. A separate but related consideration when valuing the quality of a construction project is utilization: this consideration concerns how the structure will be used (residential, commercial, storage, etc.) and how well the structure serves it's designated purpose (it's capability); these considerations (usage and capability) are synonymous with the concept of structural performance in networks, which seeks to understand the functional (as opposed to structural) aspects of a given network.

Three sub-concepts are utilized in the measurement of structural performance in this study; isolates, pendants, and the reciprocity of relationships. Brass (1995) defines isolates as those nodes in the network which have either no links or relatively few links to others; however, in network map analyses isolates are defined specifically as those nodes which have no links to other nodes (Hanneman & Riddle, 2005). The more conservative definition of isolates as being those which are completely unconnected to others in the network will be utilized in this study. Related to the concept of isolates

(and utilized in the same tests in this study) is the concept of pendants; pendants are defined as those nodes in the network which are connected to only one other network node (Hanneman & Riddle, 2005). Taken together, the measure of isolate and pendants in a given network are seen as giving an indication as to how the network is being utilized in terms of connectivity between the various network members; to the extent that there are isolates and pendants, it can be argued that the structures of the network are not being utilized to their full potential or are not achieving optimum performance.

The third concept related to structural performance is relationship reciprocity; reciprocity has been defined in previous research as "the degree to which [a] transaction orientation is reciprocated" (Scott, 1991/2000; see also Mitchell, 1969). This concept is also reflected in the work of Brass (1995), who uses the term "symmetry", defined as the extent to which a relationship is bi-directional. In this study, the definition of relationship reciprocity is derived from the more common network analysis definition; a reciprocal relationship is defined as one in which both nodes perceive a mutual relationship (Hanneman & Riddle, 2005).

An important conceptual development in the area of network analysis is structural holes theory (Burt, 1992; Monge & Contractor, 2001), based on social capital theories (Coleman, 1986; Coleman, 1988; Monge & Contractor, 2001). Structural holes theory posits that people accumulate social capital (positive relationships with other people) and invest it in structural holes (those places in networks where nodes are not linked together) (Burt, 1992; Monge & Contractor, 2001). In other words, individuals get to know other individuals and then become links between those individuals and yet

other individuals they know in the network, thereby becoming an intermediary connection between the disconnected others. The theory posits that by placing themselves in structural holes, nodes become more influential in the network by becoming links between the otherwise unconnected other nodes, thereby controlling the flow of information and resources between them (Monge & Contractor, 2001).

The argument concerning boundary spanner control of information flow between network nodes through the occupation of structural holes is also of particular interest to the present study; following on the work of Deetz (1992, 1995), this study advances the argument further through examining the extent to which organizational managers act to maintain positions in the structural holes of the inter-organizational network, thereby increasing their control of inter-organizational communication/ collaboration processes and controlling the flow of communication between the organizational units.

A final area of interest to the current research project involves issues related to trust, power, and democratic networking. Researchers have found that informal communication ties between nodes leads to the development of trust, which has been found to be a significant predictor in successfully managing uncertainty and crisis situations (Krackhardt & Stern, 1988; Monge & Contractor, 2001). Researchers have also found that interconnectedness between organizational elites serves to produce a core of individuals that are more likely to act in the interests of their class than in the interests of their individual firms or overall network (Knoke, 1993; Useem, 1984; Monge & Contractor, 2001). Finally, it has been demonstrated that there are strong

tendencies in organizational networks toward concentration of control in the hands of a few and away from democratic systems, even in organizations and networks that espouse strong democratic principles (Krackhardt, 1994; Monge & Contractor, 2001).

Again, these arguments are central to the current study; it is argued through the application of Deetz' work (1992, 1995) that managers in the inter-organizational network represent a class of employees which influence control over the inter-organizational communication in the network and who act in accordance with the interests of their status through the concentration of inter-organizational linkages within their range of influence. In doing so, it is argued that managers effectively limit the democratic exchange of ideas between organizations in the network while also constraining (quite possibly without conscience effort on their part) efforts to collaborate between lower-status members of the network's organizations.

The application of network theory in combination with other literature themes found in both the collaboration literature and the stakeholder model and managerialism arguments leads to the formulation of the final hypotheses examined in this study. These final hypotheses are structured as sub-hypotheses of the seven primary hypotheses already described; in other words, these hypotheses are posited to serve as deeper-level analyses rather than as a separate, independent analysis.

In support of the first hypothesis which states that higher levels in organizational hierarchy will be associated with an increased number of inter-organizational links, the following network-based sub-hypotheses are posited:

H_1a: Location in higher positions in an organization's hierarchy will be associated with increased structural density in the organizational communication linkage network.

H_1a_1: Location in higher positions in an organization's hierarchy will be associated with increased interconnectedness in the organizational communication linkage network.

H_1a_2: Location in higher positions in an organization's hierarchy will be associated with increased tie strength in the organizational communication linkage network.

H_1b: Location in higher positions in an organization's hierarchy will be associated with increased structural performance in the organizational communication linkage network.

H_1b_1: Location in higher positions in an organization's hierarchy will be associated with decreased numbers of isolates and pendants in the organizational communication linkage network.

H_1b_2: Location in higher positions in an organization's hierarchy will be associated with increased reciprocity in the organizational communication linkage network.

The second hypothesis states that increased position in an organizational hierarchy will be associated with increased communication activity. The first sub-hypothesis associated with hypothesis two posits that increased position in an

organizational hierarchy will be associated with increased communication frequency. In support of this sub-hypothesis, the following supporting hypotheses are generated:

H_2a_1: Location in higher positions in an organization's hierarchy will be associated with increased structural density in the communication frequency organizational network.

H_2a_1a: Location in higher positions in an organization's hierarchy will be associated with increased interconnectedness in the communication frequency organizational network.

H_2a_1b: Location in higher positions in an organization's hierarchy will be associated with increased tie strength in the communication frequency organizational network.

H_2a_2: Location in higher positions in an organization's hierarchy will be associated with increased structural performance in the communication frequency organizational network.

H_2a_2a: Location in higher positions in an organization's hierarchy will be associated with decreased numbers of isolates in the communication frequency organizational network.

H_2a_2b: Location in higher positions in an organization's hierarchy will be associated with increased reciprocity in the communication frequency organizational network

The second sub-hypothesis associated with the second primary hypothesis states that increased position in an organizational hierarchy will be associated with an increase

in the number of people communicated with in inter-organizational relationships. The following network-based hypotheses are posited in support of H_2b:

H_2b_1: Location in higher positions in an organization's hierarchy will be associated with increased structural density in the organizational network which measures the number of people communicated with.

H_2b_1a: Location in higher positions in an organization's hierarchy will be associated with increased interconnectedness in the organizational network which measures the number of people communicated with.

H_2b_1b: Location in higher positions in an organization's hierarchy will be associated with increased tie strength in the organizational network which measures the number of people communicated with.

H_2b_2: Location in higher positions in an organization's hierarchy will be associated with increased structural performance in the organizational network which measures the number of people communicated with.

H_2b_2a: Location in higher positions in an organization's hierarchy will be associated with decreased numbers of isolates in the organizational network which measures the number of people communicated with.

H_2b_2b: Location in higher positions in an organization's hierarchy will be associated with increased reciprocity in the organizational network which measures the number of people communicated with.

The third hypothesis states that increased position in an organizational hierarchy will be associated with perceptions of increased levels of inter-organizational

collaboration. It is supported by two sub-hypotheses, the first of which states that those located in higher positions will perceive higher levels of self-to-organizational collaboration. The following network-based sub-hypotheses provide a deeper examination of H_3a:

H_3a_1: Location in higher positions in an organization's hierarchy will be associated with increased network structure density in the organizational network measuring levels of perceived individual-to-organization collaboration.

H_3a_1a: Location in higher positions in an organization's hierarchy will be associated with increased interconnectedness in the organizational network measuring levels of perceived individual-to-organization collaboration.

H_3a_1b: Location in higher positions in an organization's hierarchy will be associated with increased tie strength in the organizational network measuring levels of perceived individual-to-organization collaboration.

H_3a_2: Location in higher positions in an organization's hierarchy will be associated with increased structural performance in the organizational network measuring levels of perceived individual-to-organization collaboration.

H_3a_2a: Location in higher positions in an organization's hierarchy will be associated with decreased numbers of isolates in the organizational network measuring levels of perceived individual-to-organization collaboration.

H_3a_2b: Location in higher positions in an organization's hierarchy will be associated with increased reciprocity in the organizational network measuring levels of perceived individual-to-organization collaboration.

The second sub-hypotheses associated with the third primary hypothesis proposes that those in higher positions in an organizational hierarchy will perceive higher levels of collaboration between their organization and the other organizations in the network. The network-based supporting hypotheses for H_3b are as follows:

H_3b_1: Location in higher positions in an organization's hierarchy will be associated with increased network structure density in the organizational network measuring levels of perceived organization-to-organization collaboration.

H_3b_1a: Location in higher positions in an organization's hierarchy will be associated with increased interconnectedness the organizational network measuring levels of perceived organization-to-organization collaboration.

H_3b_1b: Location in higher positions in an organization's hierarchy will be associated with increased tie strength the organizational network measuring levels of perceived organization-to-organization collaboration.

H_3b_2: Location in higher positions in an organization's hierarchy will be associated with increased structural performance in the organizational network measuring levels of perceived organization-to-organization collaboration.

H_3b_2a: Location in higher positions in an organization's hierarchy will be associated with decreased numbers of isolates the organizational network measuring levels of perceived organization-to-organization collaboration.

H_3b_2b: Location in higher positions in an organization's hierarchy will be associated with increased reciprocity the organizational network measuring levels of perceived organization-to-organization collaboration.

The fourth hypothesis presents the argument that increased levels of communication activity will be associated with less rich channels being utilized for communication. In a now-familiar pattern, two sub-hypotheses are posited in association with the fourth hypothesis. The first supporting sub-hypothesis states that increases in communication frequency will be associated with decreased channel richness. The network-based supporting hypotheses state that:

H_4a_1: Increased frequency of individual-to-network organization communication activity will be associated with increased network structure density in the organizational network measuring communication channel richness.

H_4a_1a: Increased frequency of individual-to-network organization communication activity will be associated with increased interconnectedness in the organizational network measuring communication channel richness.

H_4a_1b: Increased frequency of individual-to-network organization communication activity will be associated with increased tie strength in the organizational network measuring communication channel richness.

H_4a_2: Increased frequency of individual-to-network organization communication activity will be associated with increased structural performance in in the organizational network measuring communication channel richness.

H_4a_2a: Increased frequency of individual-to-network organization communication activity will be associated with decreased numbers of isolates in the organizational network measuring communication channel richness.

H_4a_2b: Increased frequency of individual-to-network organization communication activity will be associated with increased reciprocity in the organizational network measuring communication channel richness.

The second supporting hypothesis for H_4 states that increases in the numbers of people communicated with in an inter-organizational relationship will be associated with a decreased richness in the communication channel utilized. This relationship is further examined in the following network-based hypotheses:

H_4b_1: Increases in the number of people from other network organizations communicated with will be associated with increased network structure density in the organizational network measuring communication channel richness.

H_4b_1a: Increases in the number of people from other network organizations communicated with will be associated with increased

interconnectedness in the organizational network measuring communication channel richness.

H_4b_1b: Increases in the number of people from other network organizations communicated with will be associated with increased tie strength in the organizational network measuring communication channel richness.

H_4b_2: Increases in the number of people from other network organizations communicated with will be associated with increased structural performance in the organizational network measuring communication channel richness.

H_4b_2a: Increases in the number of people from other network organizations communicated with will be associated with decreased numbers of isolates in the organizational network measuring communication channel richness.

H_4b_2b: Increases in the number of people from other network organizations communicated with will be associated with increased reciprocity in the organizational network measuring communication channel richness.

The fifth primary hypothesis examined in this study posits that increased levels of communication activity will be associated with decreases in the directionality of inter-organizational communication flow. The first sub-hypothesis associated with H_5 states that increases in the frequency of inter-organizational communication will be

associated with decreases in the directionality of the communication flow. The following network-based sub-hypotheses are posited in support of H_5a:

H_5a_1: Increased frequency of individual-to-organization communication activity will be associated with increased network structure density in the organizational network measuring communication directionality.

H_5a_1a: Increased frequency of individual-to-organization communication activity will be associated with increased interconnectedness in the organizational network measuring communication directionality.

H_5a_1b: Increased frequency of individual-to-organization communication activity will be associated with increased tie strength in the organizational network measuring communication directionality.

H_5a_2: Increased frequency of individual-to-organization communication activity will be associated with increased structural performance in the organizational network measuring communication directionality.

H_5a_2a: Increased frequency of individual-to-organization communication activity will be associated with decreased numbers of isolates in the organizational network measuring communication directionality.

H_5a_2b: Increased frequency of individual-to-organization communication activity will be associated with increased reciprocity in the organizational network measuring communication directionality.

The second sub-hypothesis which supports the fifth primary hypothesis states that increases in the number of people communicated with in an inter-organizational

relationship will be associated with decreased directionality of communication flow. The network-based analysis further argues that:

H_5b_1: Increases in the number of people from other network organizations communicated with will be associated with increased network structure density in the organizational network measuring communication directionality.

H_5b_1a: Increases in the number of people from other network organizations communicated with will be associated with increased interconnectedness in the organizational network measuring communication directionality.

H_5b_1b: Increases in the number of people from other network organizations communicated with will be associated with increased tie strength in the organizational network measuring communication directionality.

H_5b_2: Increases in the number of people from other network organizations communicated with will be associated with increased structural performance in the organizational network measuring communication directionality.

H_5b_2a: Increases in the number of people from other network organizations communicated with will be associated with decreased numbers of isolates in the organizational network measuring communication directionality.

H_5b_2b: Increases in the number of people from other network organizations communicated with will be associated with increased

reciprocity in the organizational network measuring communication directionality.

The sixth primary hypothesis states that increases in the richness of the communication channel utilized in inter-organizational relationships will be associated with higher levels of perceived collaboration. H_6a states that increases in levels of channel richness will be associated with increased levels of perceived self-to-organizational collaboration. This sub-hypothesis is further examined in the following network-based sub-hypotheses:

H_6a_1: Increased richness in communication channel selection will be associated with increased network structure density in the organizational network measuring perceived levels of individual-to-organization collaboration.

H_6a_1a: Increased richness in communication channel selection will be associated with increased interconnectedness in the organizational network measuring perceived levels of individual-to-organization collaboration.

H_6a_1b: Increased richness in communication channel selection will be associated with increased tie strength in the organizational network measuring perceived levels of individual-to-organization collaboration.

H_6a_2: Increased richness in communication channel selection will be associated with increased structural performance in the organizational network measuring perceived levels of individual-to-organization collaboration.

H_6a_2a: Increased richness in communication channel selection will be associated with decreased numbers of isolates in the organizational network measuring perceived levels of individual-to-organization collaboration.

H_6a_2b: Increased richness in communication channel selection will be associated with increased reciprocity in the organizational network measuring perceived levels of individual-to-organization collaboration.

The second supporting hypothesis for the sixth primary hypothesis states that increases in the channel richness utilized in inter-organizational relationships will be associated with increased perceived levels of organization-to-organizational collaboration. Using a network-based approach, the following sub-hypotheses are proposed:

H_6b_1: Increased richness in communication channel selection will be associated with increased network structure density in the organizational network measuring perceived levels of organization-to-organization collaboration.

H_6b_1a: Increased richness in communication channel selection will be associated with increased interconnectedness in the organizational network measuring perceived levels of organization-to-organization collaboration.

H_6b_1b: Increased richness in communication channel selection will be associated with increased tie strength in the organizational network measuring perceived levels of organization-to-organization collaboration.

H_6b_2: Increased richness in communication channel selection will be associated with increased structural performance in in the organizational network measuring perceived levels of organization-to-organization collaboration.

H_6b_2a: Increased richness in communication channel selection will be associated with decreased numbers of isolates in the organizational network measuring perceived levels of organization-to-organization collaboration.

H_6b_2b: Increased richness in communication channel selection will be associated with increased reciprocity in the organizational network measuring perceived levels of organization-to-organization collaboration.

The seventh primary hypothesis states that increases in the directionality of communication flow between inter-organizational relationships will be associated with increases in levels of perceived collaboration in those relationships. Again, two sub-hypotheses have been posited in support of this primary hypothesis. The first sub-hypothesis supporting H_7 states that increased in directionality of communication flow will be associated with increased levels of perceived self-to-organizational collaboration. The following network-based hypotheses offer a more in-depth analysis of H_7a:

H_7a_1: Increased levels of directionality in communication flow will be associated with increased network structure density in the organizational network measuring perceived levels of individual-to-organization collaboration.

H_7a_1a: Increased levels of directionality in communication flow will be associated with increased interconnectedness in the organizational network measuring perceived levels of individual-to-organization collaboration.

H_7a_1b: Increased levels of directionality in communication flow will be associated with increased tie strength in the organizational network measuring perceived levels of individual-to-organization collaboration.

H_7a_2: Increased levels of directionality in communication flow will be associated with increased structural performance in the organizational network measuring perceived levels of individual-to-organization collaboration.

H_7a_2a: Increased levels of directionality in communication flow will be associated with decreased numbers of isolates in the organizational network measuring perceived levels of individual-to-organization collaboration.

H_7a_2b: Increased levels of directionality in communication flow will be associated with increased reciprocity in the organizational network measuring perceived levels of individual-to-organization collaboration.

Finally, the second sub-hypothesis associated with H_7 states that increases in the directionality of communication flow will be associated with increased perceived levels of organization-to-organization collaboration. The final network-based sub-hypotheses are posited in support of H_7b:

H_7b_1: Increased levels of directionality in communication flow will be associated with increased network structure density in the organizational network measuring perceived levels of organization-to-organization collaboration.

H_7b_1a: Increased levels of directionality in communication flow will be associated with increased interconnectedness in the organizational network measuring perceived levels of organization-to-organization collaboration.

H_7b_1b: Increased levels of directionality in communication flow will be associated with increased tie strength in the organizational network measuring perceived levels of organization-to-organization collaboration.

H_7b_2: Increased levels of directionality in communication flow will be associated with increased structural performance in the organizational network measuring perceived levels of organization-to-organization collaboration.

H_7b_2a: Increased levels of directionality in communication flow will be associated with decreased numbers of isolates in the organizational network measuring perceived levels of organization-to-organization collaboration.

H_7b_2b: Increased levels of directionality in communication flow will be associated with increased reciprocity in the organizational network

measuring perceived levels of organization-to-organization collaboration.

In this review of the literature, themes within the inter-organizational collaboration literature which are relevant to the present study have been explored and knowledge gaps in these literature bodies have been identified and related to the objectives of the current project. Additionally, several communication-based theories have been examined and utilized in developing a foundation for the posing of questions and hypotheses relative to inter-organizational collaboration, managerial constraints, utilizations of communication channels, and other relevant theoretical conceptualizations. Based on the questions posited (via the hypotheses and research question) in the literature review, the proceeding chapter details the research methods which were utilized in the present study as a means of providing answers to the questions that have been posed in this chapter.

Chapter III

Research Methods

The basic data collection method utilized for this study consisted of developing and administrating a survey instrument to a selected population of interest in order to the test specific inter-organizational relationship factors outlined in the preceding chapter. In this chapter the survey instrument, the population of interest, the pilot study conducted to test the validity of the survey instrument, the methods utilized for collecting the data, and the methods used to conduct the data analysis are described in detail.

Population and data collection methods

The targeted population of interest consisted of an inter-organizational network in which physical proximity had been created in order to increase collaboration between the network's member organizations. Individual participants in the study consisted of the employees of organizations inter-organizational network who were located on the network's consolidated campus (referred to in this study under the code-name "HQ") at the time of the study. Some of the member organizations have multiple locations in addition to their location at HQ; however, only those employees of the network organizations who worked at HQ were included in the study population.

Several participation solicitation messages were used in the effort to collect a data from a maximum number of participants over an approximate one-year period. The solicitation messages were sent to participants electronically via either a mass-distribution list provided by the participating organization to the researcher or via

sending the solicitation e-mails to a pre-determined point of contact within the organization (i.e. the chief executive's assistant) who then forwarded the message via an internal mass-distribution list. Solicitation messages were sent periodically until a point of diminishing returns was reached and additional solicitation messages were resulting in very few additional returns (less than 5 in the case of the last solicitation).

Description of the survey instrument

The survey instrument utilized for this study consisted of two online survey instruments interfaced in such a way as to provide participants with a seamless transition from the first to the second instrument. A sample copy of the survey instruments utilized for this study can be found in Appendix A. Bracketed terms throughout this description of the instruments as well as on the sample instruments indicate the use of either generic terms or code-names used for this study; it should be understood that actual location or organization names were used in their place when the instruments were administered.

In the first instrument participants were asked to identify the primary organization for which they worked; this resulted in their being automatically routed to the second survey instrument (which was customized according to the organization for which they worked). The second survey instrument first asked the participants to identify their primary role in their organization (executive, administrative, management/supervisory, professional researcher, student researcher, technical staff member, or other) as well as the location of their primary workspace at HQ by building and floor. The remaining portion of the second instrument was participant guided as to

the extent of the questions asked concerning each organization in the network. This self-guided process consisted of an initial question about whether the participants had contact with the organization in question, which was used to determine whether the participant was asked further questions regarding their relationships with the organization.

Participants were asked: “Do you have contact with people from [organization X]”? A “no” response resulted in the respondent being asked to answer the same question about the next organization in the network, while a “yes” response lead the participant to a series of six follow-up questions concerning their communication with the organization in question.

The first four follow-up questions described below concerning specific relationship factors were developed by a team of social science researchers from several disciplines involved in various aspects of the research program with which this study is associated, with additional input provided by several executive members of the organizations in the network. The questions were developed based on criteria concerning what factors were likely to be impacting communication and collaborative success among the member organizations. A consensus-based process was used by the members of the research team for determining the final questions and their form.

The first follow-up question was “How many people at [organization X] do you have contact with?” Response categories to this question were: “1-2”, “3-4”, “5-7”, “8-10”, or “10+”. The second follow-up question was “How often do you have contact with someone from [organization X]?” Response categories to this question were:

"almost daily", "2-3 times per week", "about once a week", "several times per month", "about once a month", and "less than once per month". The third follow-up question was "What is your primary form of contact with people from [organization X]?" Response categories were "face-to-face conversations", "e-mail", "phone calls", "group meetings", "informal conversations (hallway, watercooler, etc.)", and "none of the above". The fourth question asked in the follow-up section of the survey instrument was "How would you characterize the flow of information between yourself and the people from [organization X]?" Response categories were "from me to them", "from them to me", "equally both ways", "we don't really exchange work-related information", and "I can't tell, it varies a lot".

The remaining closed-ended questions of the survey instrument measuring collaboration levels were based on a scale that was initially developed by Bruce Frey and his colleagues (Frey, Lohmeier, Lee, & Tollefson, 2006) and used for exploring collaboration between partners working on a "Safe Schools, Healthy Students" grant project. In their work, Frey and his fellow researchers reviewed several stage-based models of collaboration (Frey et al., 2006), then developed and administered a survey instrument based on a five-stage model of collaboration originally authored by Hogue (1993). Frey et al. (2006) administered the instrument they developed as a means of evaluating the levels of collaboration between grant partners in a Midwest school district. Once their data was collected, Frey et al. (2006) used the data to produce graphic representation of the collaboration between the grant partners using methods based on techniques originally developed by Cross (2003). The instrument developed

by Frey and his colleagues was tested for reliability utilizing test-retest methods, yielding high reliability scores ranging from .69 to .97 with a mean reliability score of .87 and a standard deviation (sd) of .09 (Frey et al., 2006).

Several studies have utilized the instrument developed by Frey and his colleagues. These studies have included assessing interagency collaboration for groups of agencies tasked with servicing families of young children who are at risk for exposure to violence (Friedman et al., 2007), examining intraorganizational collaboration between stakeholders as related to improving school systems (Gajda & Koliba, 2007), examining technological factors in collaboration between research institutions and industries (Philbin, 2008), and measuring improvements in interagency collaborations designed to decrease violence in schools through proving a network of support for students (Cross, Dickmann, & Fagan, 2009). Though these studies differ from this study in terms of context, they do share some similarity with the current study via a shared application of stakeholder models and assumption that collaboration is a key to program success. Additionally, these studies also share similarity to the larger research project to which this study is contributing in terms of a shared interest in utilizing the tools of network analysis, graphical displays of collaboration information and the study of changes in collaboration over time. Finally, these studies are also similar to the current research project in their application; theoretical developments are an important but secondary aspect of the studies, the primary focus consists of a practical focus on finding ways to positively impact real-world collaboration within the entities being studied.

The fifth follow-up question was “How would you characterize the relationship between yourself and [organization X]?” Responses categories for this question were “networking”, “cooperation”, “coordination”, “coalition”, and “collaboration”. The sixth and final follow-up question asked “How would you characterize the relationship between your organization and [organization X]?” Response categories for this final follow-up question were the same as those for the fifth follow-up question.

As can be seen on the sample survey instrument located in the Appendix, definitions for the terms on the collaborations scales were provided for the participants. These definitions were developed based on descriptions provided in Frey, et al.’s (2006) instrument, and were as follows: networking= loosely defined roles, little communication, no shared decision-making, cooperation= somewhat defined roles, formal communication, provide information to each other, no shared decision-making, coordination= defined roles, frequent communication, share information and resources, some shared decision-making, coalition= share ideas and resources, frequent and prioritized communication, everyone has a say in decision-making, and collaboration= belong to one system, frequent communication with mutual trust, consensus is reached on all decisions.

Once the participants had finished responding to the portion of the survey instrument described above, three open-ended questions were asked to complete the survey instrument. These questions were: “Please tell us to what extent moving to the [HQ] has affected your communication/ networking with the other organizations in the weather community”, “Please tell us (in your opinion) to what extent moving to the

[HQ] has affected your organization's communication/ networking with other organizations in the [network] community", and "Please tell us what you think could be done to further improve communication/networking between the people and organizations in the [network] community located at [HQ]?" Responses to these open-ended questions were voluntary and no response to these questions was required in order to complete the survey instrument. The responses to the open-ended questions collected in this study will be utilized as a means for providing further support for the findings, implications and recommendations contained in the final chapter.

In all, the survey instrument (including the initial demographic questions) ranged between 18 and 96 total questions, depending on the participant's responses to the initial question about contact with each of the organizations in the network. Expected time for participants to complete the survey instrument was between 30- 60 minutes.

Prior to the administration of the survey instrument to the populations of interest, a pilot study was conducted utilizing a small population of students studying in fields relevant to the inter-organizational network under study as a means of assessing the face and content validity of the survey instrument. Participants in the pilot study came from two sections of a selected course, and were awarded extra credit by their instructor for their voluntary participation; no incentives were offered by the researchers involved in the study. Pilot study participants were asked to complete the survey instrument, then were provided with a series of open-ended questions designed to solicit their response on the readability, clarity, and usability of the instrument.

Unfortunately, the specific data collected from the pilot study was lost in a computer-related accident and is not available to be fully reported; however, it can be reported that the pilot study participants reported a reasonable study completion time (10-20 minutes), and that the instrument questions were generally clear. One area of uncertainty constituted a theme among the pilot study participants; some of them were confused as to which organization they should respond as being members of as they often had positions in more than one organization. This problem was corrected from the original version of the survey instrument prior to administration to the population of interest through the addition of the word "primary" to the question asking the participant to identify their organization.

Gauging the reliability of the complete survey instrument proved to be a much more difficult challenge. First, there was expected to be variation between the individuals participating in the survey (unlike in experimental designs where reliability can be reasonably assessed by comparing the results of those who were administered the same manipulations). Second, using test-retest methods would have resulted in a much longer instrument; thereby adding to existing concerns about inaccuracies due to participant exhaustion. It was decided that for the exploratory analysis in this study reducing concerns for participant exhaustion was of primary concern; other indicators for the reliability of the survey instrument provided a reasonable basis for making this decision, especially given the exploratory nature of the study.

While recognizing that the instrument utilized in this study has not been fully subjected to a complete reliability analysis, it is also important to note that this issue is

not unique or unusual in the development of tools for social science research. As noted by Singleton and Straits (1988/2005), many instruments are introduced with no testing of reliability or validity; these ongoing processes are often engaged once research has surfaced which raises reasons for seeking specific indications of reliability or validity (Singleton & Straits, 1988/2005). Further, Singleton and Straits note that the testing of reliability and validity are ongoing issues that extends across studies and that attitudinal measures are much more problematic in terms of reliability (due to instability and reactivity) than are other types of measures (Singleton & Straits, 1988/2005); this argument important to understanding the reliability concerns of this study, as it is behavioral rather than attitudinal scales which have not been subjected to reliability testing to date; the attitudinal scales in this study have been previously used and found to be reliable, as reported below.

Despite the lack of a satisfactory direct method of assessing the overall reliability of the instrument, indirect indicators of reliability for those portions of the instrument most sensitive to reliability concerns (the collaboration measurement scales) can be established. The primary scale utilized (measuring collaboration levels) has been found to have an acceptable level of reliability (reliability scores ranging from .81 to .87) in previous research (Frey et al., 2006); the reliability of this primary scale is the most important consideration, as the majority of the remainder of the instrument consisted of self-reported demographic and behavioral data. While the instrument was deemed sufficient for this exploratory study, future research should continue the effort to establish the overall reliability of the survey instrument utilized in this study.

Units of measure and power

At first glance, one may be lead to consider the members of the population as being the units of measure for this study and therefore conclude that it lacks in power when addressing the important issue of generalization to a larger population; this would be a false conclusion for two reasons. First, as our population of interest is more accurately defined as consisting of the relationship units between members of an inter-organizational network, questions of generalization would more accurately be directed as to what extent the results found from the study of the network in this study are to those relationships found in the overall network. The desired sample size accounts for meeting the power requirements when defined accordingly. In the case of this study, an approximate N of approximately 100 participants was sought to respond to the survey instrument concerning their relationships with 15 organizations, resulting in an approximate population of 1,500 relationships measured. This participation goal would thereby provide adequate power to generalize the results concerning the relationships to the overall population of relationships possible in the network, obtaining a power at or greater than .8 with a 95% confidence interval at the .05 probability level given a population of 20,000+ relationships in the inter-organizational network (Faul, Erdfelder, Buchner, & Lang, 2009).

An additional concern may be the fact that this study focuses on the assessment of only one inter-organizational network and is therefore open to questions concerning its ability to be applied to the larger population consisting of all inter-organizational networks; however, since the primary focus in this study is exploratory analysis, the

concern for describing the larger population of networks is significantly reduced. Specific issues concerning the limitations to generalizing the results of this study are addressed in detail in the final chapter of this study.

Operationalization of terms

In order to test the research hypotheses, it is first necessary to describe in detail the terms utilized in them and how those terms are measured using numerical scales. For the first three hypotheses, five conceptual terms needed to be operationalized for the quantitative analysis: position in the organization hierarchy, organizational links, the frequency of communication activity, the number of people from the network organization who the participant has contact with, and perceived levels of collaboration.

Position in the organization hierarchy serves as the independent variable in the first three hypotheses; respondents were asked to identify a general hierarchical position which best described their function within their organization. As can be seen in the copy of the survey instrument located in Appendix A, seven options were given to respondents to choose from; executive, administrative, management/supervisory, professional researcher, student researcher, technical, and other. Prior to the analysis it was determined that these general hierarchical should be slightly re-ordered (administrative was moved to a lower position on the rank-order), and that some of the categories should be combined to form broader hierarchical levels for the purpose of this exploratory analysis. The general hierarchical positions were finally measured using an ordinal scale consisting of the categories which were ranked-ordered as follows: other= missing data, 1= student researcher, 2= technical and administrative

employees, 3= professional researchers and 4= managers, supervisors, and executives. Organizational links represents the dependent variable in the analysis of hypothesis, and consisted of a ratio scale ranging from zero to fifteen organizations, coded as 0-15.

The independent variable for the first sub-hypothesis associated with hypothesis two (H_2a) is frequency of communication activity, numerically coded using the following categories: 0= no contact, 1= less than once per month, 2= several times per month, 3= approximately once per week, 4= 2-3 times per week and 5= almost daily. The number of people from the network organization who the participant has contact with serves as the dependent variable in H_2b, and consists of an ordinal scale using the following categories (rank-ordered from highest to lowest): none, 1-2, 3-4, 5-7, -10, and 10+.

For the third hypothesis, identical scales were used in measuring perceived collaboration at both individual and organizational levels, consisting of the following categories (ranked from lowest to highest): 0= no communication, 1= networking, 2= cooperation, 3= coordination, 4= coalition and 5= collaboration.

Two additional terms require operationalization for quantitatively testing hypotheses 4-7: channel richness and directionality of communication flow. The dependent variable for H_4 is channel richness, which consists of the following ordinal categories (rank-ordered from low to high richness levels): 0= no contact, 1= e-mail, 2= phone, 3= meetings and 4= face-to-face/ informal conversations. For the fifth hypothesis, the dependent variable consists of an ordinal measure of the direction of communication flow consisting of the following four rank-ordered (low to high)

categories: 0= no contact, 1= we really don't exchange work-related information, 2= them to me/ me to them, 3= and I can't tell- it varies a lot/ equally both ways.

The terms utilized for the network analyses included in this study which require operationalization for measurement are interconnectedness, strength of tie, isolate, and reciprocity. Each of these concepts is defined for measurement in the following paragraphs.

The concept of interconnectedness seeks to capture an understanding of the overall density of the network in terms of numbers of relationships present. Interconnectedness was measured by comparing the actual number of ties present in a given network to the number of potential ties in that same network, expressed both as a number and as a percentage of actual to potential ties. Since there were 16 organizations in the network utilized in this study (each of who could potentially have contact with the 15 other organizations, the total number of potential ties in the networks presented in the analysis was 240.

The strength of tie concept seeks to capture the average power of the relationships in a given network. For the first hypothesis in this study, strength of tie was measured by calculating the average number of communication contacts per relationship tie in each given network. For hypotheses 2-7, the strength of tie measure varied in accordance with the average level of the dependent variable in each hypothesis as appropriate. Given the variability of this measurement based on each hypothesis, the terms used to calculate the strength of tie for each hypothesis is explicitly explained before presenting the results of that measurement.

The concepts of isolates and pendants when combined seek to measure the extent to which there is a communication relationship between all of the entities in a given network. In this study, isolates are measured by a simple count of those organizations which have no connections to any other organization in the given network being analyzed. The pendants analysis in this study consisted of a count of those relationships in which an organization was connected with only one other organization in the network. By assigning a value of 2 to the isolates and a value of 1 to the pendants, an overall isolation score was calculated for each network; the overall isolation score was then used to measure the differences between each network in the analyses.

The final concept (reciprocity) seeks to examine the level to which a tie between two network nodes (organizations) is perceived as existing by both of the nodes being connected by the tie. In this study, reciprocity was measured using a dyad-based calculation method (Hanneman & Riddle, 2005), and the level of reciprocity is presented as a percentage which compares the number of reciprocal ties to the overall number of ties present in the network.

Methods for data analysis

The data were initially examined by running descriptive statistics on the demographic and variable data. The data was downloaded from the aforementioned online survey site (survey monkey) in the form of word-based responses. These responses were then hand-translated into numerical data utilizing a survey codebook and survey code sheets, samples of which can be located in Appendix B. This numerical data was then entered into SPSS for statistical analysis. In order to test the hypotheses,

correlation coefficients were used to determine the relationships between the variables tested in each hypothesis; given that each hypothesis contains at least one ordinal level variable, the Spearman correlation coefficient is the appropriate measure and was utilized, even though it is a nonparametric measure and is weaker than the Pearson correlation coefficient which is used on interval or ratio level data (Cronk, 1999/2006; Knoke, Bohrnstedt, & Mee, 2002; Tabachnick & Fidell, 1996/2007).

To determine the levels of variability explained in each dependent variable by the proposed independent variable, cross-tabulations were utilized for those hypotheses containing ordinal variables on both the independent and dependent sides of the equations, and one-way ANOVAs were utilized when the dependent variable was interval or ratio in nature. For those hypotheses concerning which consisted of a primary hypothesis and sub-hypotheses, a separate test for each sub-hypothesis was run and the results of both tests are presented as a means of testing the main hypotheses.

The second methodology utilized (for analyzing the network-based sub-hypotheses) was network analysis. A multi-phase process was used to convert the SPSS data into a suitable form for analysis using the network analysis program UCINET (Borgatti, Everett, & Freeman, 2002). Using the data from the SPSS "data labels" file (word-based responses), each line of relationship code in which a relationship was indicated (relationships in which there was no communication linkage were omitted from this analysis) was entered onto network maps tally sheets, samples of which are located in Appendix B. Once the data entry onto the tally sheets was completed, averages for both total relationships and each level of relationship (as appropriate for

each hypothesis) were calculated. The calculated averages were then rounded off to whole integers (as required for analysis in UCINET). The numbers were rounded down to the nearest whole integer if the one-hundredth decimal place was equal to or less than .49, if the one-hundredth decimal place was .50 or higher, the number was rounded up. The whole numbers were then entered onto network map correlation matrices (a sample of this matrix can also be found in Appendix B), then this data was entered into the correlation matrices utilized by the network analysis program already mentioned.

Once the data was entered into the UCINET (Borgatti, Everett, & Freeman, 2002) matrices, data files were created for each network-based sub-hypothesis. These files were then transferred into a sub-program contained in UCINET entitled NetDraw (Borgatti, 2002) that created network maps to assist with the analysis. A separate data file and set of network maps (strength of tie maps and relationship reciprocity maps) were created for both the total relationship averages and each individual level of the independent variable for each network-based sub-hypothesis. The maps generated by NetDraw (Borgatti, 2002) were then manipulated in order to maximize visualization of the inter-organizational connections and saved as image files (.Jpeg) which were then transferred into images compatible with word-processing programs. Finally, legends were created and added which converted the numerical data utilized for the mapping into word-based scales; these maps are included and utilized in the results chapter of this study.

The final network analysis consisted of utilizing a combination of the statistical tests available in either UCINET (Borgatti, Everett, & Freeman, 2002) or NetDraw

(Borgatti, 2002) which tested most of the sub-arguments associated with network structural density (interconnectedness and strength of tie) and network structural performance (boundary spanning, structural holes, and relationship reciprocity). The isolates variable was not tested statistically, but was rather evidenced through a visual examination of the network maps in which non-connected organizations were identified and tabulated.

The research question was examined by testing the relationships between the various demographic and communication-based variables and the perceived levels of individual-to-organization and organization-to-organization collaboration using two multiple regression calculations. Significant factors impacting perceived levels of collaboration at both the individual-to-organization and organization-to-organization levels were identified and the positive or negative impacts of those variables on collaboration perceptions were identified.

The final step in the methodology utilized in this study consisted of a review of the responses to the open-ended questions of the survey instrument focusing on those responses that provided additional support for or refutation of the findings from the testing of the hypotheses and research questions. Respondents were asked to provide feedback as to what extent the co-location of the organizations had affected their connections with other organizations in the network, to what extent their organization's collaboration with other network organizations had been impacted by the co-location, and what could be done to further improve collaboration between the member of the organizations and the organizational entities in the inter-organizational network.

Samples of these responses have been included in the summary of the research findings located in the final chapter of this study; where conflicts in opinions existed, effort was made to select representative samples including all applicable perspectives.

In summary, the methodology utilized in this project consisted of collecting data from individuals in participating organizations within the inter-organizational network of interest. A multi-step process was then used to convert the data into several different forms as required for the analysis, and a multi-method approach was taken in order to provide an in-depth analysis of the data. Having described these research methods and procedures in detail in this chapter, the proceeding chapter presents the findings from the data analysis.

Chapter IV

Results

Description of demographics

The data collection process yielded a total of 112 survey responses. Thirteen of the responses were found to be incomplete and were not included in this study; therefore resulting in the utilization of data collected from 99 respondents. The organizations were assigned code-names consisting of alternating male and female first names in order to protect specific organizational identities. Twelve of the fifteen network organizations had respondents participate in the study; Figure 4.1 provides a breakdown of the number of respondents by their primary organizations.

Figure 4.2 provides a breakdown of the number of respondents by their job functions, using the final data categories as described below. The breakdown of the functions of the survey respondents in the raw data was as follows: 17 (17.2%) of the respondents classified themselves as student researchers, 13 (13.1%) were classified as technical employees, 3 (3.0%) classified themselves as administrative employees, 28 (28.3%) of the respondents were professional researchers, 16 (16.2%) were management or supervisory employees, and 5 (5.1%) were executives. For the purposes of the analysis, the categories of technical and administrative employees were combined into one category which then totaled 16 (16.2%) of the responses, and the management/supervisory category was combined with the executive category, yielding a total of 21 (21.2%) of the responses. For the hypothesis examining the relationship between job function and communication linkages (H_1), the "other" responses (n= 17) were coded as missing data and were therefore excluded from the analysis, resulting in

Figure 4.1: Number of respondents by their primary organization

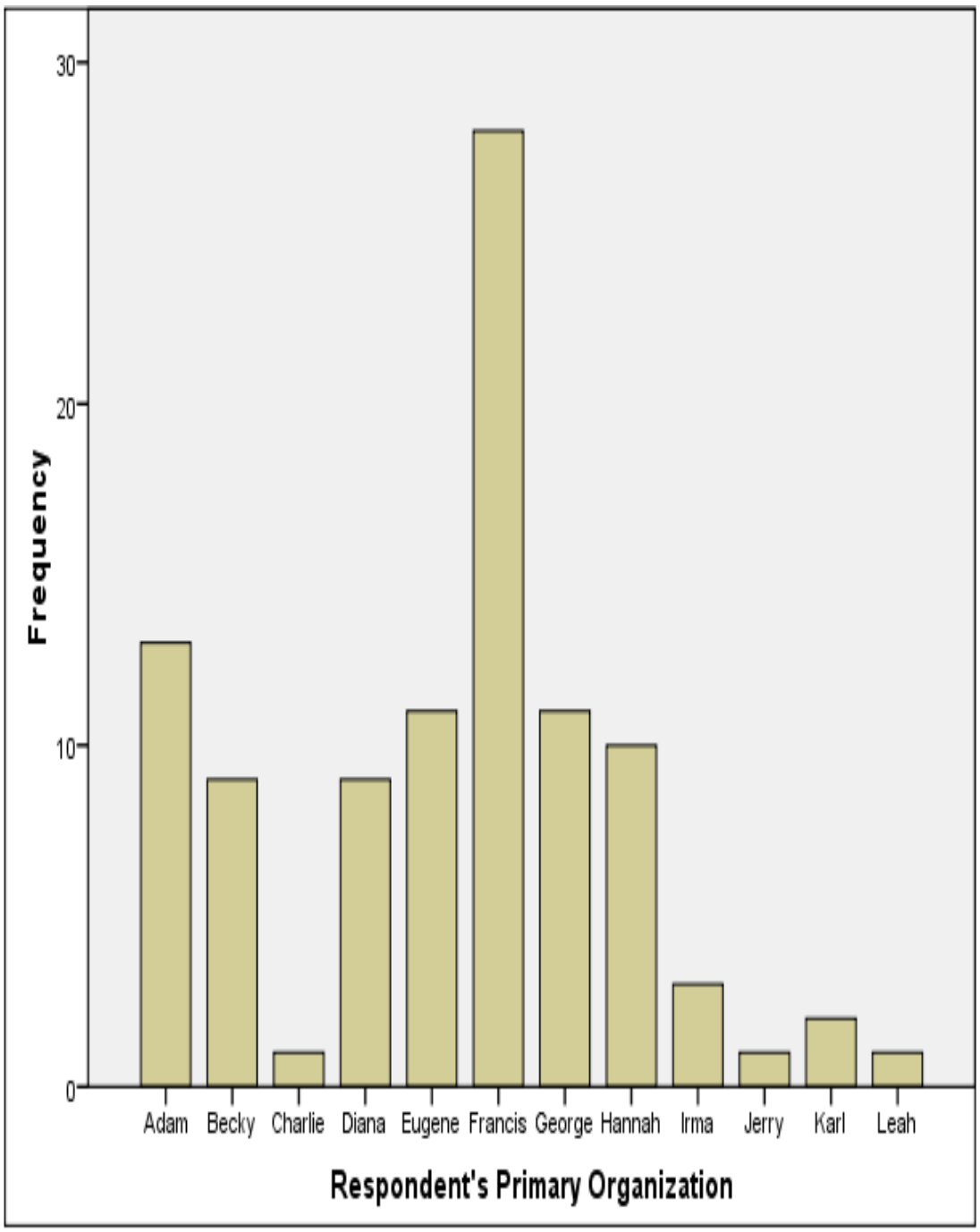
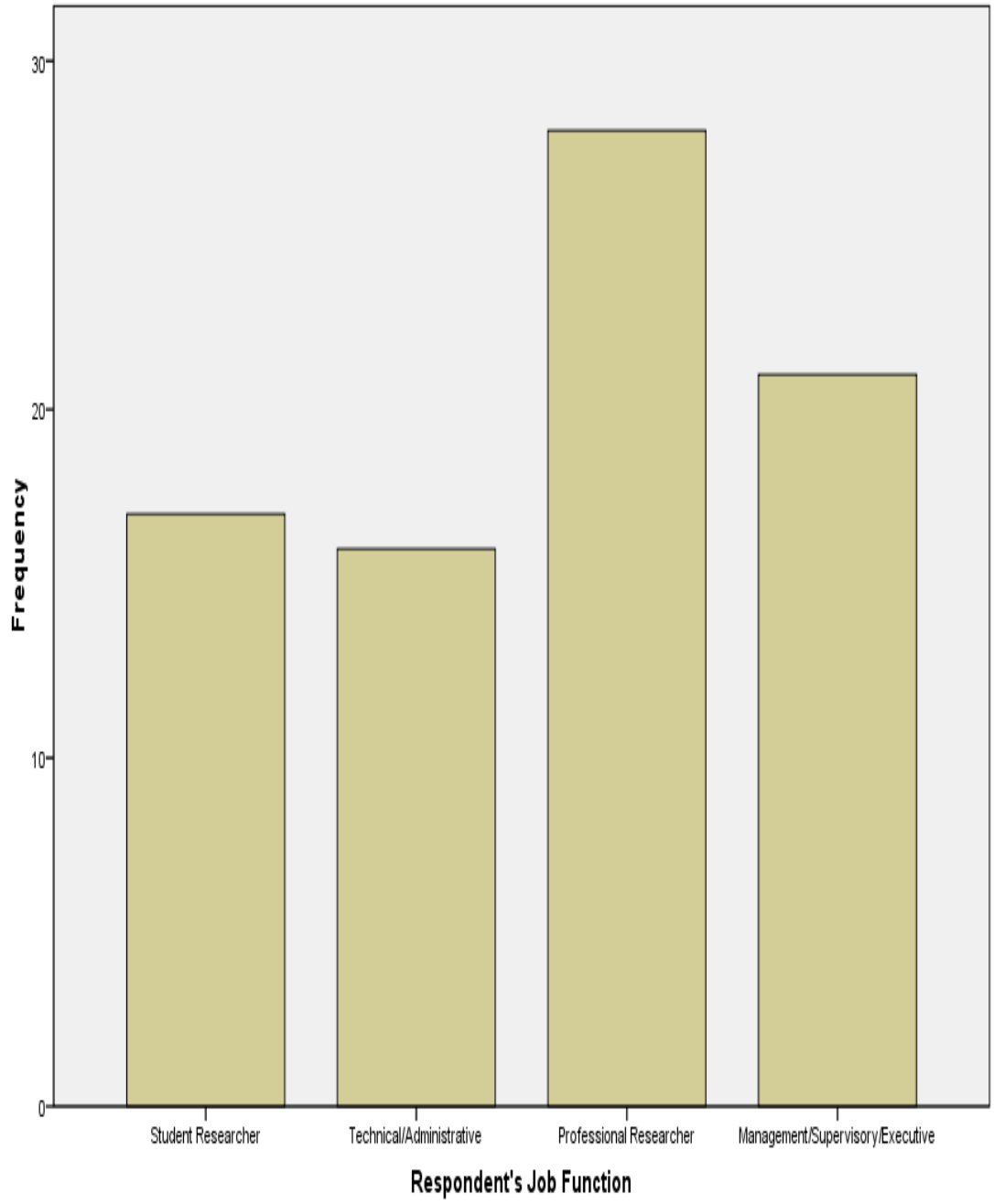


Figure 4.2: Number of respondents by job function



a total of 82 valid responses for this hypothesis.

Concerning the number of organizational links between individuals and network organizations, an average of 6.65 organizational links for each respondent were reported. Figure 4.3 provides a breakdown of the number of inter-organizational links by respondent. No links with other organizations, twelve links with other organizations, thirteen links with other organizations, and links to all 15 of the other network organizations were the least frequently occurring responses, having one respondent (1%) each. At the highest end of the frequencies for numbers of linkages the categories for three and five linkages each contained thirteen respondents (13.1%), while the most frequently recorded response was that of eight communication links with other member organizations (21, 21.2%).

Concerning the relationship level demographics, data was collected on a total of 1,485 inter-organizational relationships. While specific relationship demographic data in relation to the variables considered in the analysis will be provided as necessary for supporting the outcomes of the statistical tests, a breakdown of the relationships by the participant's organization and the participant's function is provided here in order to assist the reader with understanding the general parameters of this data.

The breakdown presented in Figure 4.4 demonstrates a strong similarity between the number of inter-organizational relationships survey by organization and the data concerning the breakdown of participants by their organization, as would be expected. At the low end of the reported inter-organizational relationships, the organizations code-named Charlie, Jerry, and Leah each provided information concerning 15 inter-organizational relationships (1%). At the highest level of participation, members of the

Figure 4.3: Number of inter-organizational links by number of respondents

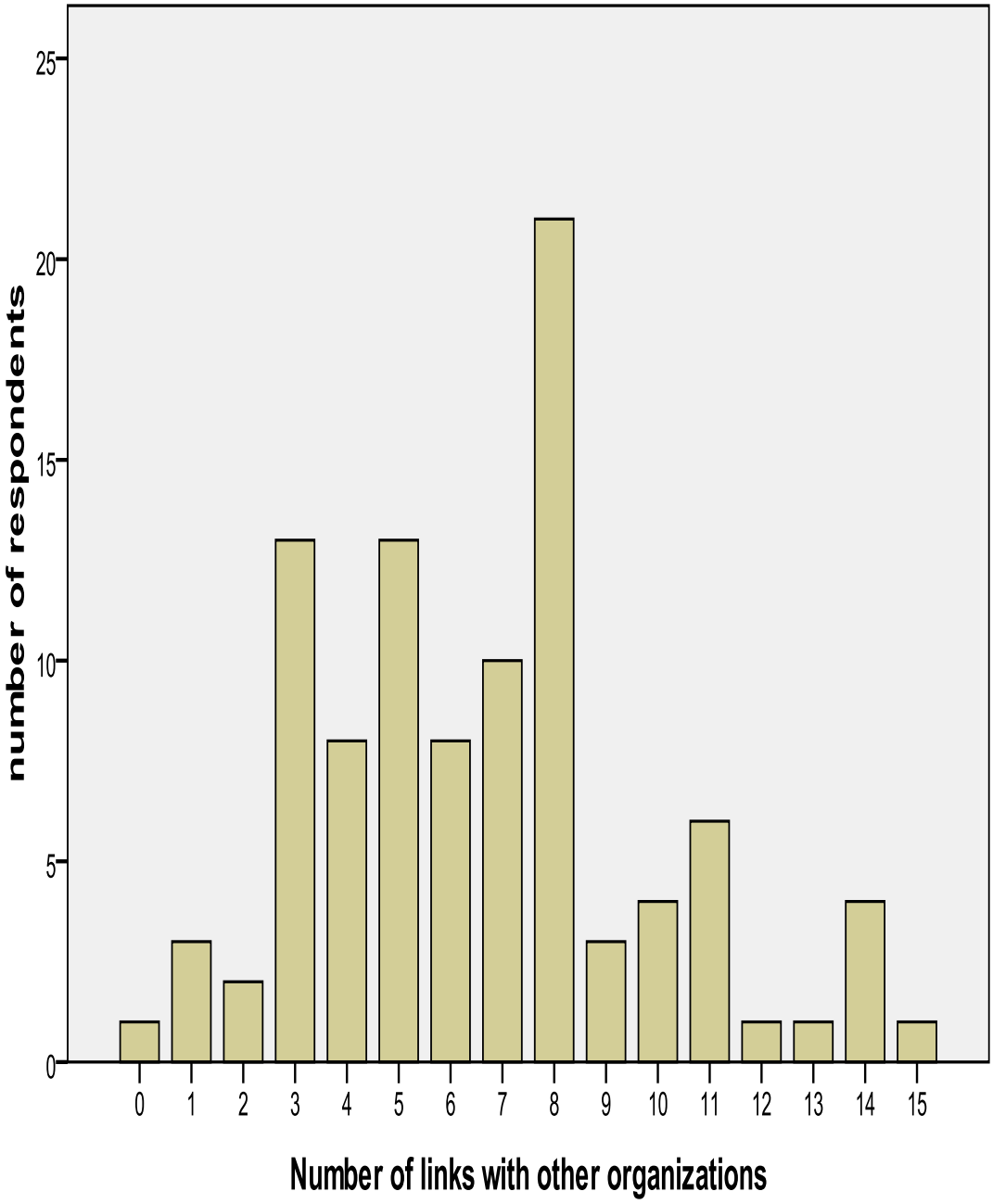
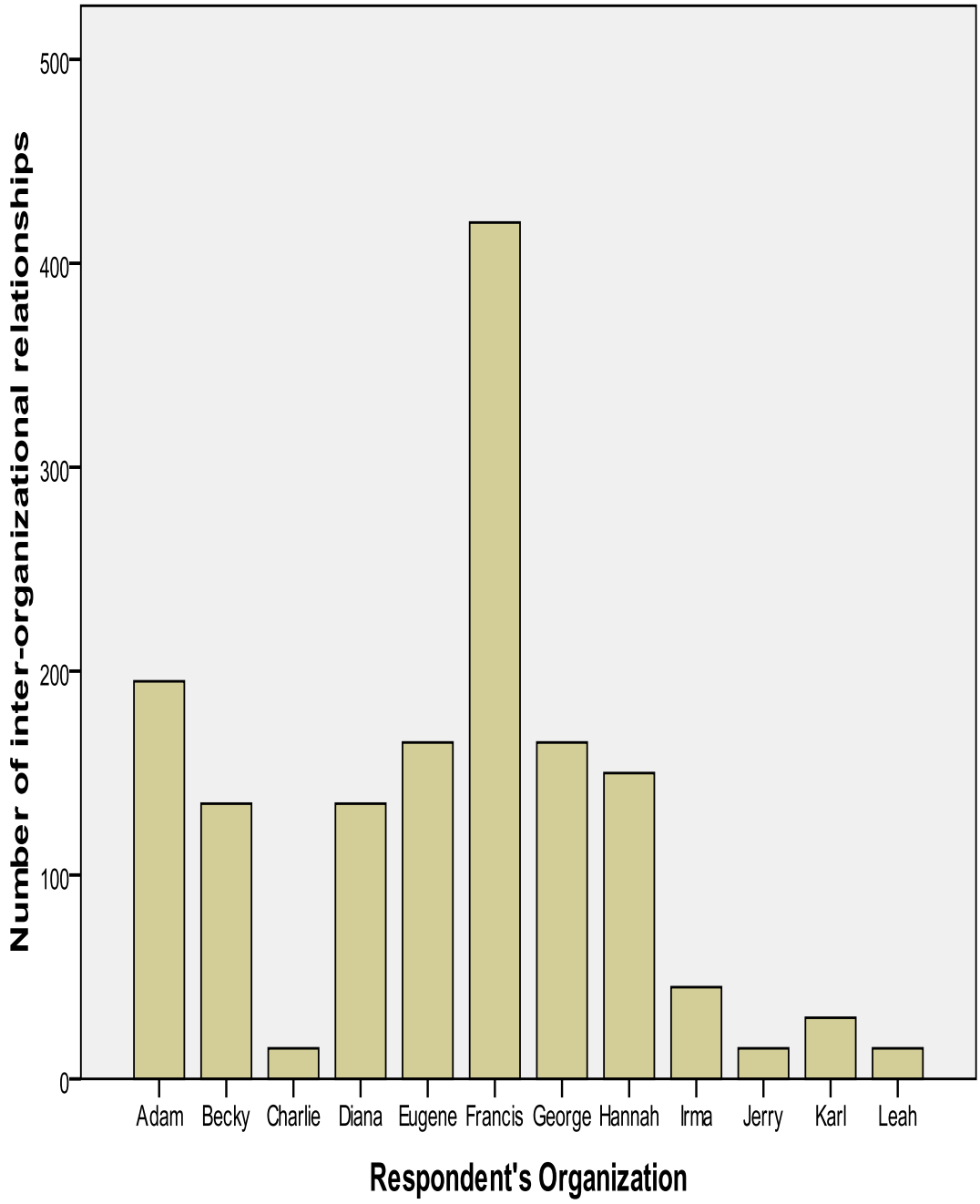


Figure 4.4: Number of relationships by organization



organization code-named Francis reported concerning 420 (28.3%) inter-organizational relationships.

Using the collapsed job function categories utilized in the analysis, a total of 255 (17.2%) relationships were reported by those who reported "other" as their job function; data on these relationships were not included in the analysis of the hypotheses in which one of the variables concerned hierarchical position in the member's organization (they were treated as system-missing data), but were included as appropriate in the analysis of those hypotheses that were not concerned with organizational hierarchy. Figure 4.5 provides a breakdown of the number of inter-organizational relationships reported in the study by job functions of the participants. Technical and administrative employees provided data on 240 inter-organizational relationships (16.2%), representing the smallest job function group in terms of number of relationships reported. Professional researchers provided the most inter-organizational relationship data with a total of 420 relationships (28.3%).

Hypothesis testing

A correlation matrix using Spearman's rho was run to ascertain an indication of the level of difference between the constructs measured in the survey instrument. Table 3 provides a breakdown of the data generated in the correlation matrix. Perhaps most importantly, the primary dependent variables (levels of collaboration) were found to be only moderately coordinated with each other (rho= .741), indicating that the constructs are related (as would be expected), though significantly different. Potentially disturbing high levels of correlation (> .8) were found between several variables. These high correlations between variables included relationships between the independent variable

Figure 4.5: Number of inter-organizational relationships by job function

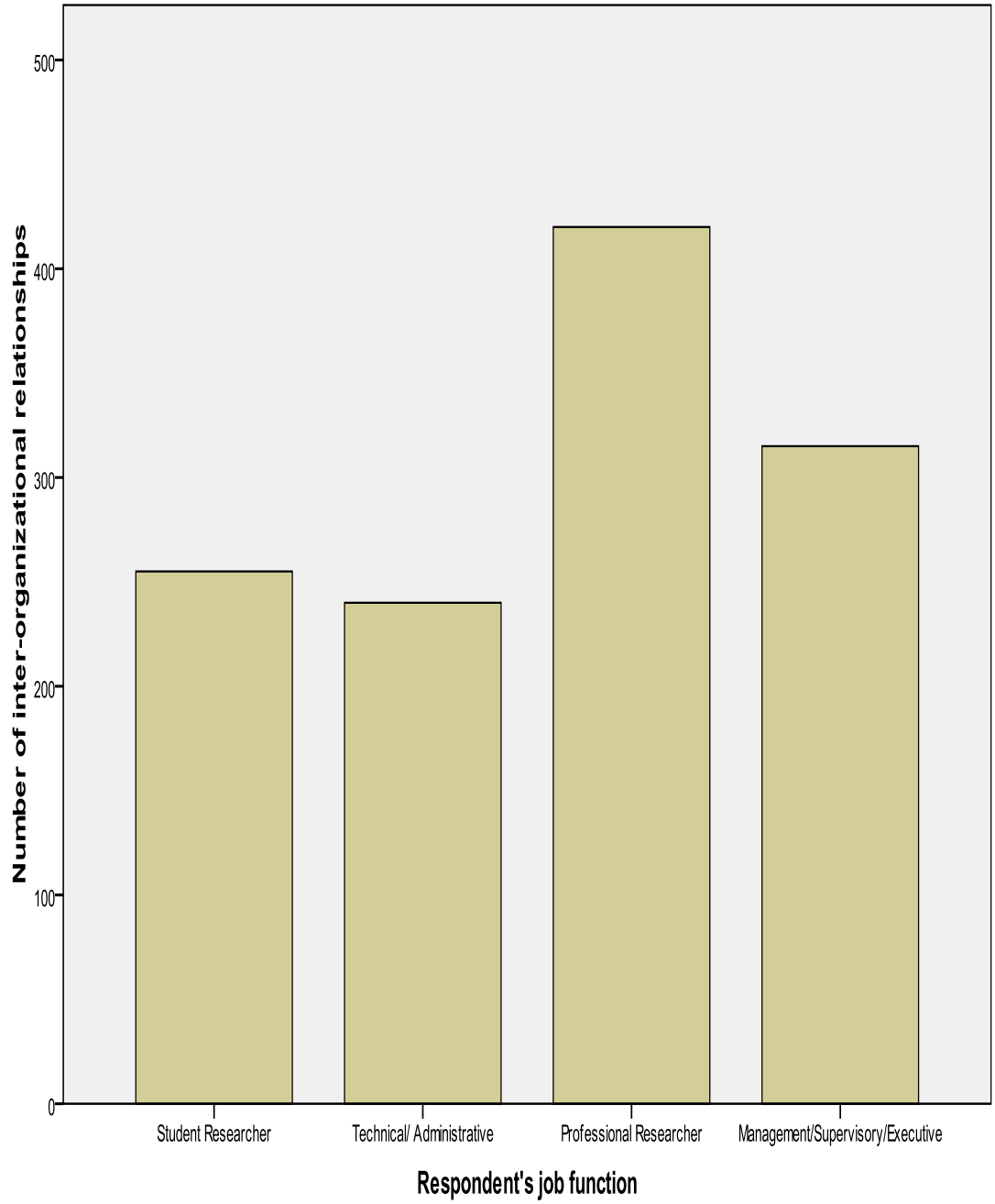


Table 3*: All variable correlation matrix (Spearman's rho)*

	Frequency	Self-to-org. Collaboration	Org.-to-org. Collaboration	Job Function	Channel Richness	Comm. Directionality
Frequency						
Self-to-org. Collaboration	.943** 1467					
Org.-to-org. Collaboration	.416** 645	.741** 645				
Job Function	.186** 1218	.213** 1217	-.095* 535			
Channel Richness	.928** 1462	.910** 1459	.094* 638	.184** 1213		
Comm. Directionality	.923** 1464	.943** 1463	.249** 642	.227** 1214	.926** 1457	

**. Correlation is significant at the .01 level (2 tailed).

*. Correlation is significant at the 0.05 level (2 tailed).

"frequency of communication activity" and the dependent variable "perception of individual to organizational collaboration" (rho= .943), between the independent variables "frequency of communication activities" and "channel richness" (rho= .928), "frequency of communication activities" and "multi-directional communication" (rho= .923) as well as "channel richness" and "multi-directional communication" (rho= .926). Upon consideration, it was decided that no variables would be eliminated from the analysis based on these statistical correlations, as there are clear conceptual differences between the correlated variables.

The first primary hypothesis (H_1) posits that individuals who are higher in their organization's hierarchy will have communication linkages with a greater of number of network organizations than those who are lower in status. This is the only hypothesis in the study which relies on individual rather than relationship level data; limiting the population for this analysis to a maximum number equal to the actual number of surveys collected. Position in the organization hierarchy serves as the independent variable in this hypothesis, and was measured using an ordinal scale consisting of the categories of "other", "student researcher", "technical employee/ administrative employee", "professional researcher", and "management/ supervisory/ executive". The other category was coded as missing data, and the other categories were ranked-ordered from low to high with student researchers at the bottom of the scale, technical and administrative employees ranked second, professional researchers ranked third, and managers, supervisors, and executives at the highest level on the scale. Organizational links represents the dependent variable in the analysis, and consisted of a ratio scale ranging from zero to fifteen organizations.

To test the first hypothesis, the respondent's function in their organization was compared to the number of organizations in the network with which the respondent indicated having a communication linkage. Since the independent variable is ordinal in nature, Spearman's rho was determined to be the appropriate correlation test to run between the variables. Since the hypothesis states that higher levels of the independent variables should be correlated with higher levels in the dependent variable (a directional hypothesis), a one-tailed correlation analysis was conducted. The Spearman's rho calculation indicated that there was a statistically significant, positive, and moderate relationship between an individual's position in the hierarchy of their organization and the number of network organizations with which they have contact ($n= 82$, $rho= .444$, $p< .05$).

A one-way ANOVA was run to provide further insight into the nature of the relationship between the two variables addressed in the first hypothesis. This test was determined to be appropriate as the groups in each variable are independent and the dependent variable consists of a ratio-level scale. The ANOVA indicated that there was a significant difference in the number of organizational linkages between the hierarchical levels, with a fairly small effect size ($F(3,78)= 7.025$, $\eta^2= .213$, $p<.05$). Tukey's HSD was utilized as a post-hoc test to ascertain the nature of the specific differences between the groups of employees.

The mean differences between each level of hierarchy followed the hypothesized rank-order, though not all of the differences between the groups were found to be statistically significant. Student researchers were found to have an average of 5.06 ($sd= 2.436$) communication linkages in the inter-organizational network,

technical and administrative employees had an average of 5.13 (sd= 2.604) inter-organizational communication links, professional researchers reported an average of 6.89 (sd= 2.82) communication links, and those in management, supervisory, or executive positions reported an average of 9.0 (sd= 4.0) communication links with other network organizations. Statistically significant mean differences were found between student researchers and management/ supervisory/ executive employees (se= .999, $p<.05$), and between technical/ administrative employees and employees from the management/ supervisory/ executive classification (se= .999, $p<.05$).

The first network-based supporting hypothesis for hypothesis one states that the networks of those who are located in higher positions in an organizational hierarchy will be associated with higher network density in the linkage network. Two sub-hypotheses are posited. The first states that higher-level organizational hierarchy networks will be associated with increased levels of interconnectedness; the second posits that higher-level organizational hierarchy networks will be associated with stronger relational ties.

Testing of the first network-based sub-hypothesis examines the number of links between organizations at each level of organizational hierarchy. Figures 4.6- 4.10 provide visual representations of the numbers of inter-organizational ties present in the network, first presenting the total network map (Figure 4.6) and then for each of the hierarchical levels (Figures 4.7- 4.10). In terms of the level of interconnectedness in the overall inter-organizational network, there were 136 relational ties present out of a possible 240 ties (56.76%). Examination of the network ties present in the hierarchically-based networks yielded the following results: employees in management/

Figure 4.6: Total Number of Contacts between Organizations

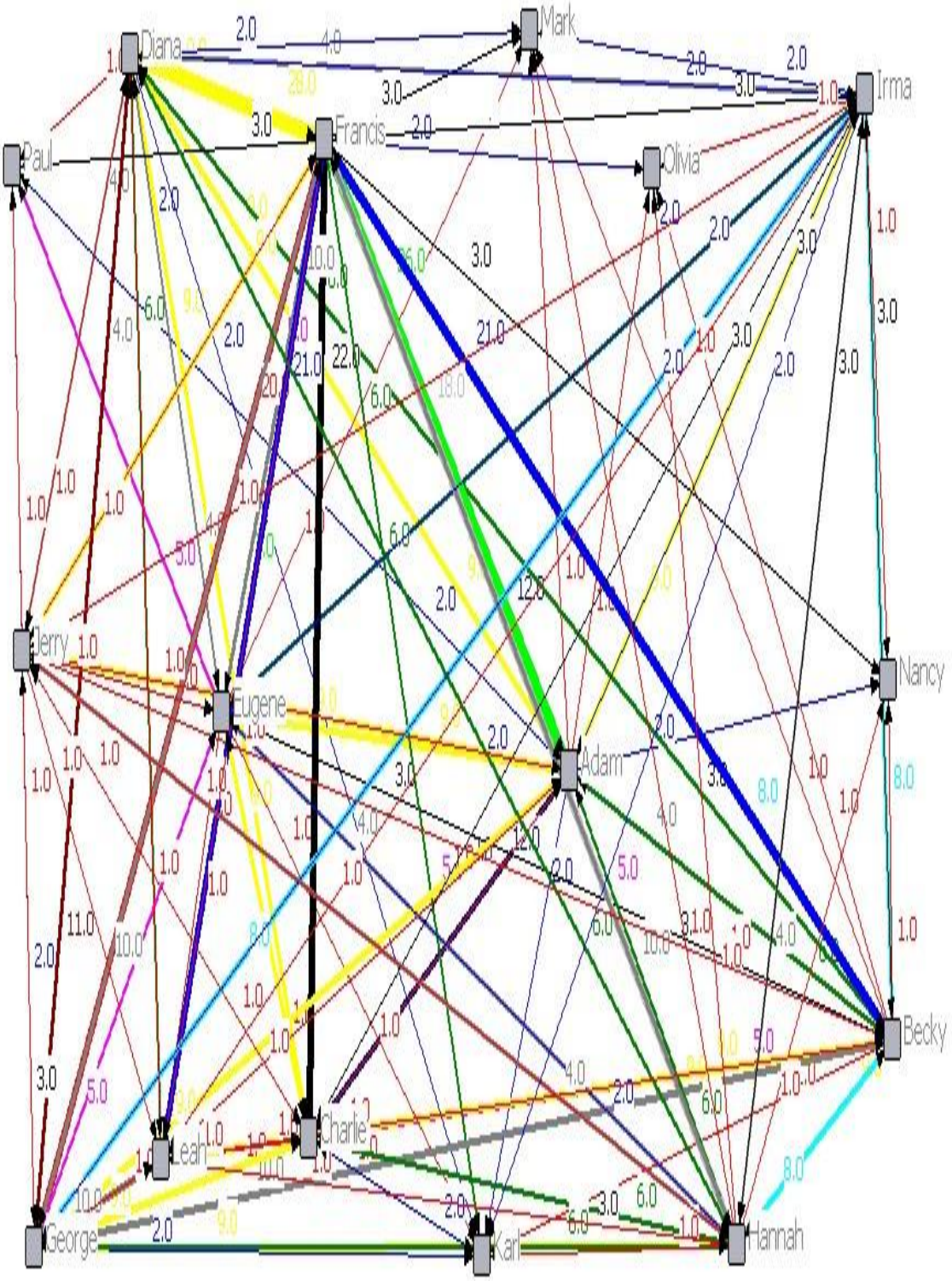


Figure 4.7: Management/Supervisory/Executive Organizational Contacts

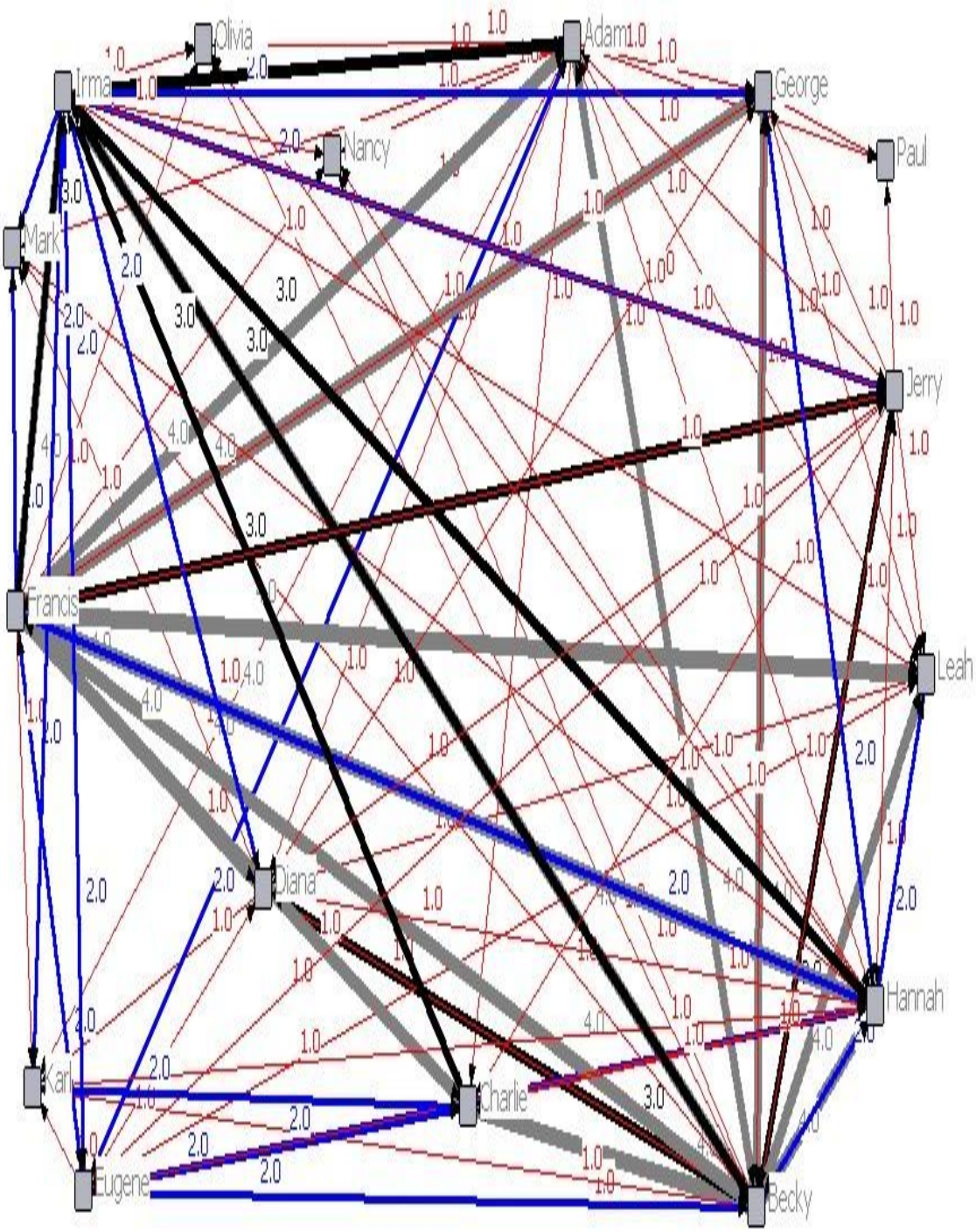


Figure 4.8: Professional Researcher Contacts between Organizations

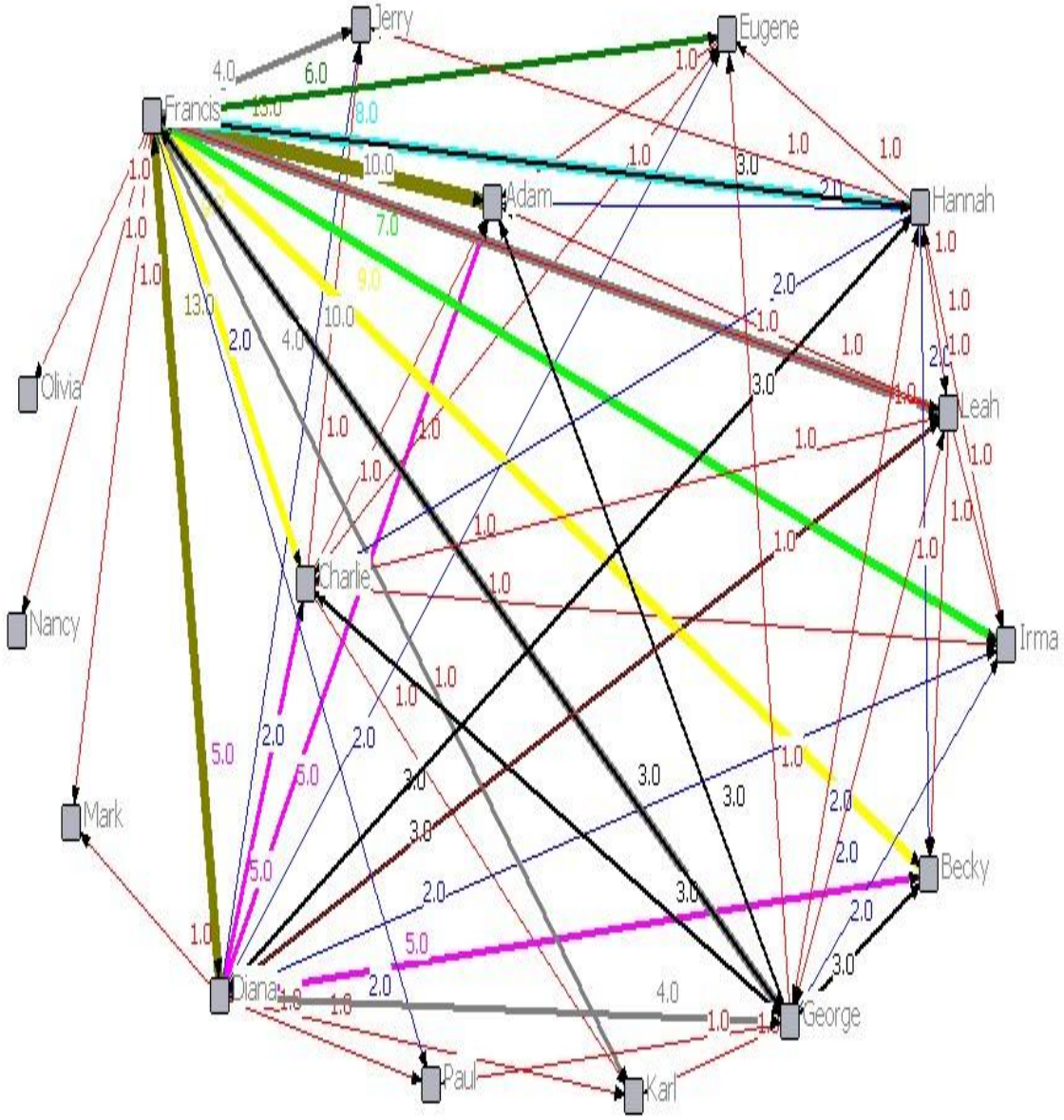


Figure 4.9: Technical/Administrative Contacts between Organizations

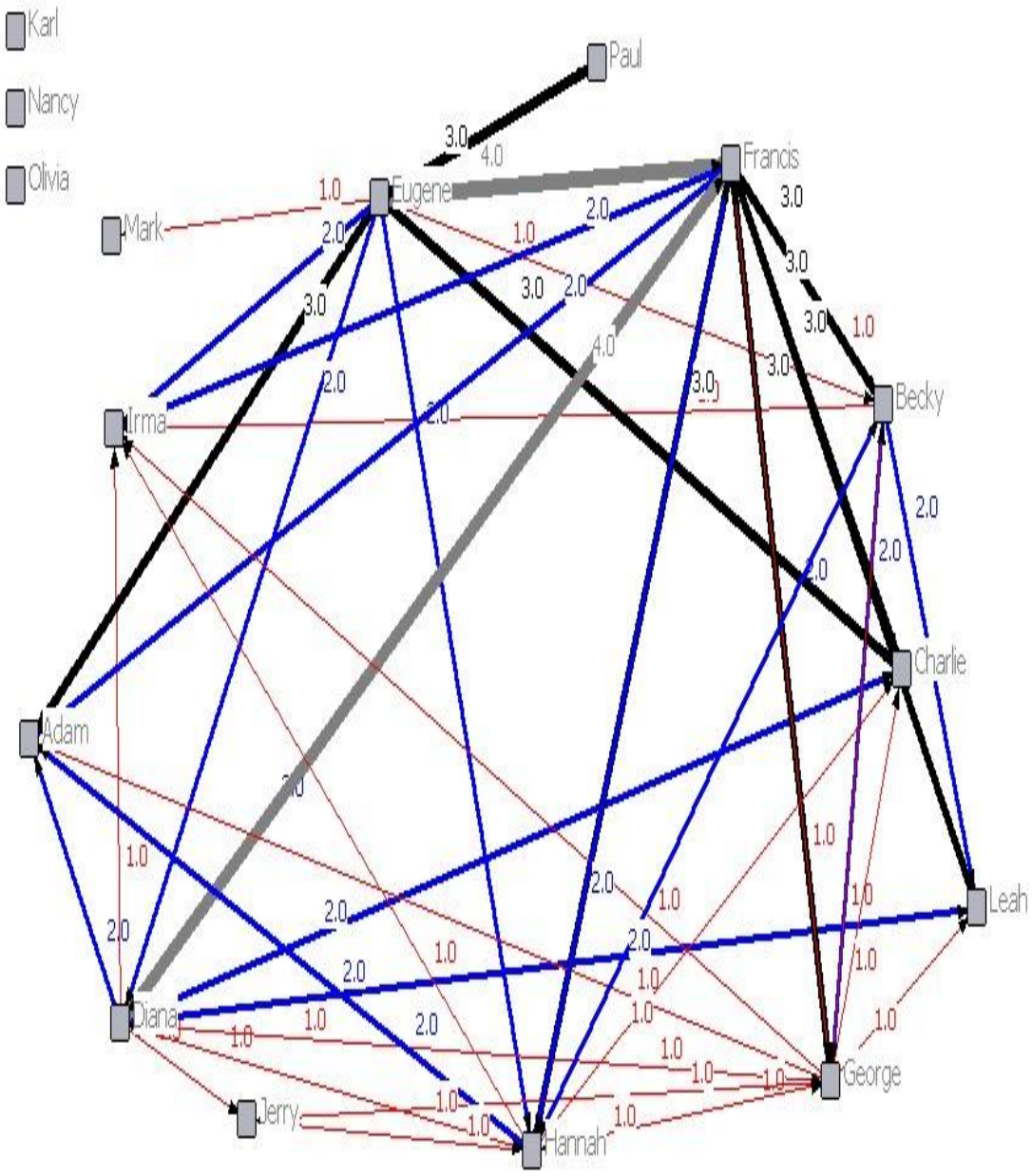
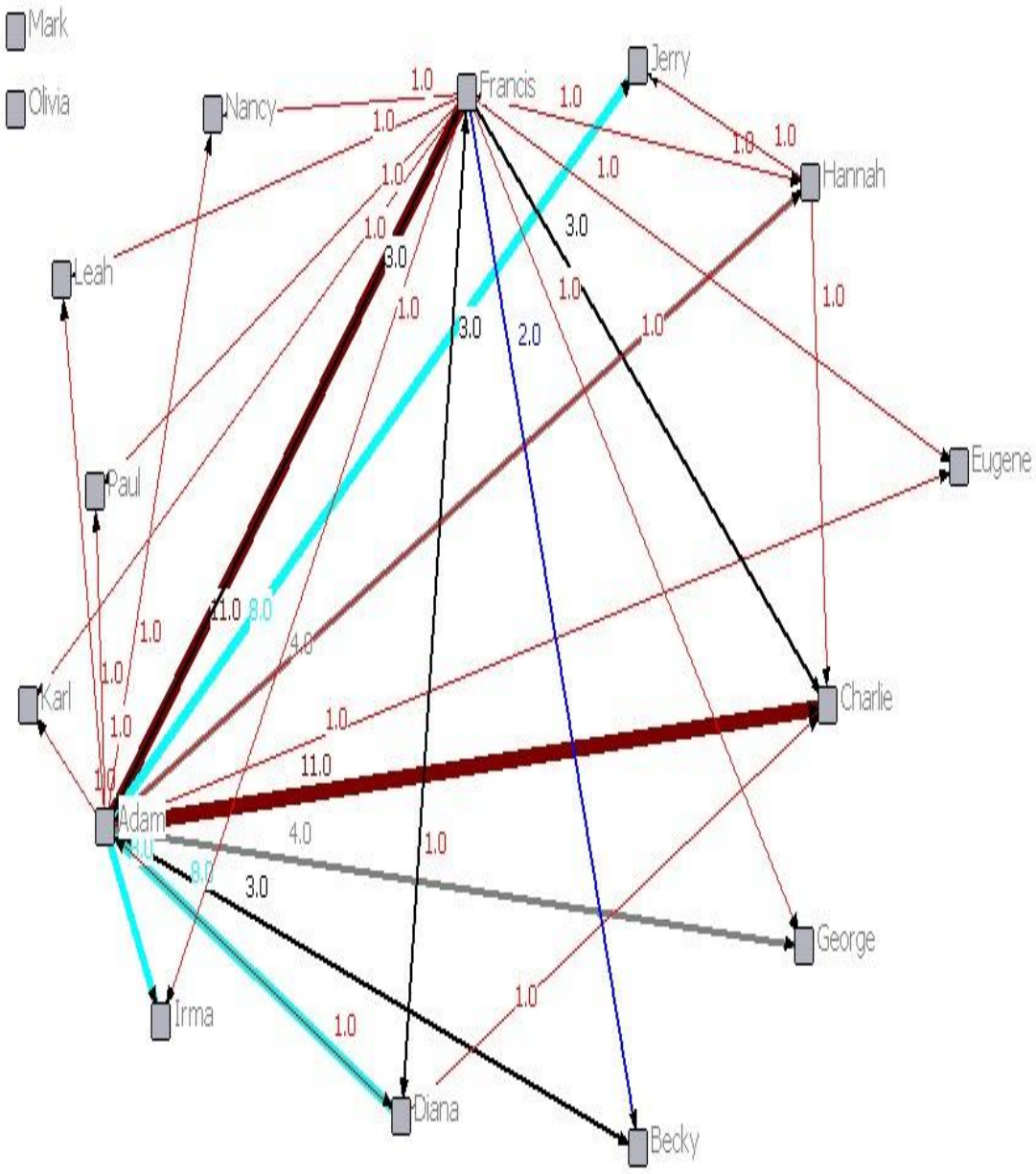


Figure 4.10: Student Researcher Contacts between Organizations



supervisory/ executive positions (Figure 4.7) had 110 ties (45.83%), professional researchers (Figure 4.8) had 66 ties (27.5%), technical/ administrative employees (Figure 4.9) had 47 ties (19.58%), and student researchers (Figure 4.10) had 32 inter-organizational ties (13.33%).

The second sub-hypothesis states that higher-level organizational hierarchy networks will be associated with stronger relational ties. Testing of this second network-based sub-hypothesis examines the average number of links (tie strength) between organizations at each level of organizational hierarchy. In terms of tie strength in the overall inter-organizational network (Figure 4.6), there was an average of 4.93 inter-organizational ties per organization represented in the network. Examination of the network ties present in the hierarchically-based networks yielded the following results: employees in management/ supervisory/ executive positions (Figure 4.7) had an average of 1.73 inter-organizational ties, professional researchers (Figure 4.8) had an average of 2.94 ties, technical/ administrative employees (Figure 4.9) had an average of 1.79 ties, and student researchers (Figure 4.10) had an average of 2.75 inter-organizational ties.

The second network-based supporting hypothesis for H_1 states that the networks of higher-level employees will be associated with higher levels of network structural performance. Again, two sub-hypotheses are posited. The first sub-hypothesis states that the networks of higher-levels employees will have fewer isolates; the second states that the networks of higher-level employees will have greater levels of reciprocity.

The presence of isolates can be seen in the network maps already presented (Figures 4.6- 4.10). The total ties map shows that there are no organizational isolates in the overall network (Figure 4.6). The network of those in management/ supervisory/

executive positions (Figure 4.7) also contains no isolates, as does the network of professional researchers (Figure 4.8). The network of technical/ administrative employees (Figure 4.9) contains three isolates, and that of student researchers (Figure 4.10) contains two isolates. The pendant analysis shows that there are no pendants in the overall network, no pendants in the management/ supervisory/ executive network, 2 pendants in the professional researcher network (Olivia and Nancy), 2 pendants (Mark and Paul) in the technical/ administrative employee network, and no pendants in the student researcher network. The combined isolation scores for each of the networks in the analysis was therefore calculated as being 0 for both the overall network and the management/ supervisory/ executive network, 2 for the professional researcher network, 8 for the technical/ administrative employee network, and 4 for the student researcher network.

The final supporting network-based sub-hypothesis for H_1 states that higher-level networks will have higher levels of reciprocity. Visual representations of the reciprocal ties in the organizational tie network are presented in Appendix C as Figures C1-C5. The first figure (C1) presents the total network, while the proceeding maps (C2-C5) present the visualized data for each level of hierarchy tested. The reciprocity analyses conducted on each of these networks yielded the following results: the total network contains 56.32% reciprocal ties, the management/ supervisory/ executive network is 39.24% reciprocal, the professional researcher network contains 24.53% reciprocity, the technical/ administrative network has a reciprocity level of 23.68%, and the student researcher network is 18.52% reciprocal in nature.

Hypothesis two posits that higher status in an organization's hierarchy will be associated with greater levels of communication activities with network organizations. This hypothesis and those that follow in the analysis are designed to consider the relationship as the unit of measure, thus allowing for the expansion of the measured population from the number of people who participated in the study to the number of relationships those participants reported about. As with the first hypothesis, position in the organizational hierarchy serves as the independent variable (for both sub-hypotheses) and uses the same ordinal scale previously described. The independent variable for the first sub-hypothesis associated with hypothesis two (H_2a) is frequency of communication activity, consisting of the following categories (presented here in rank-order from lowest to highest): no contact, less than once per month, several times per month, approximately once per week, 2-3 times per week, and almost daily.

Since the level of measurement for both the independent and dependent variables in H_2a are ordinal in nature, and the sub-hypothesis states that higher status in the organizational hierarchy should be associated with greater frequency of inter-organizational communication activity, a one-tailed Spearman's rho was once again selected as the appropriate test to measure the correlation between the variables measured in H_2a. The rho calculation for this hypothesis indicated that there is a small but statistically significant positive relationship between organizational hierarchical positions and the frequency of network communication activities ($n= 1218$, $rho= .186$, $p< .05$).

In order to ascertain more detailed information concerning the relationship between organizational hierarchical position and frequency of network communication

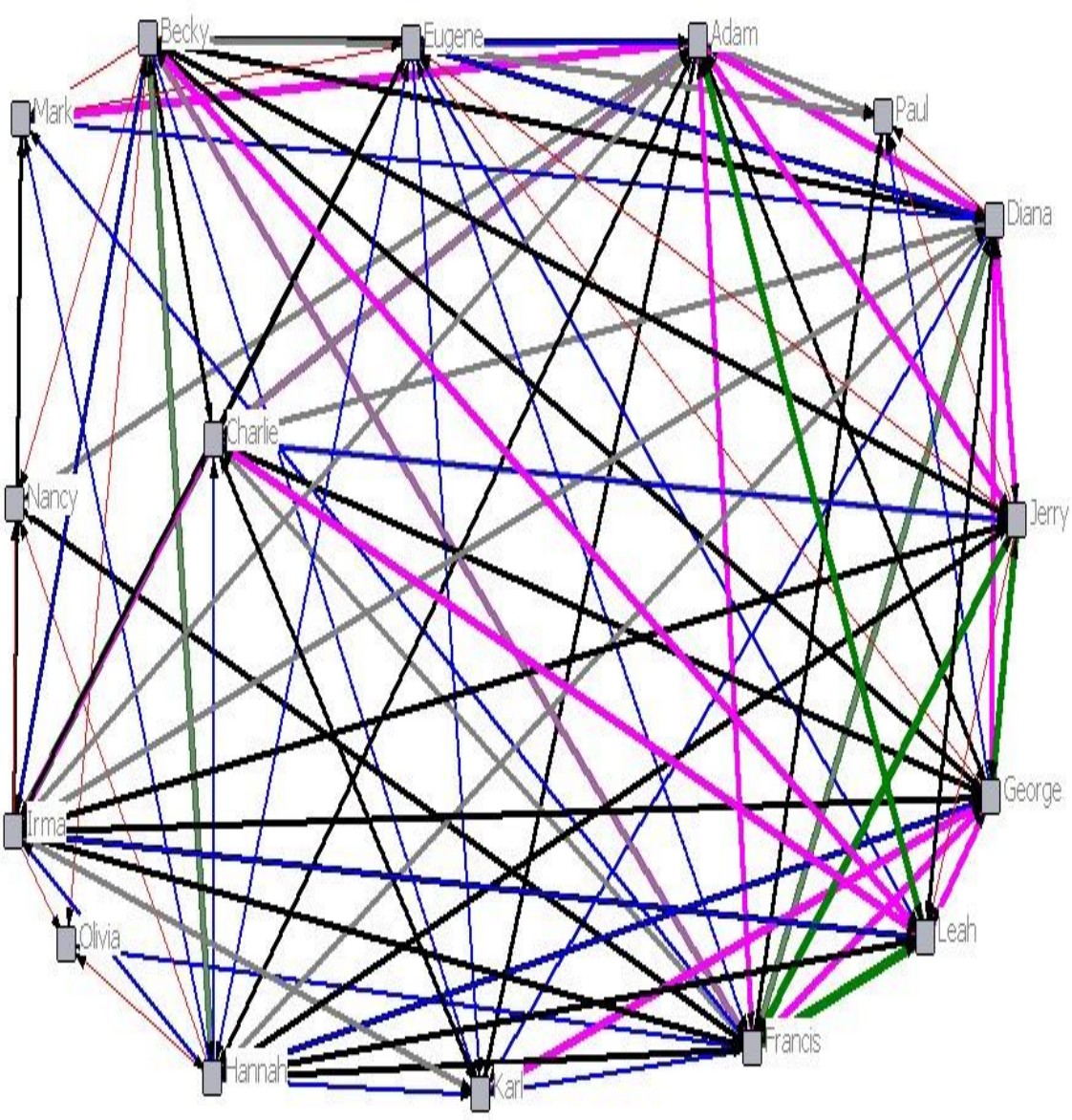
activity, crosstabulation tests were run on the data. Crosstabulation was chosen as the appropriate measure, as the ordinal level of the dependent variable in this sub-hypothesis violates the assumptions required for the calculation of an ANOVA. Over one thousand (1,218) relationships were measured in the cross-tabulation data for H_2a, and the Kendall's tau-b indicated that there were significant differences between the job function groups (6.592, se= .024, $p < .05$). Over 650 (663) of the relationships reported upon consisted of those between participants and organizations in which there was no contact reported, with the remaining 555 reporting some communication activity. Table 4 provides a breakdown of the cross-tabulation data concerning frequency of communication activity and hierarchical positions.

The first network-based supporting hypothesis for H_2a states that the networks of those who are located in higher positions in an organizational hierarchy will be associated with higher network density in the communication frequency network. Two sub-hypotheses are posited. The first states that higher-level organizational hierarchy networks will be associated with increased levels of interconnectedness; the second posits that higher-level organizational hierarchy networks will be associated with increased levels of average communication frequency. Testing of the first network-based sub-hypothesis for H_2a examines the number of links between organizations at each level of organizational hierarchy. Figures 4.11-4.15 provide visual representations of the numbers of inter-organizational ties present in the network, first presenting the total network map (Figure 4.11) and then for each of the hierarchical levels (Figures 4.12- 4.15).

Table 4*: Job Function by Communication Frequency Crosstabulation*

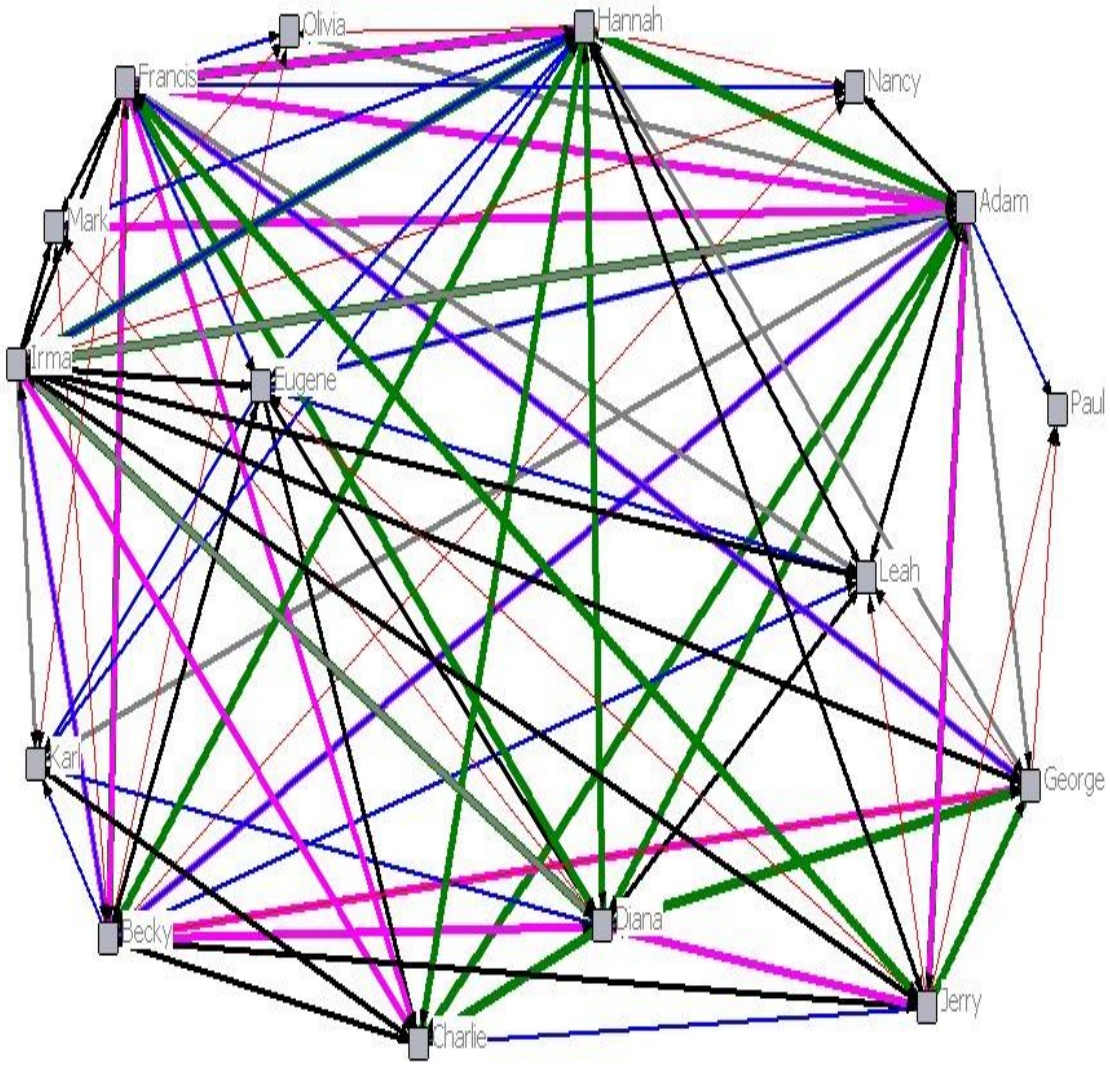
Job Function		Student Researcher	Technical/ Admin.	Prof. Researcher	Mgmt./ Supervisory/ Executive	Total
Frequency	No contact	167	156	216	124	663
	Less than once per month	11	17	40	33	101
	Approx. 1 per month	15	9	33	32	89
	Several times per month	14	21	33	32	100
	Approx. 1 per week	18	6	30	26	80
	2-3 times per week	10	13	21	26	70
	Almost daily	20	17	37	41	115
	Total	255	239	410	314	1218

Figure 4.11: Total Communication Frequency of Contacts between Organizations



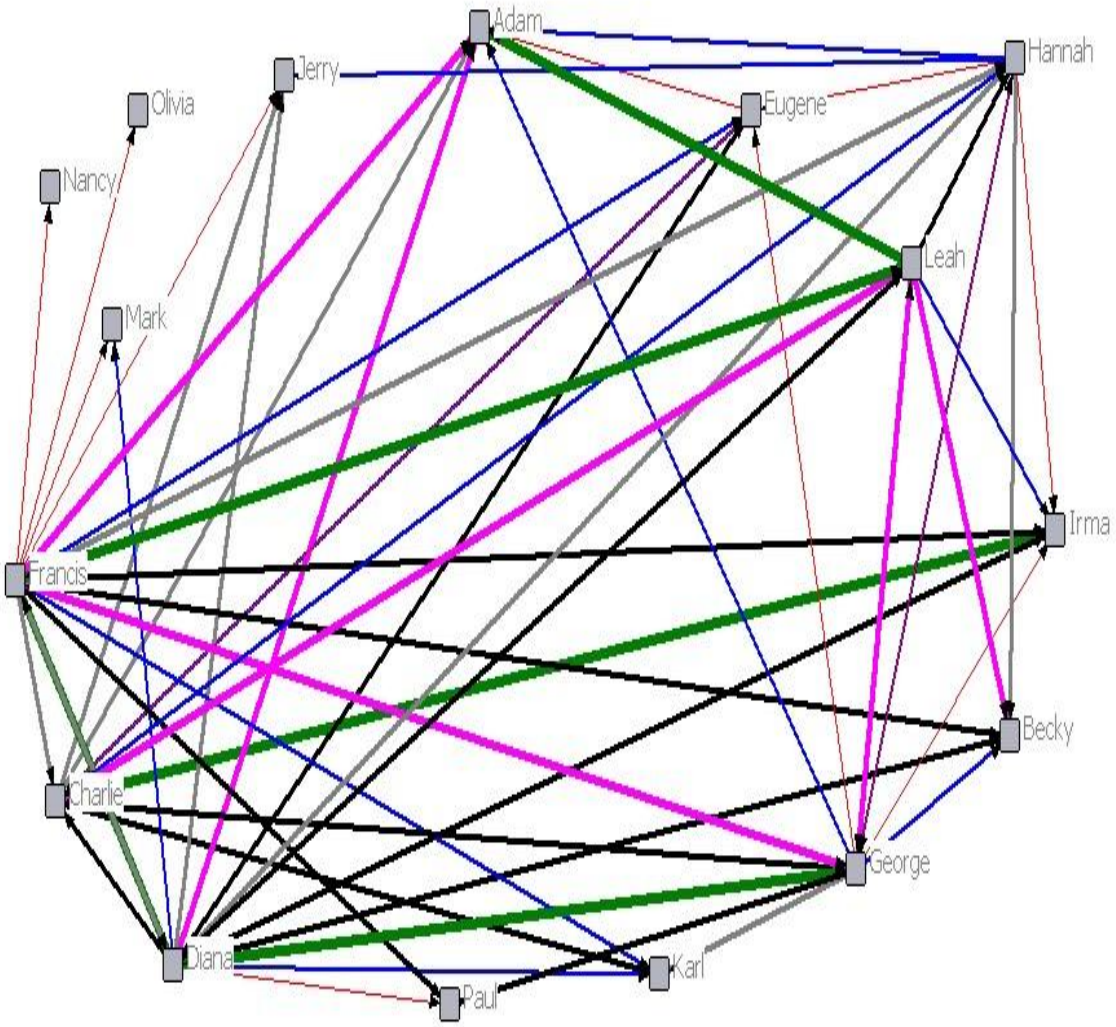
Legend	
Red = Less than Once per Month	Gray = Approx. Once per Week
Blue = Approx. Once per Month	Pink = 2-3 Times per Week
Black = Several Times per Month	Green = Almost Daily

Figure 4.12: Management/Supervisory/Executive Communication Frequency



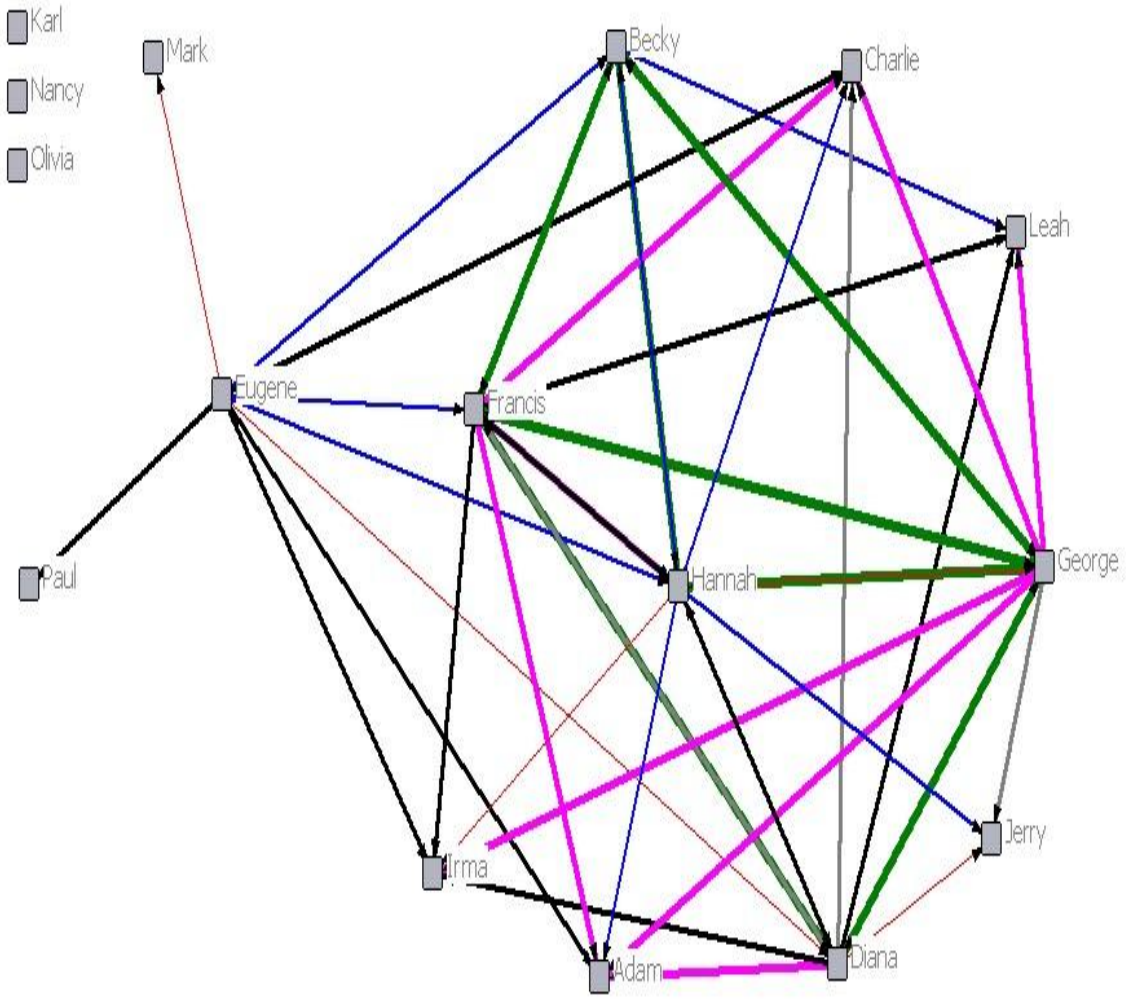
Legend	
Red = Less than Once per Month	Gray = Approx. Once per Week
Blue = Approx. Once per Month	Pink = 2-3 Times per Week
Black = Several Times per Month	Green = Almost Daily

Figure 4.13: Professional Researcher Communication Frequency of Contacts



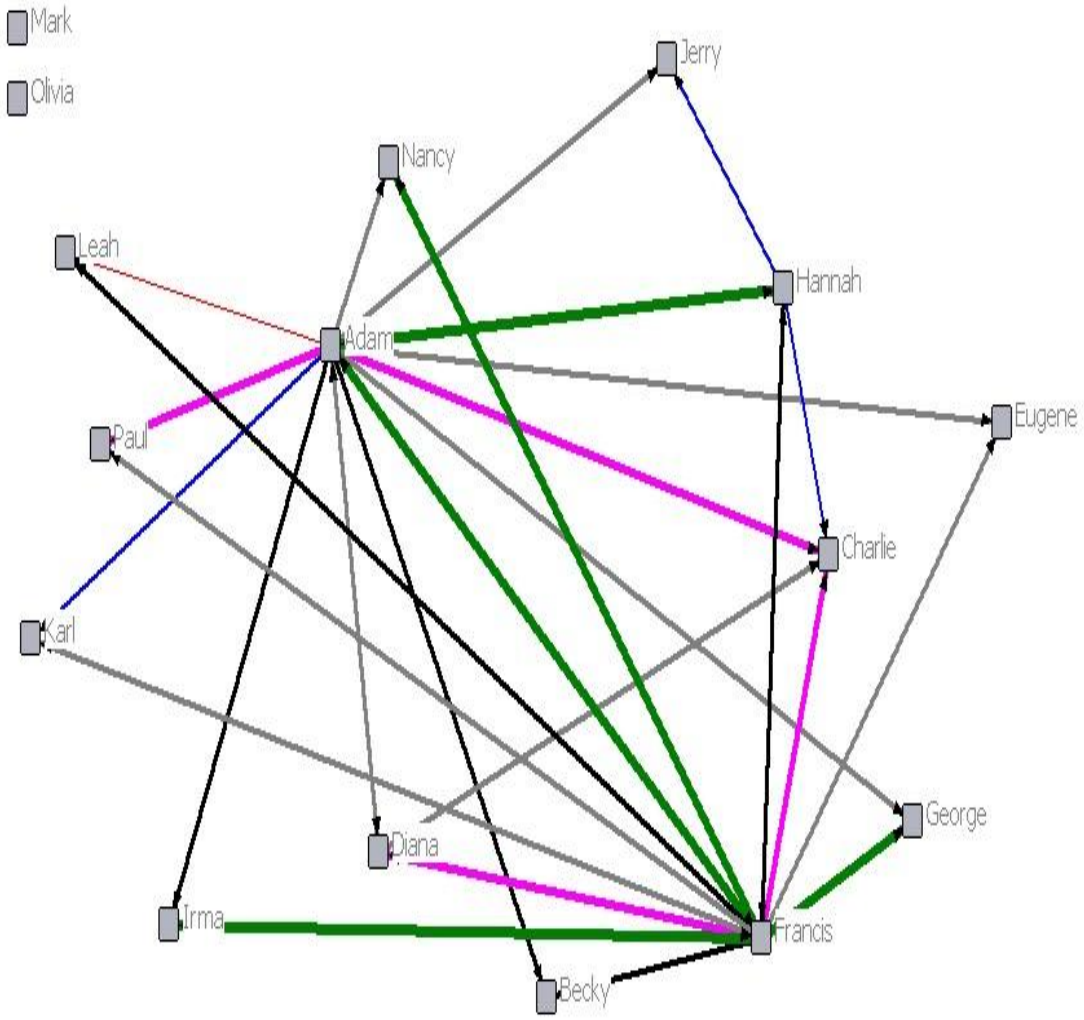
Legend	
Red = Less than Once per Month	Gray = Approx. Once per Week
Blue = Approx. Once per Month	Pink = 2-3 Times per Week
Black = Several Times per Month	Green = Almost Daily

Figure 4.14: Technical/Administrative Communication Frequency of Contact



Legend	
Red = Less than Once per Month	Gray = Approx. Once per Week
Blue = Approx. Once per Month	Pink = 2-3 Times per Week
Black = Several Times per Month	Green = Almost Daily

Figure 4.15: Student Researcher Communication Frequency of Contact



Legend	
Red = Less than Once per Month	Gray = Approx. Once per Week
Blue = Approx. Once per Month	Pink = 2-3 Times per Week
Black = Several Times per Month	Green = Almost Daily

In terms of the level of interconnectedness in the overall inter-organizational communication frequency network (Figure 4.11), there were 135 relational ties present out of a possible 240 ties (56.25%). Examination of the network ties present in the hierarchically-based networks yielded the following results: employees in management/ supervisory/ executive positions (Figure 4.12) had 110 ties (45.83%), professional researchers (Figure 4.13) had 65 ties (27.08%), technical/ administrative employees (Figure 4.14) had 46 ties (19.17%), and student researchers (Figure 4.15) had 32 inter-organizational ties (13.33%).

The second sub-hypothesis associated with H_2a states that higher-level organizational hierarchy networks will be associated with higher levels of average communication frequency. The overall average communication frequency of the total network (Figure 4.11) was 3.05; translated to the scale used to measure this variable in the survey instrument, this number indicates that the average communication frequency is several times per month. Examination of the network ties present in the hierarchically-based networks yielded the following results: employees in management/ supervisory/ executive positions (Figure 4.12) had an average communication frequency of 3.47 (several times per month), professional researchers (Figure 4.13) had an average of 3.13 (several times per month), technical/ administrative employees (Figure 4.14) had an average of 4.57 (approximately once per week), and student researchers (Figure 4.15) had an average of 3.81 (several times per month).

The second network-based supporting hypothesis for H_2a states that the networks of higher-level employees will be associated with higher levels of network structural performance. The first sub-hypothesis states that the networks of higher-

levels employees will have fewer isolates; the second states that the networks of higher-level employees will have greater levels of reciprocity.

The presence of isolates can be seen in the network maps already presented (Figures 4.11- 4.15). The total ties map shows that there are no organizational isolates in the overall network (Figure 4.11). The network of those in management/ supervisory/ executive positions (Figure 4.12) also contains no isolates, as does the network of professional researchers (Figure 4.13). The network of technical/ administrative employees (Figure 4.14) contains three isolates, and that of student researchers (Figure 4.15) contains two isolates. The pendant analysis shows that there are no pendants in the overall network, no pendants in the management/ supervisory/ executive network, 2 pendants in the professional researcher network (Olivia and Nancy), 2 pendants (Mark and Paul) in the technical/ administrative employee network, and no pendants in the student researcher network. The combined isolation scores for each of the networks in the analysis was therefore calculated as being 0 for both the overall network and the management/ supervisory/ executive network, 2 for the professional researcher network, 8 for the technical/ administrative employee network, and 4 for the student researcher network.

The final supporting network-based sub-hypothesis for H_2a states that higher-level networks will have higher levels of reciprocity. Visual representations of the reciprocal ties in the organizational tie network are presented in Appendix C as Figures C6-C10; the first figure (C6) presents the total network, while the proceeding maps (C7-C10) present the visualized data for each level of hierarchy tested. The reciprocity analyses conducted on each of these networks yielded the following results: the total

network contains 56.98% reciprocal ties, the management/ supervisory/ executive network is 39.24% reciprocal, the professional researcher network contains 22.64% reciprocity, the technical/ administrative network has a reciprocity level of 24.32%, and the student researcher network is 18.52% reciprocal in nature.

The second sub-portion of hypothesis two posits that positions in the organizational hierarchy will be associated with the number of people from a network organization that are communicated with. The number of people from the network organization who the participant has contact with serves as the dependent variable in H_2b, and consists of an ordinal scale using the following categories (rank-ordered from highest to lowest): none, 1-2, 3-4, 5-7, -10, and 10+. Once again, directionality is implied in the hypothesis (higher position in the organizational hierarchy should be associated with contact with greater numbers of people for the network organizations), so a one-tailed Spearman's rho is again the desired measurement tool for assessing correlation levels. The analysis of H_2b indicated a small, positive, and statistically significant relationship was found ($n= 1207$, $rho= .198$, $p< .05$).

Crosstabulation tests were also used in H_2b in order to obtain more specific data concerning the nature of the relationship between the two variables; this tool was chosen based on the same justification given for H_2a. 1,207 relationships were measured in the crosstabulation data for H_2b, and the Kendall's tau-b indicated that there were significant differences between the job function groups (6.978, $se= .024$, $p< .05$). Similar to H_2a, there were over 600 (662) relationships included in the analysis in which it was reported that there was no contact between the respondent and people from the other network organizations, with approximately 550 (545) of the relationships being

those in which there was contact with at least one person from the other organization. Table 5 presents the cross-tabulation data associated with H_2b.

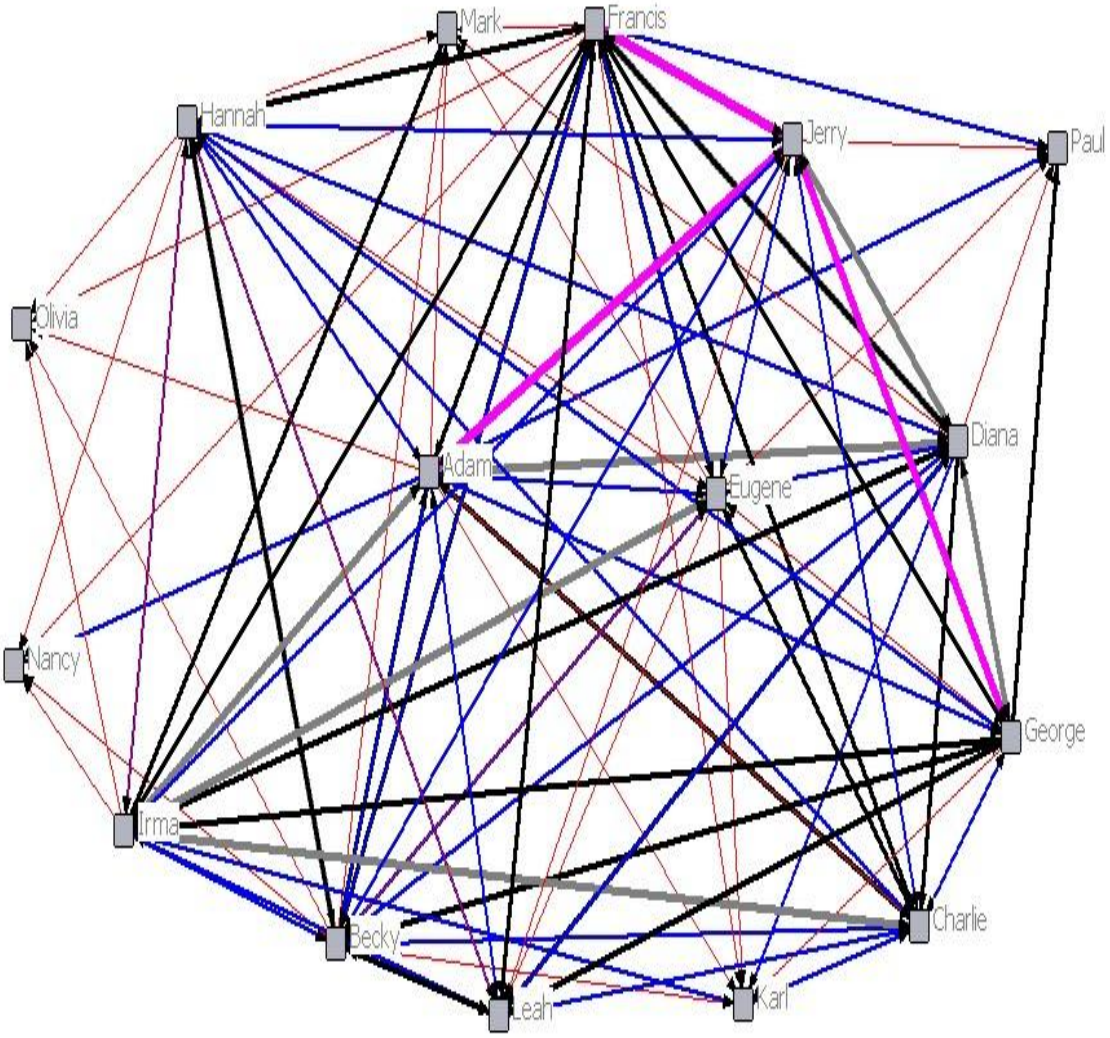
The first network-based supporting hypothesis for H_2b states that the networks of those who are located in higher positions in an organizational hierarchy will be associated with higher network density in the network containing the number of people communicated with. Two sub-hypotheses are posited. The first states that higher-level organizational hierarchy networks will be associated with increased levels of interconnectedness; the second posits that higher-level organizational hierarchy networks will be associated with stronger relational ties (in the form of more average people communicated with).

Testing of the first network-based sub-hypothesis associated with H_2b examines the number of links between organizations at each level of organizational hierarchy. Figures 4.16- 4.20 provide visual representations of the numbers of inter-organizational ties present in the network, first presenting the total network map (Figure 4.16) and then for each of the hierarchical levels (Figures 4.17- 4.20). In terms of the level of interconnectedness in the overall inter-organizational network (Figure 4.16), there were 134 relational ties present out of a possible 240 ties (55.83%). Examination of the network ties present in the hierarchically-based networks yielded the following results: employees in management/ supervisory/ executive positions (Figure 4.17) had 109 ties(45.42%), professional researchers (Figure 4.18) had 63 ties (26.25%), technical/ administrative employees (Figure 4.19) had 47 ties (19.58%), and student researchers (Figure 4.20) had 31 inter-organizational ties (12.92%).

Table 5*: Job function by number of people communicated with*

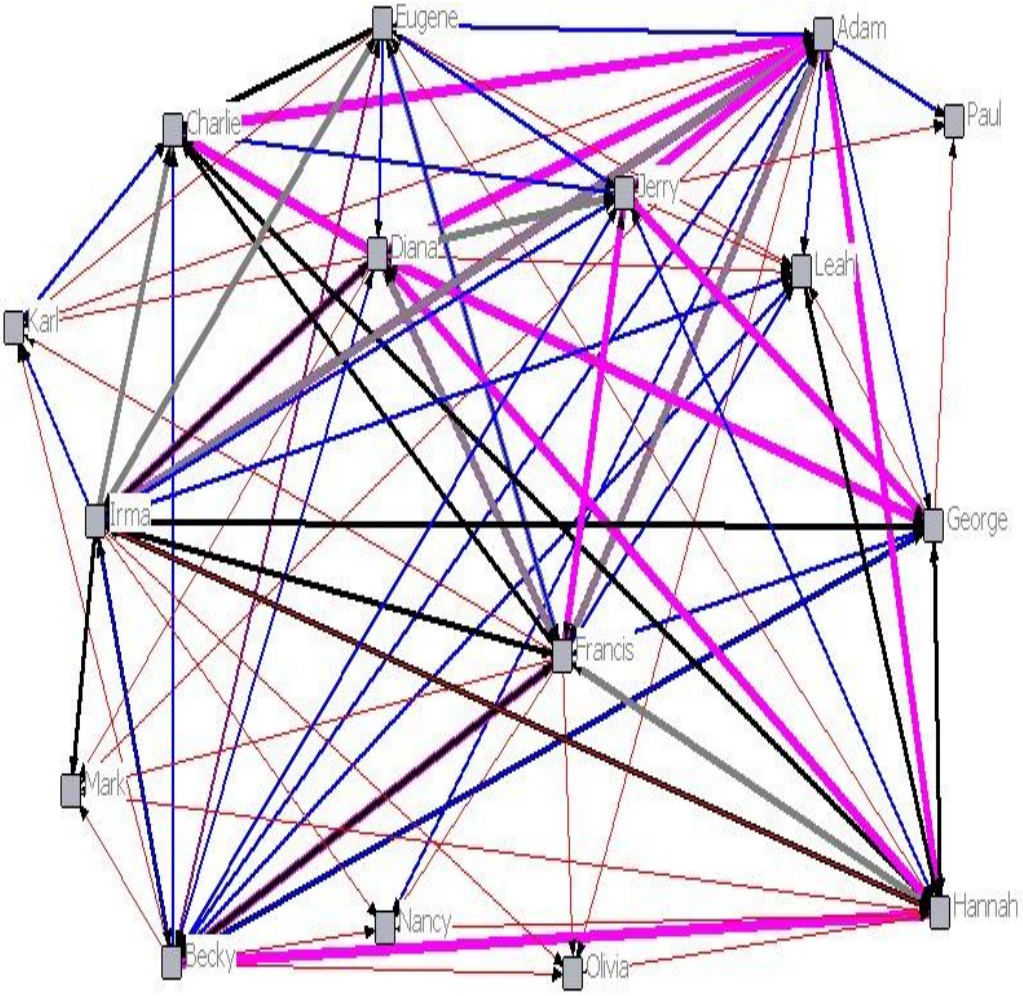
Job Function	Student Researcher	Technical/ Admin.	Prof. Researcher	Mgmt./ Supervisory/ Executive	Total
Number of People Communicated with	167	156	215	124	662
	29	28	78	61	196
	33	24	54	53	164
	8	14	25	22	69
	5	10	13	13	41
	12	6	21	36	75
Total	254	238	406	309	1207

Figure 4.16: Total Number of People in Contacts between Organizations



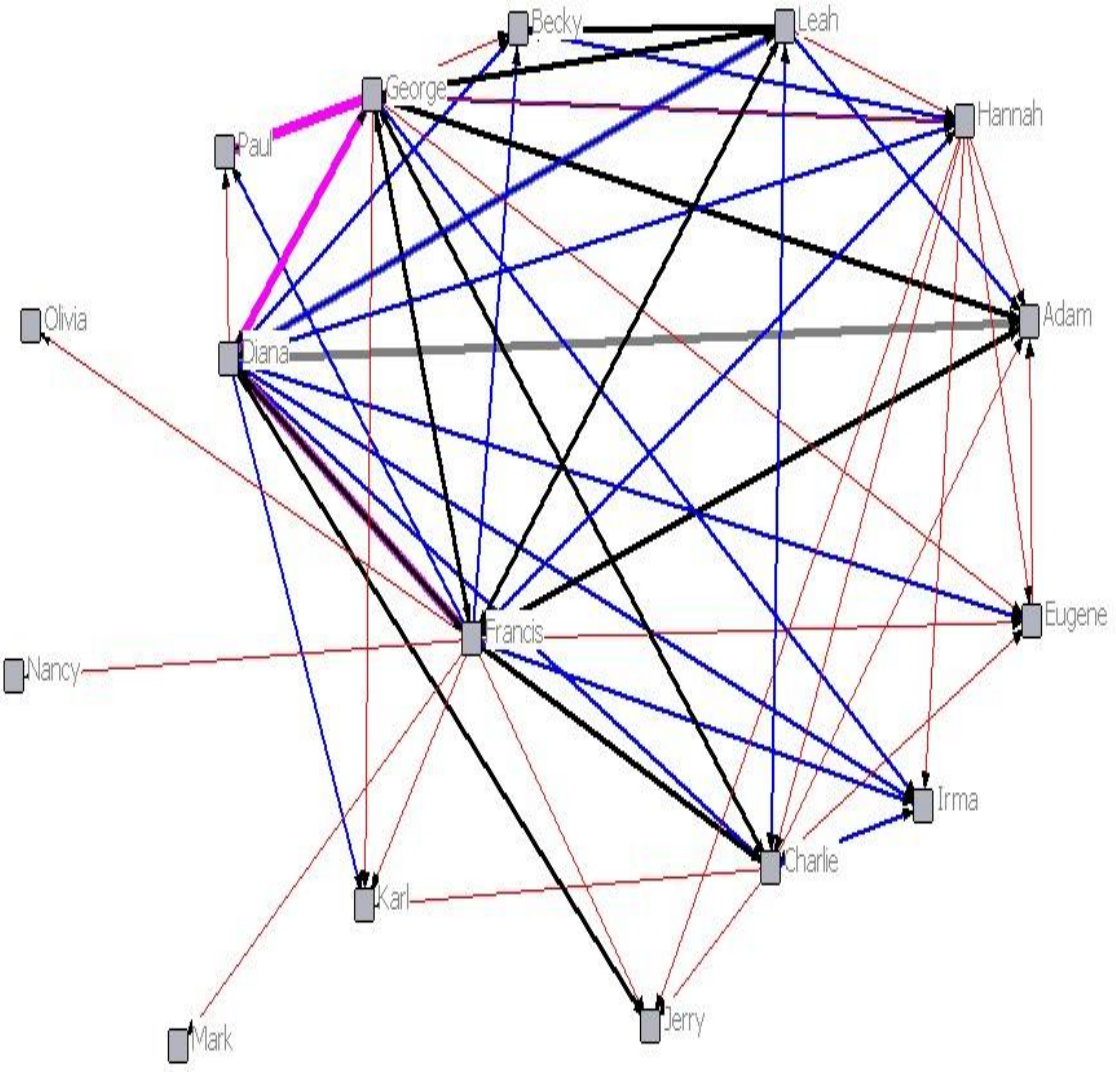
Legend	
Red = 1-2 People	Gray = 8-10 People
Blue = 3-4 People	Pink = 10+ People
Black = 5-7 People	

Figure 4.17: Management/ Supervisory/ Executive Number of People in Contacts



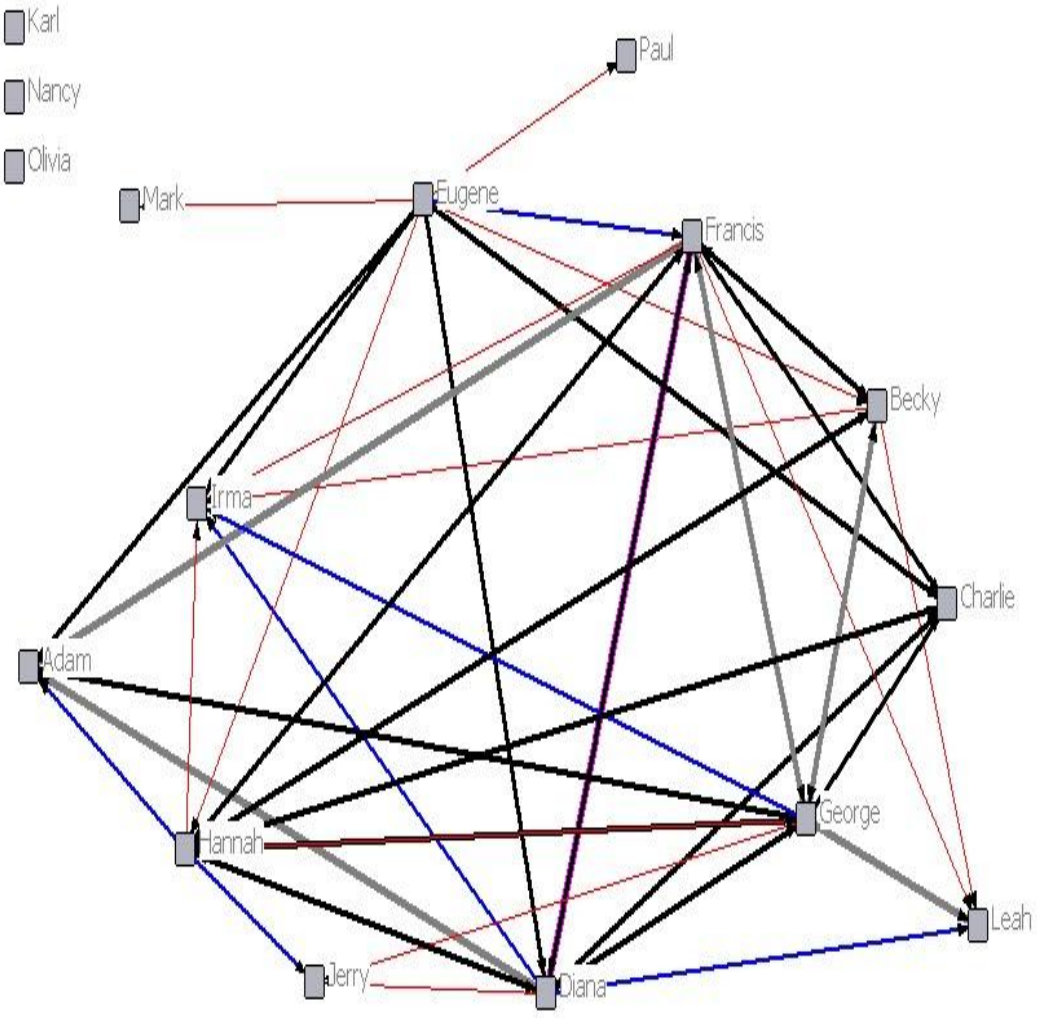
Legend	
Red = 1-2 People	Gray = 8-10 People
Blue = 3-4 People	Pink = 10+ People
Black = 5-7 People	

Figure 4.18: Professional Researcher Number of People in Contacts



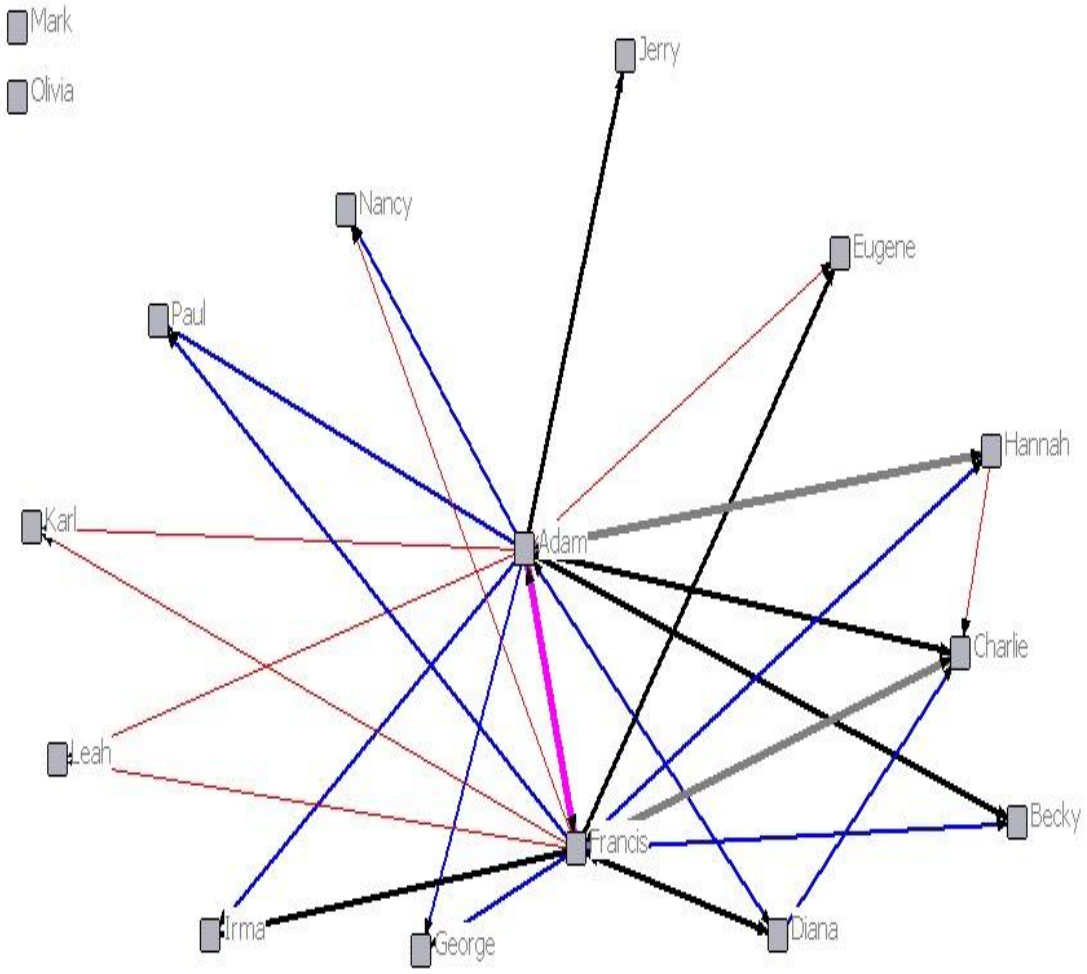
Legend	
Red = 1-2 People	Gray = 8-10 People
Blue = 3-4 People	Pink = 10+ People
Black = 5-7 People	

Figure 4.19: Technical/ Administrative Number of People in Contacts



Legend	
Red = 1-2 People	Gray = 8-10 People
Blue = 3-4 People	Pink = 10+ People
Black = 5-7 People	

Figure 4.20: Student Researcher Number of People in Contacts



Legend	
Red = 1-2 People	Gray = 8-10 People
Blue = 3-4 People	Pink = 10+ People
Black = 5-7 People	

The second sub-hypothesis associated with H_2b states that higher-level organizational hierarchy networks will be associated with stronger relational ties. In terms of tie strength in the overall inter-organizational network, the average of the total network (Figure 4.16) was calculated as 2.03, which translates to a response of three to four people communicated with. Examination of the network ties present in the hierarchically-based networks yielded the following results: employees in management/ supervisory/ executive positions (Figure 4.17) had an average of 2.46 (3-4 people communicated with), professional researchers (Figure 4.18) had an average of 1.91 (1-2 people communicated with), technical/ administrative employees (Figure 4.19) had an average of 2.30 (3-4 people communicated with), and student researchers (Figure 4.20) had an average of 2.05 (3-4 people communicated with).

The second network-based supporting hypothesis for H_2b states that the networks of higher-level employees will be associated with higher levels of network structural performance. The first sub-hypothesis states that the networks of higher-levels employees will have fewer isolates; the second states that the networks of higher-level employees will have greater levels of reciprocity.

The presence of isolates can be seen in the network maps already presented (Figures 4.16- 4.20). The total ties map shows that there are no organizational isolates in the overall network (Figure 4.16). The network of those in management/ supervisory/ executive positions (Figure 4.17) also contains no isolates, as does the network of professional researchers (Figure 4.18). The network of technical/ administrative employees (Figure 4.19) contains three isolates, and that of student researchers (Figure 4.20) contains two isolates. The pendant analysis shows that there are no pendants in the

overall network, no pendants in the management/ supervisory/ executive network, 3 pendants in the professional researcher network (Olivia, Nancy and Mark), 2 pendants (Mark and Paul) in the technical/ administrative employee network, and 1 pendant (Jerry) in the student researcher network. The combined isolation scores for each of the networks in the analysis was therefore calculated as being 0 for both the overall network and the management/ supervisory/ executive network, 3 for the professional researcher network, 8 for the technical/ administrative employee network, and 5 for the student researcher network.

The final supporting network-based sub-hypothesis for H2b states that higher-level networks will have higher levels of reciprocity. Visual representations of the reciprocal ties in the organizational tie network are presented in Appendix C, as Figures C11-C15; the first figure (C11) presents the total network, while the proceeding maps (C12-C15) present the visualized data for each level of hierarchy tested. The reciprocity analyses conducted on each of these networks yielded the following results: the total network contains 55.81% reciprocal ties, the management/ supervisory/ executive network is 39.74% reciprocal, the professional researcher network contains 23.53% reciprocity, the technical/ administrative network has a reciprocity level of 23.68%, and the student researcher network is 19.23% reciprocal in nature.

The third hypothesis predicts that there will be an association between hierarchical positions in an organization and perceived the perceived level of collaboration between individuals and organizations. This hypothesis also contains two sub-hypotheses, the first (H_3a) measuring perceptions of individual to organizational collaboration and the second (H_3b) measuring perceptions of organization to

organization collaboration levels. The independent variable in both of these sub-hypotheses is the same as the ordinal independent variable used in H_1 and H_2. Identical scales were used in measuring both individual and organizational levels of collaboration, consisting of the following categories (ranked from lowest to highest): no communication, networking, cooperation, coordination, coalition, and collaboration. While it could be argued that these scales are ordinal in nature, these categories are conceptualized as consisting of varying degrees of inter-organizational networking and have therefore been treated as interval level data in the analysis, allowing for more robust testing of the relationships between the independent and dependent variables.

H_3a posits that there is an association between hierarchical position in an organization and perceived collaboration between the individual and the network organization. Specifically, it is asserted that increased hierarchical positions will perceive higher levels of individual to organization collaboration than lower status positions. Based on the fact that the independent variable is ordinal in nature and that directionality is implied in the sub-hypothesis, a one-tailed Spearman's rho was again utilized to ascertain the level of correlation between the independent and dependent variables. Spearman's rho indicated that there is a weak, positive, and statistically significant relationship between the hierarchical positions in an organization and perceptions of individual to organizational collaboration ($n= 1217$, $rho= .213$, $p< .05$).

Since the dependent variable is treated as being interval-level in the analysis, a one-way ANOVA was selected to provide deeper insight into the nature of the relationship between hierarchical position and perceived levels of collaboration between individuals and network organizations. The ANOVA indicated that there was a

significant difference in the number of organizational linkages between the hierarchical levels with a very small effect size ($F(3,1213)= 16.618$, $\eta^2= .039$, $p<.05$). Mean collaboration scores for each of the job function groups were as follows: student researchers reported the lowest levels of self-to-organization collaboration (m= .68, sd= 1.214), technical and administrative employees reported slightly higher average levels of self-to-organization collaboration (m= .73, sd= 1.181), professional researchers had the second-to-highest levels of self-to-organization collaboration (m= 1.14, sd= 1.540), and the managers, supervisors, and executives reported the highest levels of self-to-organization collaboration (m= 1.39, sd= 1.498). The post-hoc Tukey's HSD analysis indicated that significant differences existed between the student researchers and professional researchers (se= .112, p< .05), between student researchers and managers, supervisors, and executives (md= .709, se= .118, p< .05), between technical and administrative employees and professional researchers (se= .114, p< .05), and between technical and administrative employees and those of management, supervisory, or executive rank (se= .120, p< .05).

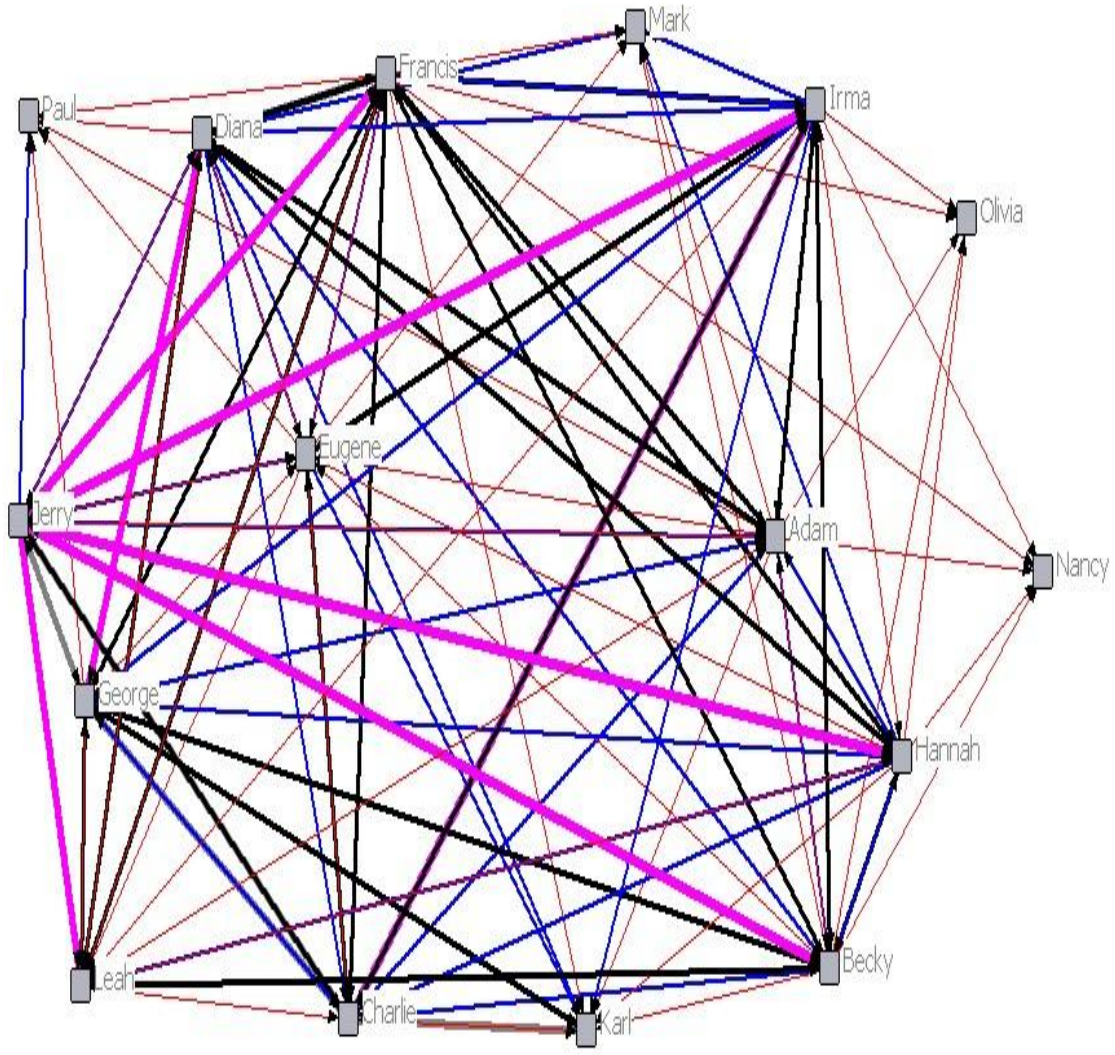
The first network-based supporting hypothesis for H_3a states that the networks of those who are located in higher positions in an organizational hierarchy will be associated with higher network density in the individual-to-organizational perceived collaboration network. Two sub-hypotheses are posited. The first states that higher-level organizational hierarchy networks will be associated with increased levels of interconnectedness; the second posits that higher-level organizational hierarchy networks will be associated with stronger relational ties (in the form of average perceived individual-to-organization collaboration level).

Testing of the first network-based sub-hypothesis associated with H_3a examines the number of links between organizations at each level of organizational hierarchy. Figures 4.21- 4.25 provide visual representations of the numbers of inter-organizational ties present in the network, first presenting the total network map (Figure 4.21) and then for each of the hierarchical levels (Figures 4.22- 4.25).

In terms of the level of interconnectedness in the overall inter-organizational network (Figure 4.21), there were 136 relational ties present out of a possible 240 ties (56.76%). Examination of the network ties present in the hierarchically-based networks yielded the following results: employees in management/ supervisory/ executive positions (Figure 4.22) had 110 ties (45.83%), professional researchers (Figure 4.23) had 65 ties (27.08%), technical/ administrative employees (Figure 4.24) had 47 ties (19.58%), and student researchers (Figure 4.25) had 31 inter-organizational ties (12.92%).

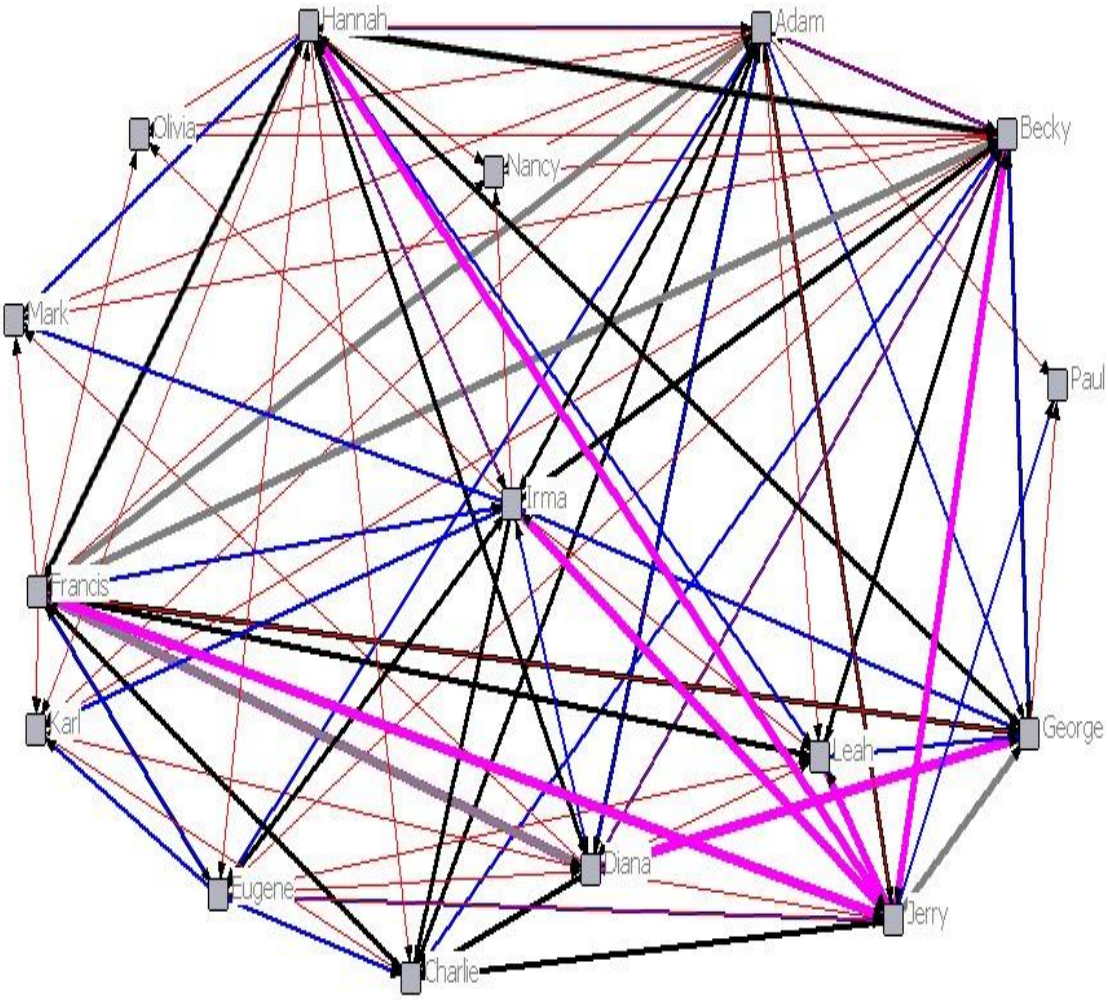
The second sub-hypothesis associated with H_3b states that higher-level organizational hierarchy networks will be associated with stronger relational ties. Testing of this second network-based sub-hypothesis examines the average perceived individual-to-organization collaboration level between organizations at each level of organizational hierarchy. In terms of tie strength in the overall inter-organizational network (Figure 4.21), an average collaboration level of 1.99 (networking) was calculated. Examination of the network ties present in the hierarchically-based networks yielded the following results: employees in management/ supervisory/ executive positions (Figure 4.22) had an average perceived collaboration level of 2.10 (cooperation), professional researchers (Figure 4.23) had an average of 2.09

Figure 4.21: All Employment Levels Individual-to-Organization Collaboration



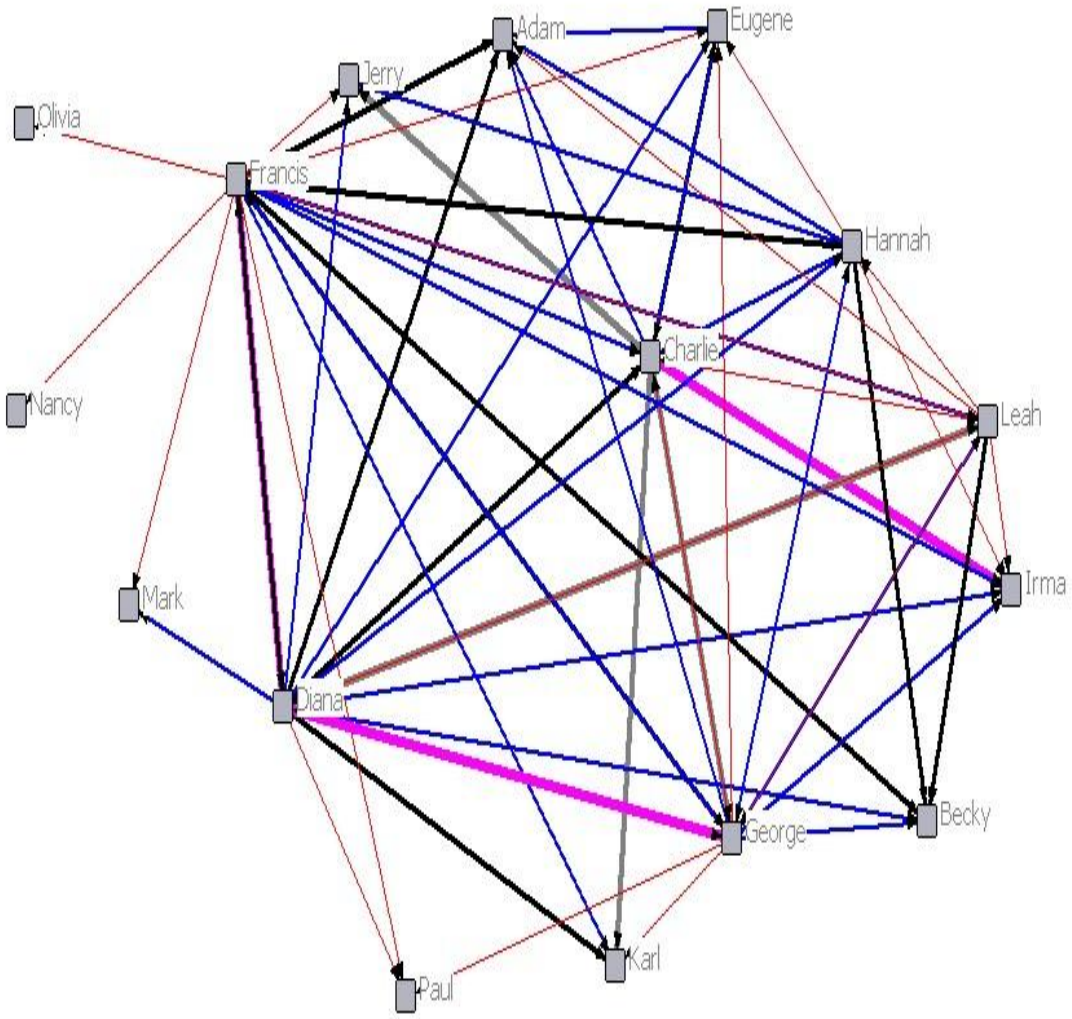
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Red = Networking	Gray = Coalition
Blue = Cooperation	Pink = Collaboration
Black = Coordination	

Figure 4.22: Management/Supervisory/Executive Individual-to-Organization Collaboration



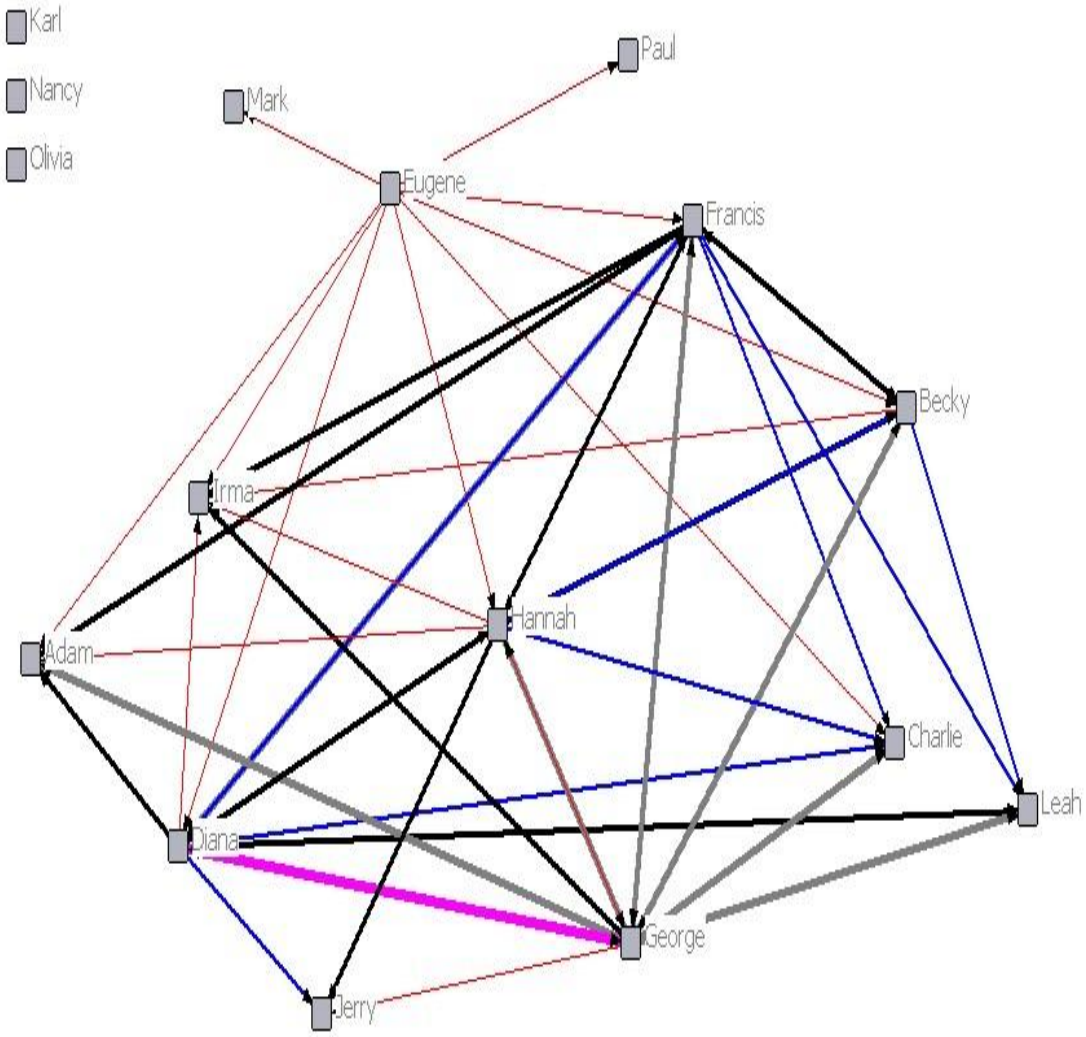
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Red = Networking	Gray = Coalition
Blue = Cooperation	Pink = Collaboration
Black = Coordination	

Figure 4.23: Professional Researcher Individual-to-Organization Collaboration



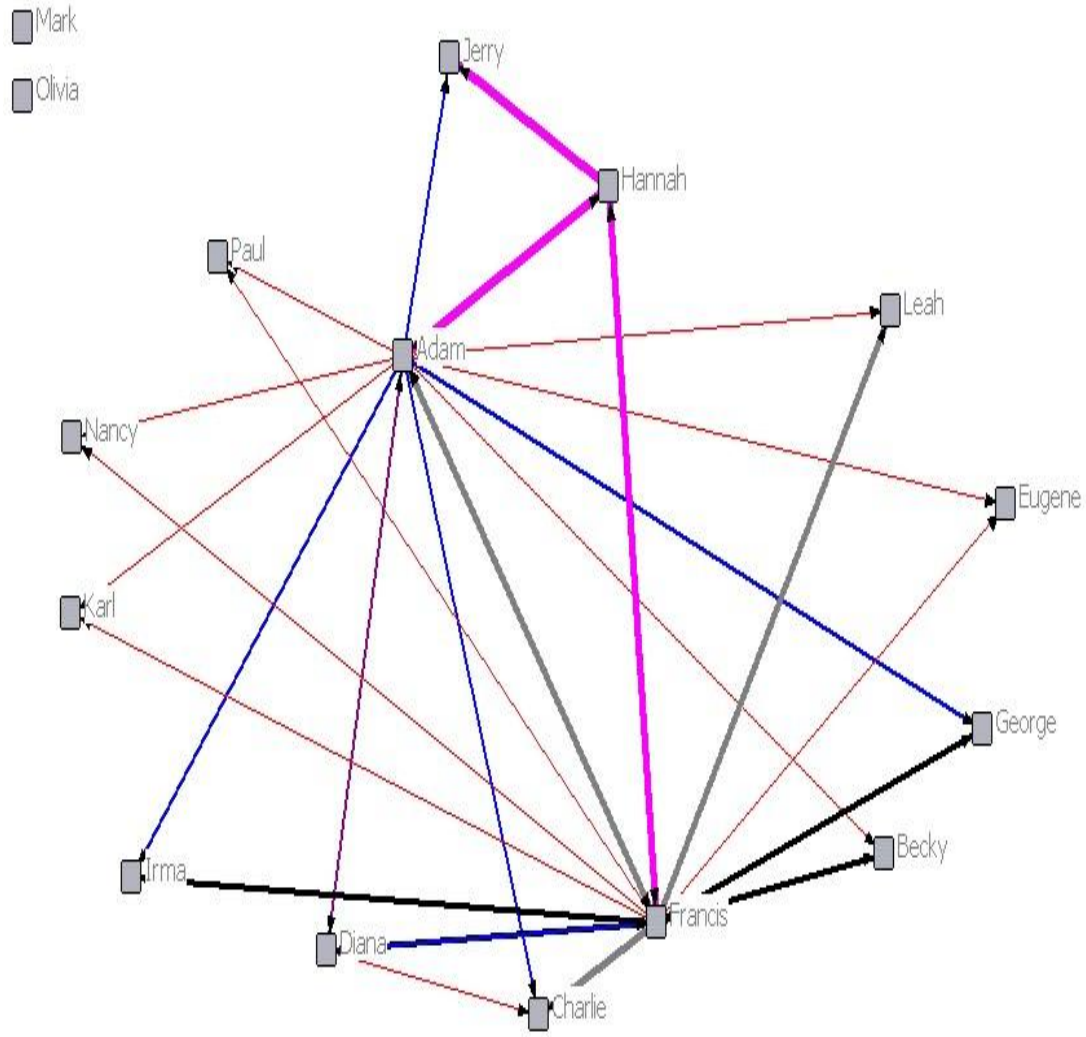
Legend	
Red = Networking	Gray = Coalition
Blue = Cooperation	Pink = Collaboration
Black = Coordination	

Figure 4.24: Technical/Administrative Individual-to-Organization Collaboration



Legend	
Red = Networking	Gray = Coalition
Blue = Cooperation	Pink = Collaboration
Black = Coordination	

Figure 4.25: Student Researcher Individual-to-Organization Collaboration



Legend	
Red = Networking	Gray = Coalition
Blue = Cooperation	Pink = Collaboration
Black = Coordination	

(cooperation), technical/administrative employees (Figure 4.24) had an average of 2.24 (cooperation), and student researchers (Figure 4.25) had an average of 2.12 (cooperation).

The second network-based supporting hypothesis for H_3a states that the networks of higher-level employees will be associated with higher levels of network structural performance in the network measuring perceived levels of individual-to-organization collaboration. The first sub-hypothesis states that the networks of higher-levels employees will have fewer isolates; the second states that the networks of higher-level employees will have greater levels of reciprocity.

The presence of isolates can be seen in the network maps already presented (Figures 4.21- 4.25). The total ties map shows that there are no organizational isolates in the overall network (Figure 4.21). The network of those in management/ supervisory/ executive positions (Figure 4.22) also contains no isolates, as does the network of professional researchers (Figure 4.23). The network of technical/ administrative employees (Figure 4.24) contains three isolates, and that of student researchers (Figure 4.25) contains two isolates. The pendant analysis shows that there are no pendants in the overall network, no pendants in the management/ supervisory/ executive network, 2 pendants in the professional researcher network (Olivia and Nancy), 2 pendants (Mark and Paul) in the technical/ administrative employee network, and no pendants in the student researcher network. The combined isolation scores for each of the networks in the analysis was therefore calculated as being 0 for both the overall network and the management/ supervisory/ executive network, 2 for the professional researcher network,

8 for the technical/ administrative employee network, and 4 for the student researcher network.

The final supporting network-based sub-hypothesis for H3a states that higher-level networks will have higher levels of reciprocity. Visual representations of the reciprocal ties in the organizational tie network are presented in Appendix C as Figures C16-C20; the first figure (C16) presents the total network, while the proceeding maps (C17-C20) present the visualized data for each level of hierarchy tested. The reciprocity analyses conducted on each of these networks yielded the following results: the total network contains 56.32% reciprocal ties, the management/ supervisory/ executive network is 39.24% reciprocal, the professional researcher network contains 22,64% reciprocity, the technical/ administrative network has a reciprocity of 23.68%, and the student researcher network is 19.23% reciprocal in nature.

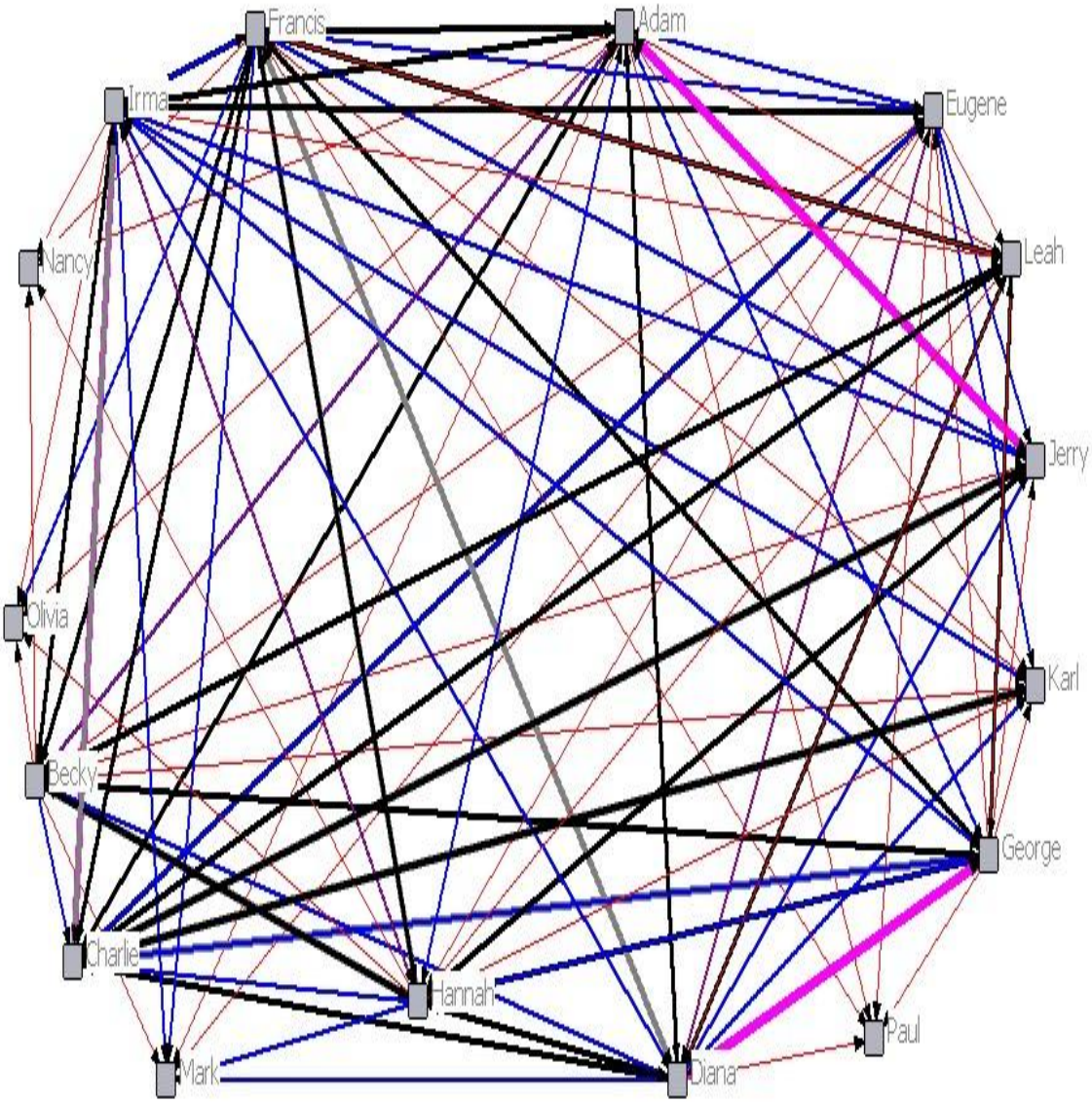
H_3b asserts that there is an association between hierarchical position in an organization and perception of organization to organization collaboration. Spearman's rho indicates that there is a very weak, negative, and statistically significant relationship between these two variables (n= 535, rho= -.095, $p < .05$). The one-way ANOVA analysis indicated that significant differences existed between the hierarchical positions, though once again the effect size was small ($F(3, 531)= 4.615$, $\eta^2= .025$, $p < .05$). Respondents in the management, supervisory, and executive group reported the lowest average levels of perceived organization-to-organization collaboration (m= 2.33, sd= 1.232). Student researchers reported the second-to-lowest levels of perceived organization-to-organization collaboration (m= 2.65, sd= 1.301), with technical and administrative employees reporting slightly higher levels of perceived organization-to-

organization collaboration (m= 2.59, sd= 1.247). Professional researchers reported the highest levels of perceived organization-to-organization collaboration (m= 2.82, sd= 1.373). The Tukey's HSD analysis indicated that statistically significant differences existed between only two groups. Professional researchers and those in the management, supervisory, and executive positions were found to have significantly different perceived levels of organization-to-organization collaboration (se= .134, $p < .05$).

The first network-based supporting hypothesis for H_3b states that the networks of those who are located in higher positions in an organizational hierarchy will be associated with higher network density in the organization-to-organization perceived collaboration network. Two sub-hypotheses are posited. The first states that higher-level organizational hierarchy networks will be associated with increased levels of interconnectedness; the second posits that higher-level organizational hierarchy networks will be associated with stronger relational ties (organization-to-organization perceived collaboration level).

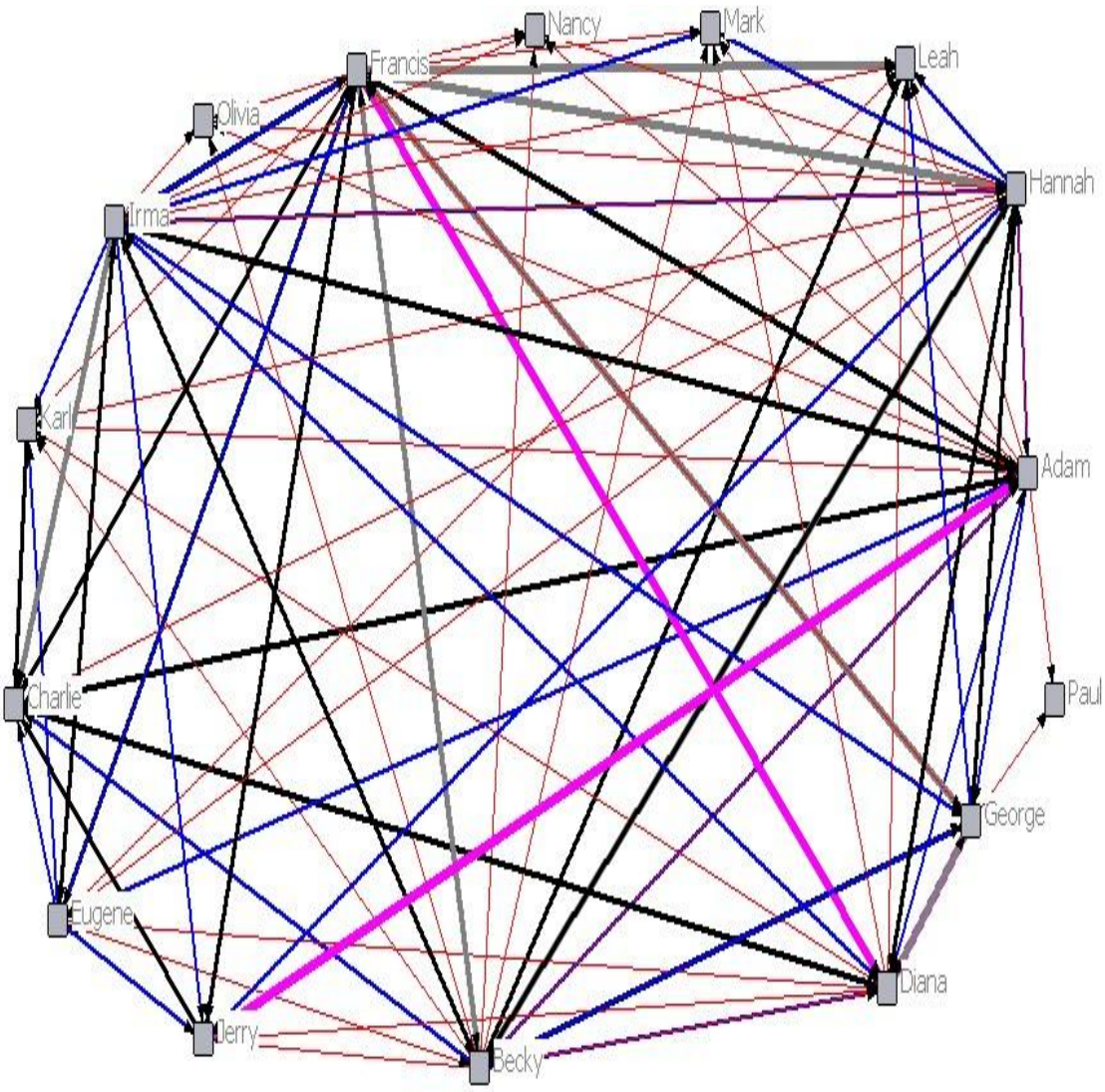
Testing of the first network-based sub-hypothesis examines the number of links between organizations at each level of organizational hierarchy. Figures 4.26- 4.30 provide visual representations of the numbers of inter-organizational ties present in the network, first presenting the total network map (Figure 4.26) and then for each of the hierarchical levels (Figures 4.27- 4.30). In terms of the level of interconnectedness in the overall inter-organizational network (Figure 4.26), there were 127 relational ties present out of a possible 240 ties (52.92%). Examination of the network ties present in

Figure 4.26: All Employment Levels Organization-to-Organization Collaboration



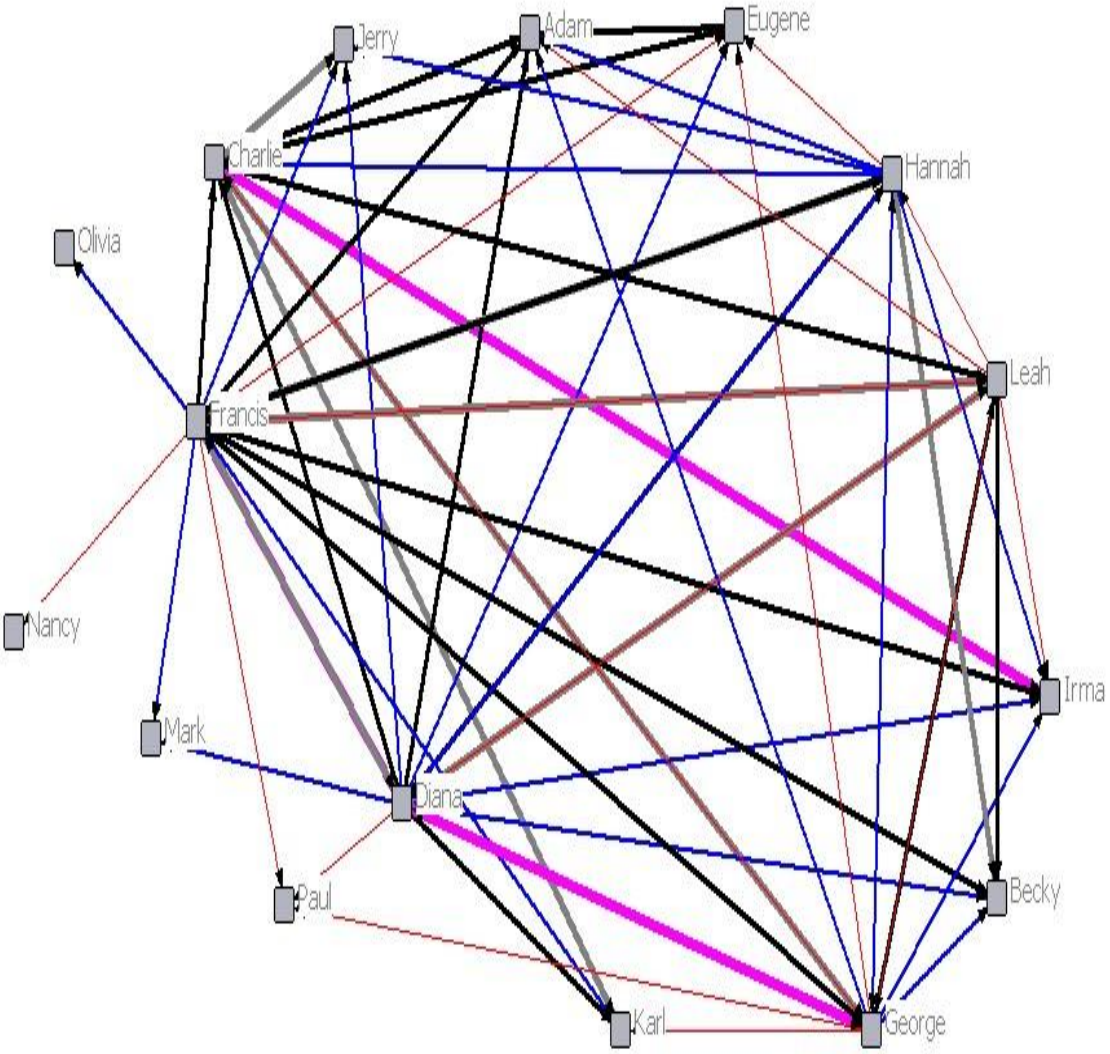
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Blue = Cooperation	Pink = Collaboration
Black = Coordination	

Figure 4.27: Management/Supervisory/Executive Organization-to-Organization Collaboration



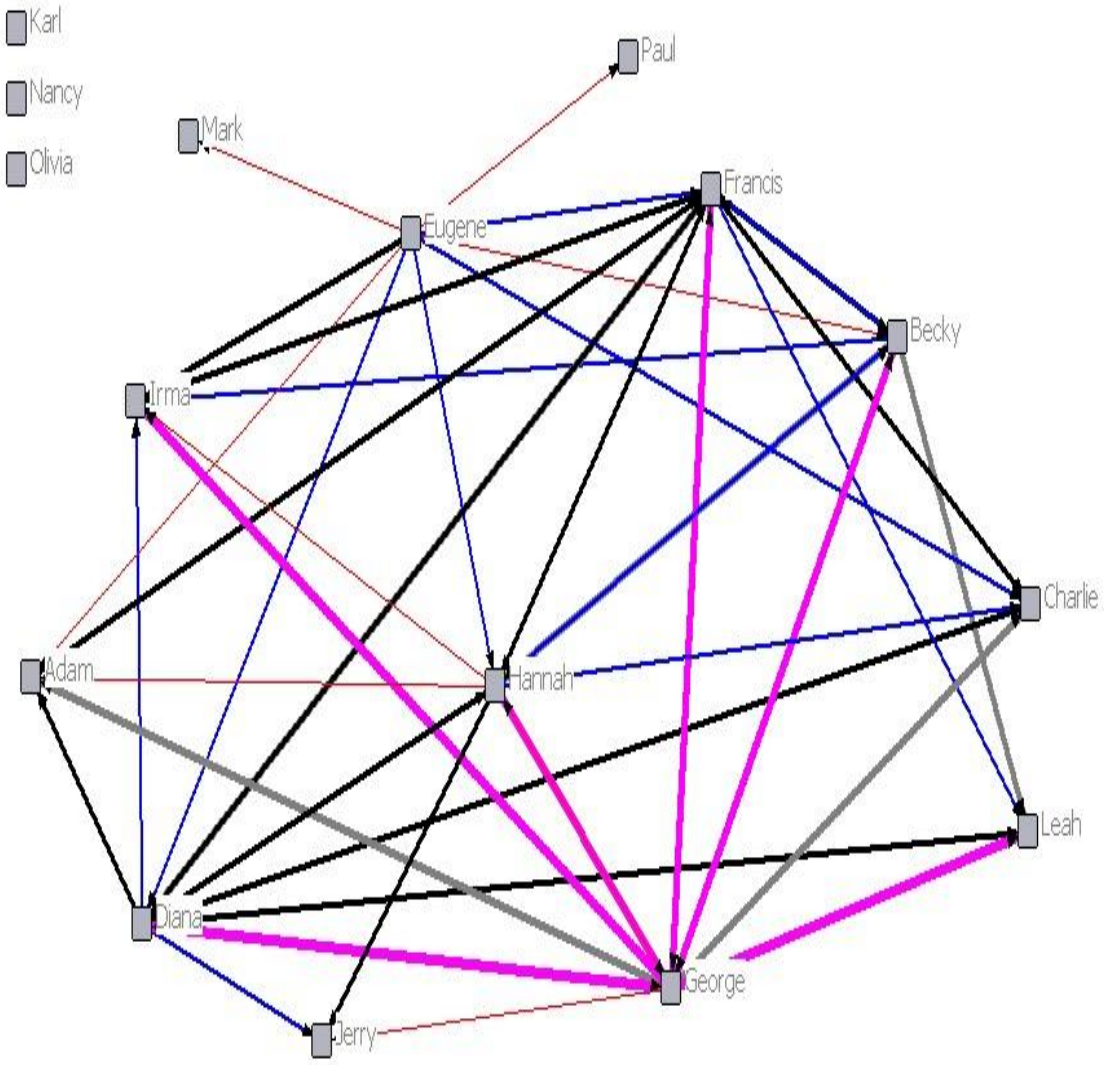
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Blue = Cooperation	Pink = Collaboration
Black = Coordination	

Figure 4.28: Professional Researcher Organization-to-Organization Collaboration



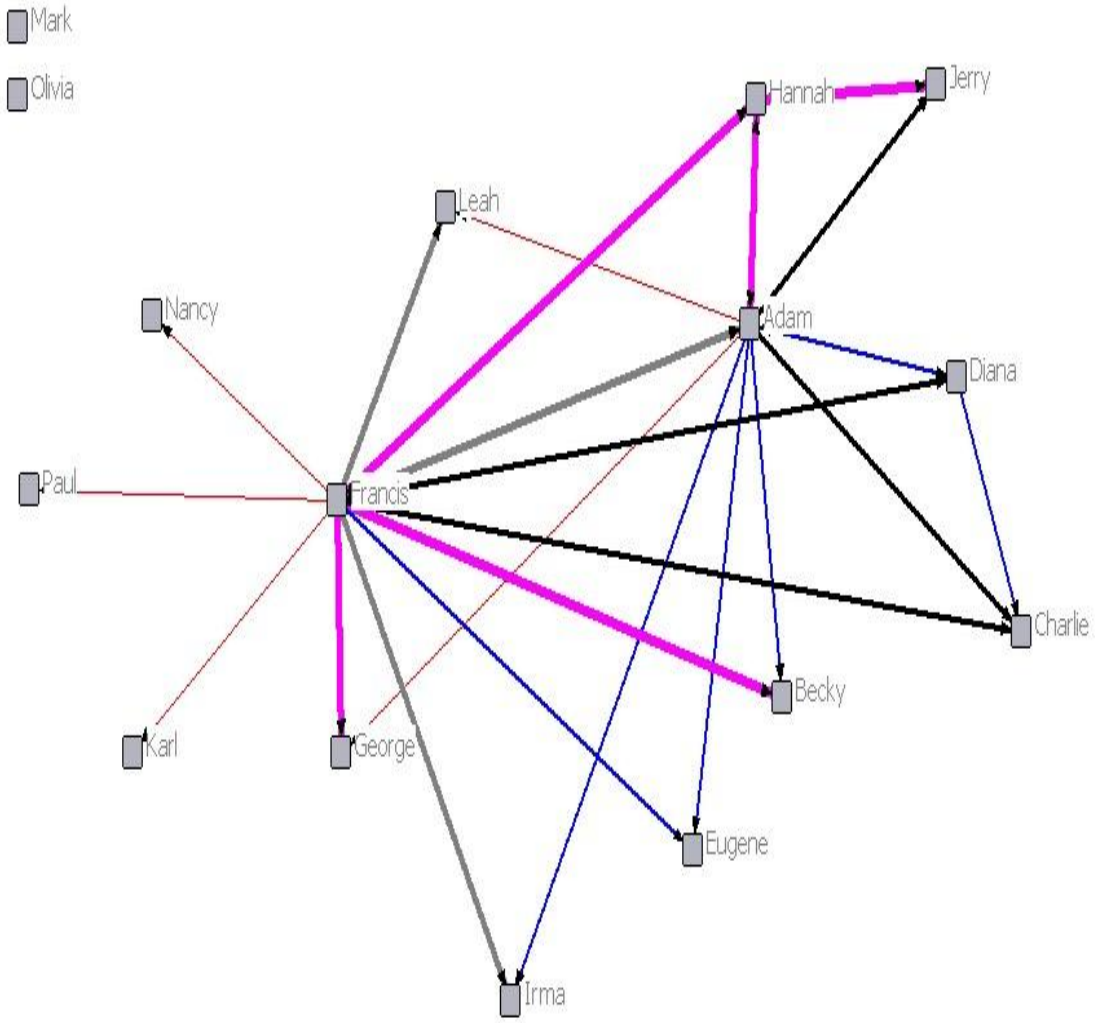
Legend	
Red = Networking	Gray = Coalition
Blue = Cooperation	Pink = Collaboration
Black = Coordination	

Figure 4.29: Technical/Administrative Organization-to-Organization Collaboration



Legend	
Red = Networking	Gray = Coalition
Blue = Cooperation	Pink = Collaboration
Black = Coordination	

Figure 4.30: Student Researcher Organization-to-Organization Collaboration



Legend	
Red = Networking	Gray = Coalition
Blue = Cooperation	Pink = Collaboration
Black = Coordination	

the hierarchically-based networks yielded the following results: employees in management/ supervisory/ executive positions (Figure 4.27) had 101 ties (42.08%), professional researchers (Figure 4.28) had 65 ties (27.08%), technical/ administrative employees (Figure 4.29) had 47 ties (19.58%), and student researchers (Figure 4.30) had 28 inter-organizational ties (11.67%).

The second sub-hypothesis associated with H_3b states that higher-level organizational hierarchy networks will be associated with stronger relational ties. Testing of this second network-based sub-hypothesis examines the average number of links (tie strength) between organizations at each level of organizational hierarchy. In terms of tie strength in the overall inter-organizational network (Figure 4.26), the average calculated perceived organization-to-organization collaboration level was 2.09 (cooperation). Examination of the network ties present in the hierarchically-based networks yielded the following results: employees in management/ supervisory/ executive positions (Figure 4.27) had an average of 2.02 (cooperation), professional researchers (Figure 4.28) had an average of 2.40 (cooperation), technical/ administrative employees (Figure 4.29) had an average of 2.71 (cooperation), and student researchers (Figure 4.30) had an average of 2.84 (cooperation).

The second network-based supporting hypothesis for H_3b states that the networks of higher-level employees will be associated with higher levels of network structural performance. The first sub-hypothesis states that the networks of higher-levels employees will have fewer isolates; the second states that the networks of higher-level employees will have greater levels of reciprocity.

The presence of isolates can be seen in the network maps already presented (Figures 4.26- 4.30). The total ties map shows that there are no organizational isolates in the overall network (Figure 4.26). The network of those in management/ supervisory/ executive positions (Figure 4.27) also contains no isolates, as does the network of professional researchers (Figure 4.28). The network of technical/ administrative employees (Figure 4.29) contains three isolates, and that of student researchers (Figure 4.30) contains two isolates. The pendant analysis shows that there are no pendants in the overall network, no pendants in the management/ supervisory/ executive network, 2 pendants in the professional researcher network (Olivia and Nancy), 2 pendants (Mark and Paul) in the technical/ administrative employee network, and 3 pendants (Nancy, Paul and Karl) in the student researcher network. The combined isolation scores for each of the networks in the analysis was therefore calculated as being 0 for both the overall network and the management/ supervisory/ executive network, 2 for the professional researcher network, 8 for the technical/ administrative employee network, and 7 for the student researcher network.

The final supporting network-based sub-hypothesis for H_3b states that higher-level networks will have higher levels of reciprocity. Visual representations of the reciprocal ties in the organizational tie network are presented in Appendix C as Figures C21-C25; the first figure (C21) presents the total network, while the proceeding maps (C22-C25) present the visualized data for each level of hierarchy tested. The reciprocity analyses conducted on each of these networks yielded the following results: the total network contains 49.41% reciprocal ties, the management/ supervisory/ executive network is 32.89% reciprocal, the professional researcher network contains 22.64%

reciprocity, the technical/ administrative network has a reciprocity level of 23.68%, and the student researcher network is 21.74% reciprocal in nature.

H_4 projects that increased levels of communication activities will be associated with decreased channel richness in communication activity. As with H_2 and H_3, two sub-hypotheses are posited; H_4a proposes that increases in contact frequency will result in less rich channels of communication, and H_4b asserts that communication with an increased number of people will result in selection of less rich communication channels. The dependent variable for H_4 is channel richness, which consists of the following ordinal categories (rank-ordered from low to high richness levels): no contact, e-mail, phone, meetings, and face-to-face/ informal conversations.

The independent variable for H_4a consists of the ordinal scale described as the dependent variable in H_2a. Frequency of contact consists of the following rank-ordered (low to high) categories: less than once per month, approximately once per month, several times per month, approximately once per week, 2-3 times per week, and almost daily. The one-tail Spearman's rho correlation analysis indicated that there was a strong, positive, and statistically significant relationship between frequency of contact and the richness of the selected channel for communication (N= 1462, rho= .928, $p < .05$). The Kendall's tau-b test run with the crosstabulation of the data for this hypothesis indicated that there were significant differences between the frequencies of contact in terms of channel richness selections (88.248, se= .010, $p < .05$).

Respondents indicated having no contact with other member organizations in 805 of the cases as related to this hypothesis, leaving 657 relationship cases with specific channel selection data. In general, out of the 657 relationships with channel

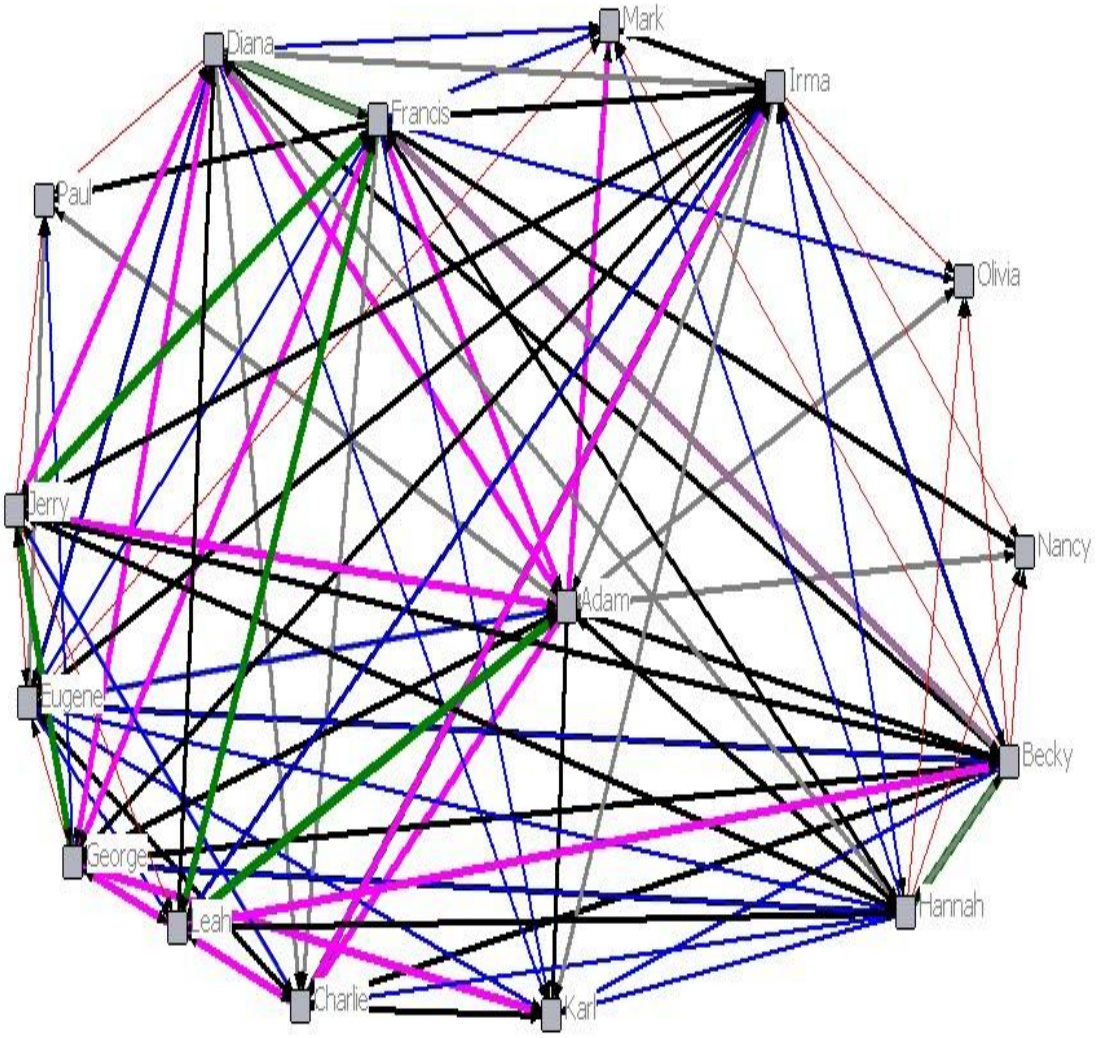
selection data, phone was the least utilized communication channel (17), followed by meetings (50), e-mail (174), and face-to-face or informal communication was the most utilized (416). Table 6 provides the crosstabulation data generated for H_4a.

The first network-based supporting hypothesis for H_4a states that the networks consisting of more rich communication channels will be associated with higher network density in the communication frequency networks. Once again, two sub-hypotheses are posited. The first states that communication channel networks with higher levels of communication richness will be associated with increased levels of interconnectedness; the second posits that communication channel networks with higher levels of richness will be associated with stronger relational ties (frequency of communication). Testing of the first network-based sub-hypothesis examines the number of links between organizations at each level of communication richness. Figures 4.31- 4.35 provide visual representations of the numbers of inter-organizational ties and communication frequencies present in the network, first presenting the total network map (Figure 4.31) and then for each of the communication channel richness levels (Figures 4.32- 4.35). In terms of the level of interconnectedness in the overall inter-organizational communication frequency networks (Figure 4.31), there were 135 relational ties present out of a possible 240 ties (56.25%). Examination of the network ties present in the communication richness-based networks yielded the following results: communication utilizing face-to-face/ informal communication channels (Figure 4.32) had 106 ties (44.17%), communication via meetings (Figure 4.33) had 43 ties (17.92%), phone-based communication (Figure 4.34) had 12 ties (5.0%), and communication via e-mail (Figure 4.35) had 84 inter-organizational ties (35.0%).

Table 6*: Communication frequency by Media Richness*

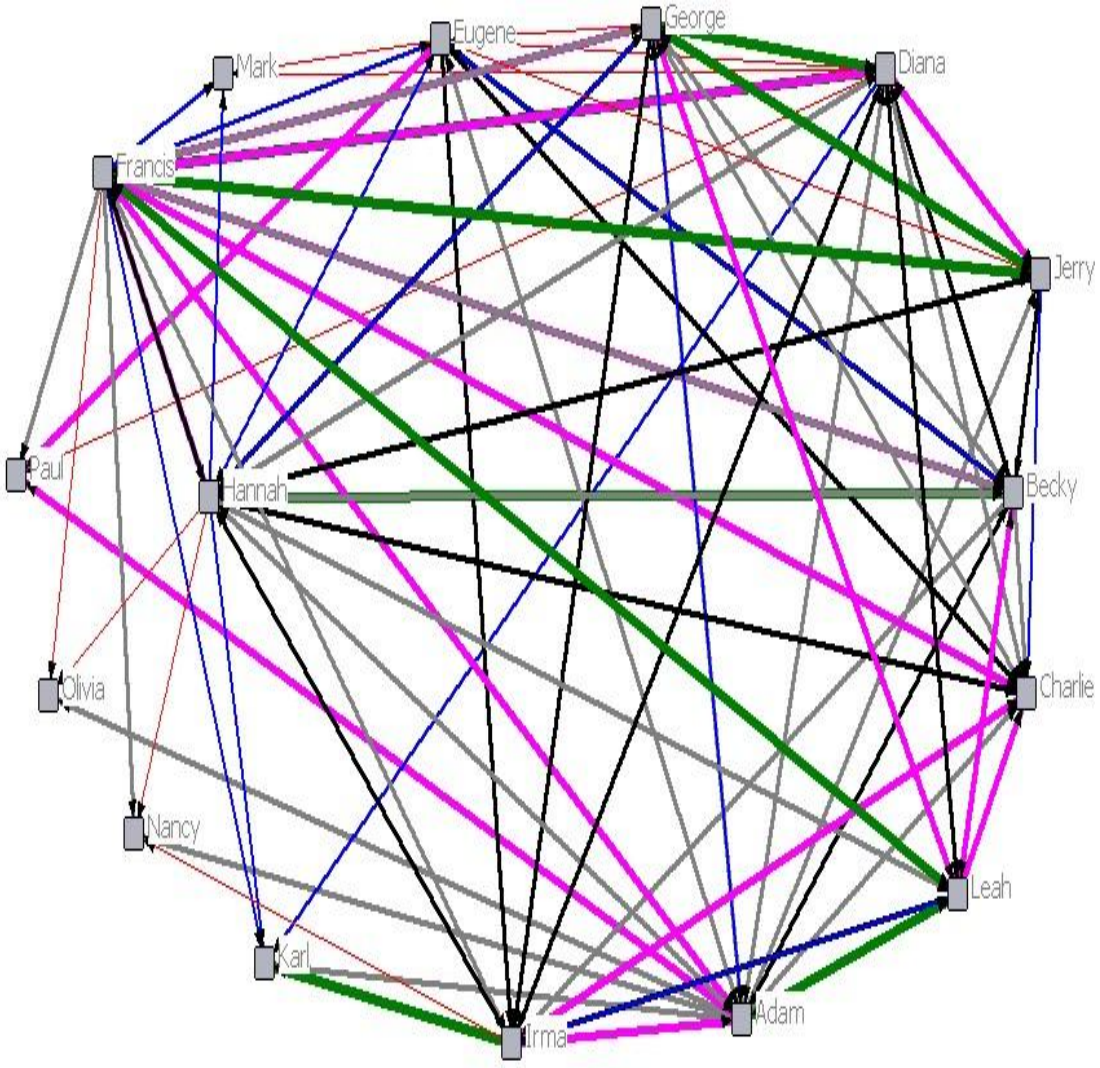
Channel Richness		No contact	E-mail	Phone	Meetings	Ftf/ Informal	Total
Frequency of communication	No contact	805	0	0	0	0	805
	Less than 1 per month	0	41	2	11	64	118
	Approx. 1 per month	0	43	4	19	54	120
	Several per month	0	30	3	12	70	115
	Approx. 1 per week	0	27	1	4	66	98
	2-3 per week	0	17	5	1	51	74
	Almost daily	0	16	2	3	111	132
	Total	805	174	17	50	416	1462

Figure 4.31: All Channels Frequency of Contact between Organizations



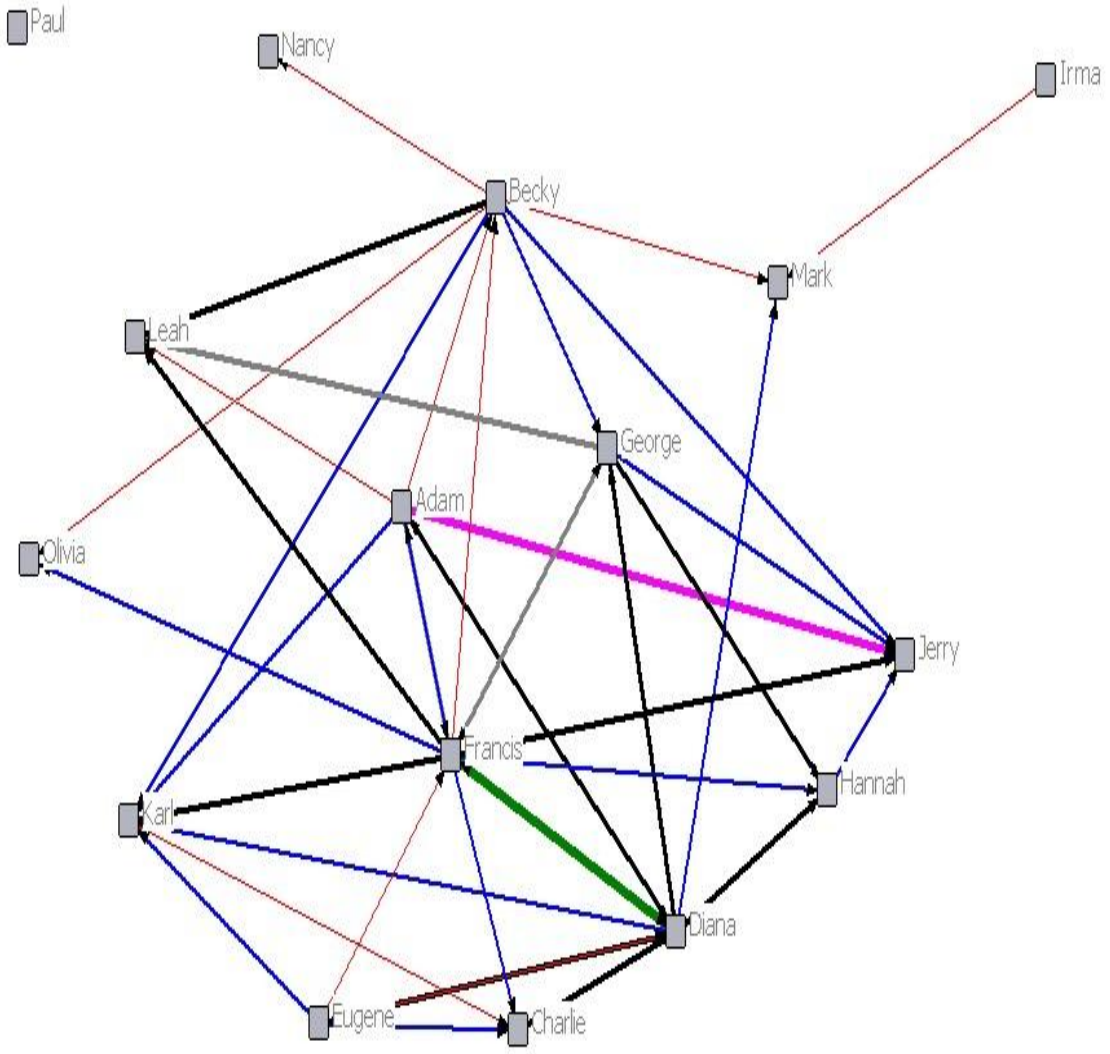
Legend	
Red = Less than Once per Month	Gray = Approx. Once per Week
Blue = Approx. Once per Month	Pink = 2-3 Times per Week
Black = Several Times per Month	Green = Almost Daily

Figure 4.32: Face-to-Face/Informal Frequency of Contact between Organizations



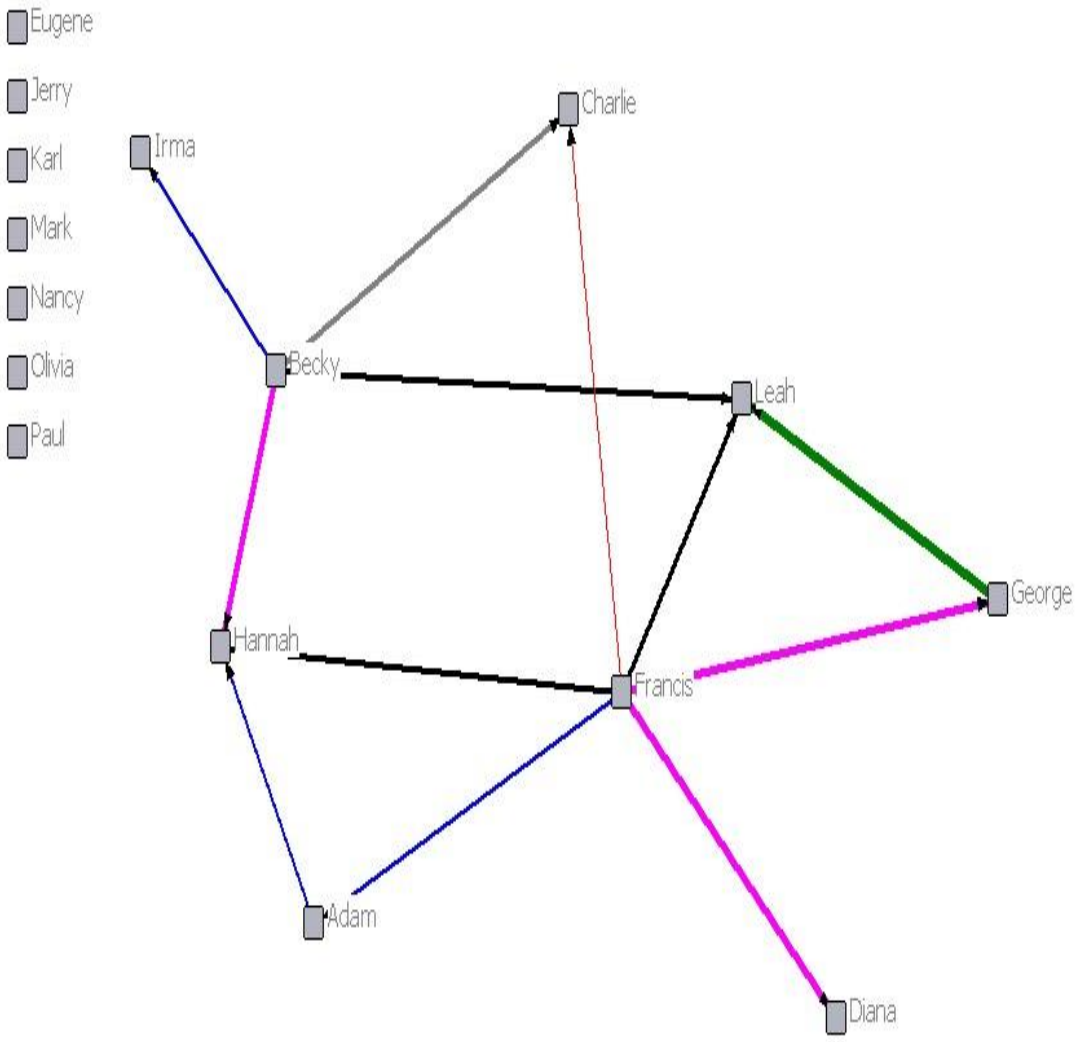
Legend	
Red = Less than Once per Month	Gray = Approx. Once per Week
Blue = Approx. Once per Month	Pink = 2-3 Times per Week
Black = Several Times per Month	Green = Almost Daily

Figure 4.33: Meetings Frequency of Contact between Organizations



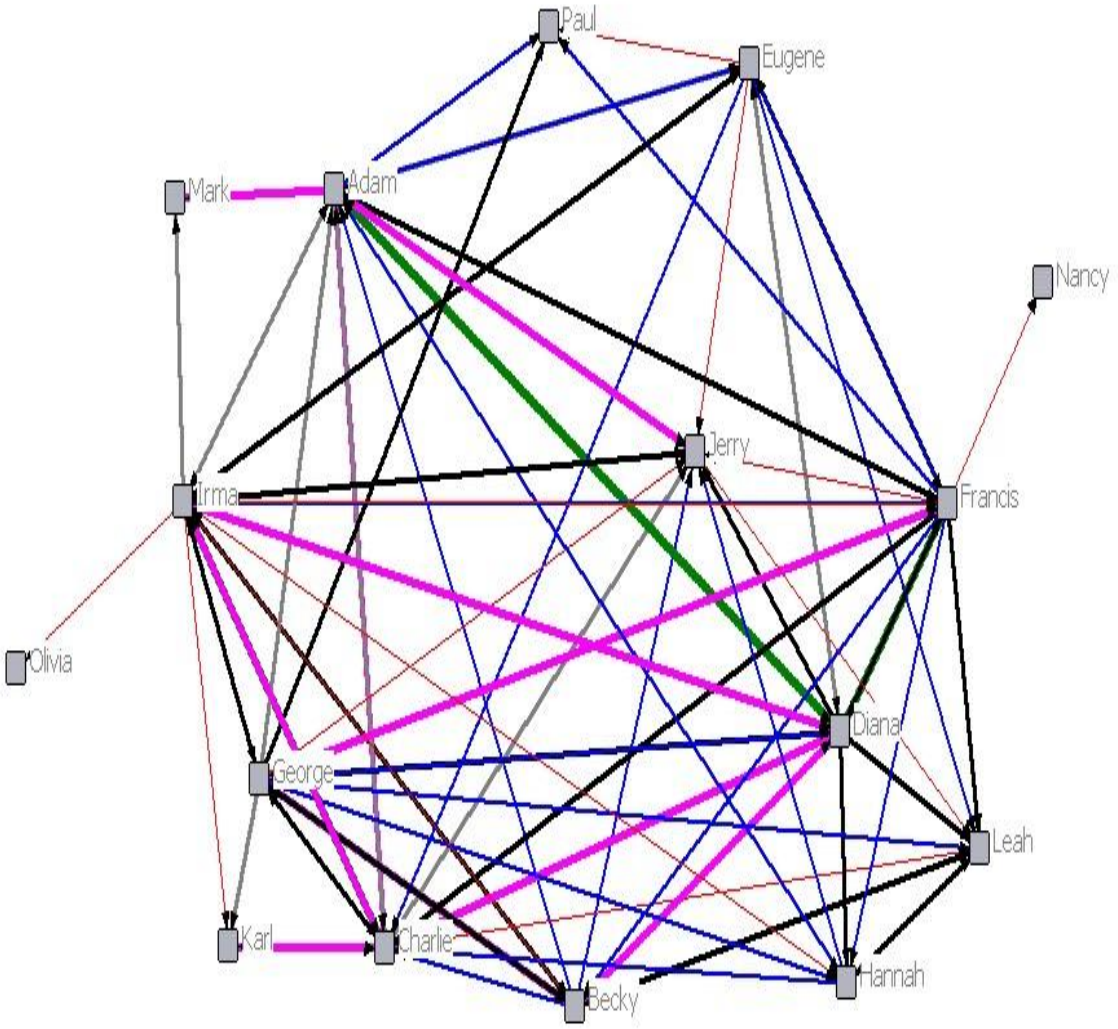
Legend	
Red = Less than Once per Month	Gray = Approx. Once per Week
Blue = Approx. Once per Month	Pink = 2-3 Times per Week
Black = Several Times per Month	Green = Almost Daily

Figure 4.34: Phone Frequency of Contact between Organizations



Legend	
Red = Less than Once per Month	Gray = Approx. Once per Week
Blue = Approx. Once per Month	Pink = 2-3 Times per Week
Black = Several Times per Month	Green = Almost Daily

Figure 4.35: E-mail Frequency of Contact between Organizations



Legend	
Red = Less than Once per Month	Gray = Approx. Once per Week
Blue = Approx. Once per Month	Pink = 2-3 Times per Week
Black = Several Times per Month	Green = Almost Daily

The second sub-hypothesis states that the networks of communication that are higher in communication channel richness will be associated with stronger relational ties in the communication frequency-based networks. Testing of this second network-based sub-hypothesis examines the average number of links (tie strength) between organizations at each level of communication channel richness. In terms of tie strength in the overall inter-organizational network (Figure 4.31), an average of 3.04 (several times per month) was calculated. Examination of the network ties present in the channel richness-based networks yielded the following results: communication occurring via face-to-face/ informal channels (Figure 4.32) had an average of 3.37 (several times per month), meeting-based communication channels (Figure 4.33) had an average of 2.37 (approximately once per month), phone-based communication (Figure 4.34) had an average of 3.42 (several times per month), and e-mail communication channels (Figure 4.35) had an average of 2.84 (approximately once per month).

The second network-based supporting hypothesis for H_4a states that more rich communication channel networks will be associated with higher levels of network structural performance in the communication frequency networks. Again, two sub-hypotheses are posited. The first sub-hypothesis states that more rich communication channels will have fewer isolates in the communication frequency networks; the second states that more rich communication channels will have greater levels of reciprocity in the communication frequency networks.

The presence of isolates can be seen in the network maps already presented (Figures 4.31- 4.35). The total ties map shows that there are no organizational isolates in the overall network (Figure 4.31). The network of face-to-face/ informal

communication channels (Figure 4.32) also contains no isolates. The network of meeting-based communication (Figure 4.33) contains one isolate, while the phone-based communication network (Figure 4.34) contains seven isolates. E-mail based communication (Figure 4.35) was found to contain no isolates in the overall network. The pendant analysis shows that there are no pendants in the overall frequency of contact network, no pendants in the face-to-face/ informal communication network, 2 pendants in the meetings-based communication network (Nancy and Irma), 2 pendants (Irma and Diana) in the phone-based communication network, and 2 pendants (Nancy and Olivia) in the e-mail communication network. The combined isolation scores for each of the networks in the analysis was therefore calculated as being 0 for both the overall network and the face-to-face/ informal communication network, 4 for the meetings-based communication network, 16 for the phone-based communication network, and 2 for the e-mail based communication network.

The final supporting network-based sub-hypothesis for H_4a states that more rich communication channels will have higher levels of reciprocity in the communication frequency networks. Visual representations of the reciprocal ties in the communication channels are presented in Appendix C as Figures C26-C30; the first figure (C26) presents the total network, while the proceeding maps (C27-C30) present the visualized data for each level of communication richness tested. The reciprocity analyses conducted on each of these networks yielded the following results: the total network contains 55.17% reciprocal ties, the face-to-face/ informal network is 47.22% reciprocal, the meetings-based network contains 16.22% reciprocity, the phone-based

communication network has a reciprocity level of 0.0%, and the e-mail communication network is 40.0% reciprocal in nature.

The independent variable for H_4b consists of the same ordinal measure which operated as the independent variable in the analysis of H_2b, and consists of the following rank-ordered categories: none, 1-2, 3-4, 5-7, 8-10, and 10+. The one-tailed Spearman's rho correlation analysis indicated that there is a very strong, positive, and statistically significant relationship between the number of people from the network organization whom the participant has contact with and the richness of the channel utilized for communication ($n= 1452$, $rho= .923$, $p< .05$). The Kendall's tau-b test run with the cross-tabulation of the data for this hypothesis indicated that there were significant differences between groups indicating the number of people from the network organization whom the participant has contact with in terms of channel richness selections (89.916, $se= .010$, $p< .05$).

Respondents indicated having no contact with other member organizations in 805 of the cases as related to this hypothesis, leaving 647 relationship cases with specific channel selection data. In general, out of the 647 relationships with channel selection data, phone was the least utilized communication channel (16), followed by meetings (48), e-mail (175), and face-to-face or informal communication was the most utilized (408). Table 7 presents the detailed data from the crosstabulation tests concerning number of people contacted and the richness of the primary channel used for communication.

The first network-based supporting hypothesis for H_4b states that the communication channel networks of those who communicate with more people will be

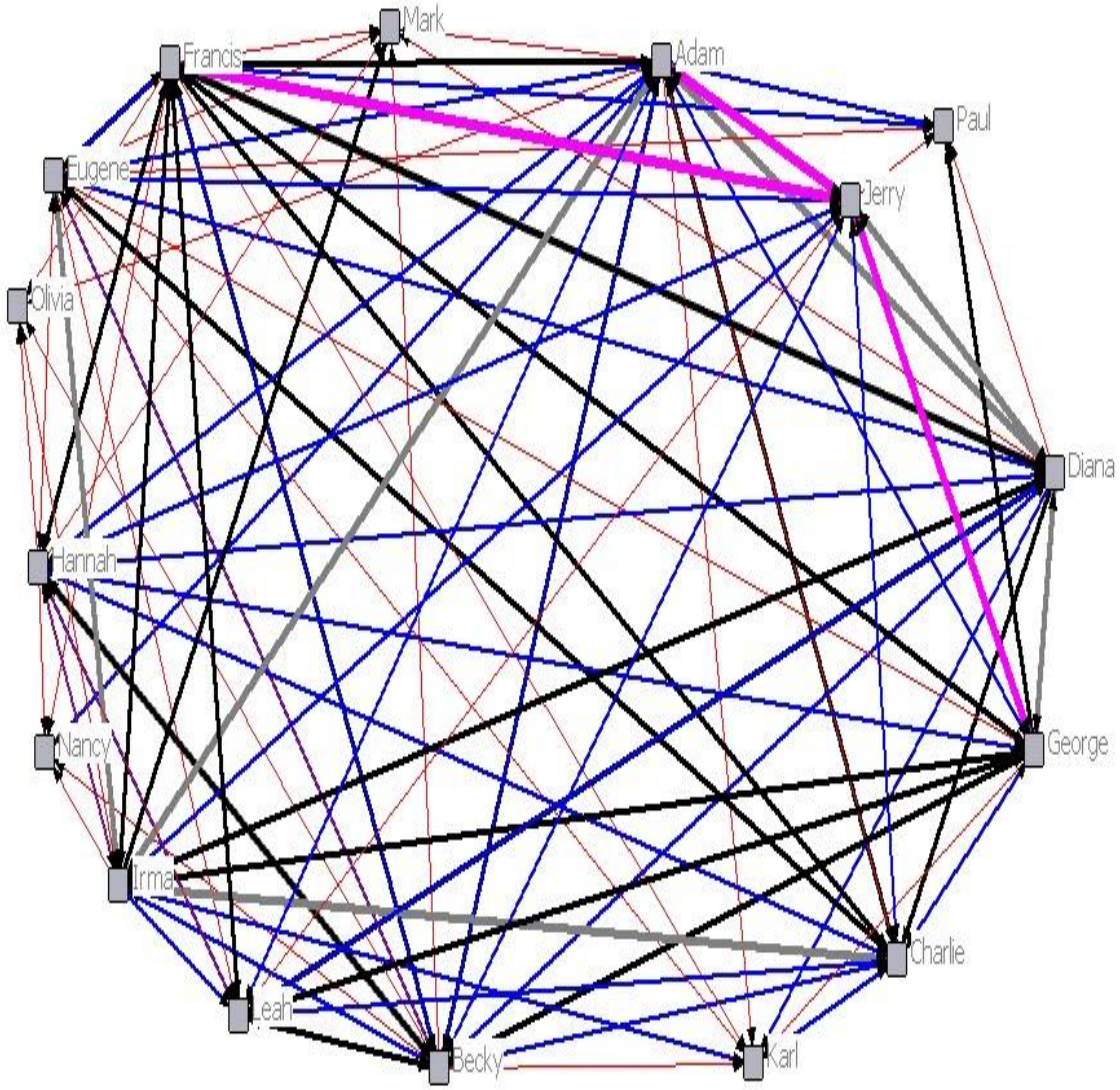
Table 7*: Number of People by Channel Richness*

Channel Richness		No contact	E-mail	Phone	Meetings	Ftf/ Informal	Total
# of People Communicated with	None	804	0	0	0	0	804
	1-2	1	73	7	24	128	233
	3-4	0	55	6	18	113	192
	5-7	0	18	2	4	65	89
	8-10	0	7	0	1	38	46
	10+	0	22	1	1	64	88
Total		805	175	16	48	408	1452

associated with higher network density. Two sub-hypotheses are posited. The first states that more rich communication channel networks will be associated with increased levels of interconnectedness in the networks measuring the number of people communicated with; the second posits that more rich communication channel networks will be associated with stronger relational ties (number of people communicated with) in the networks.

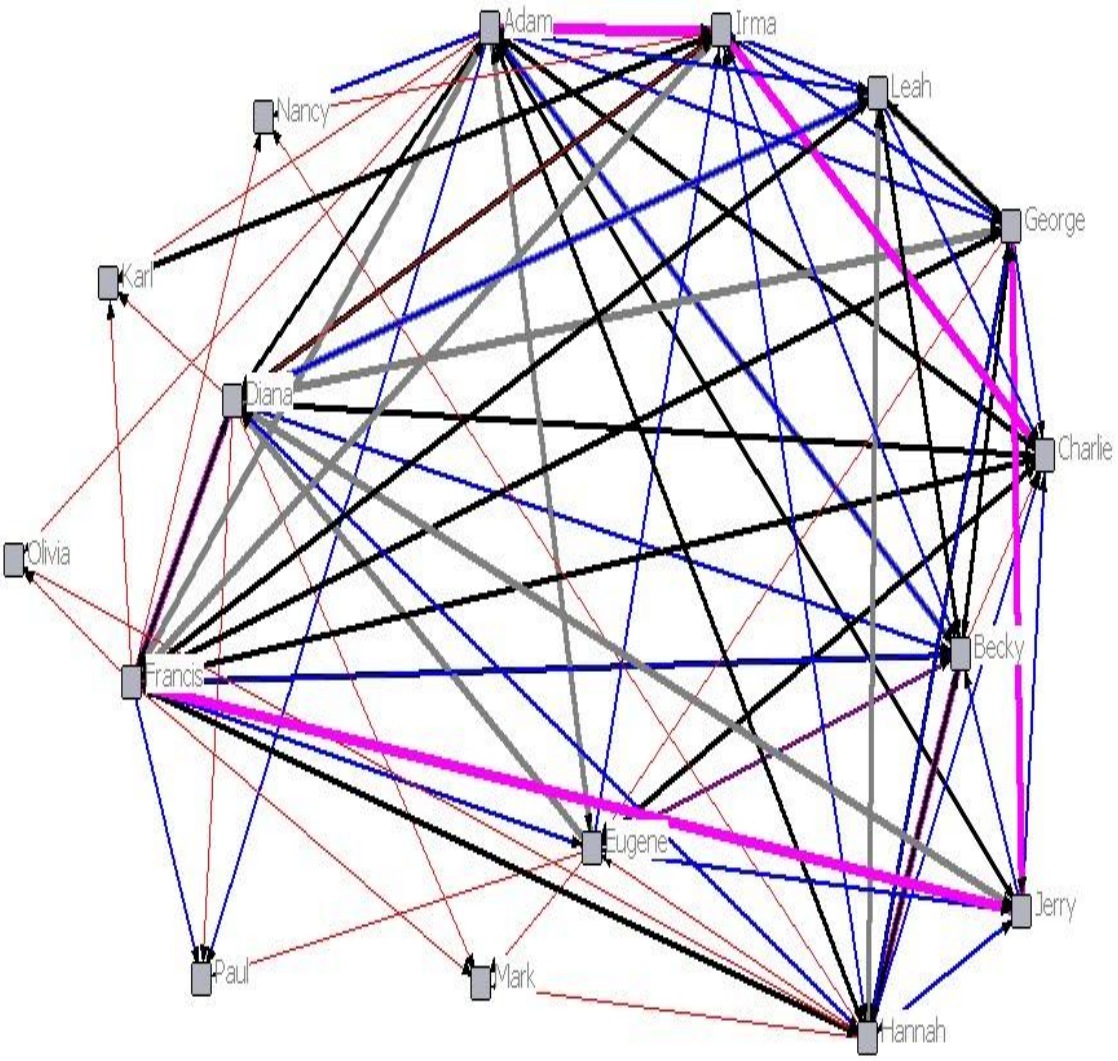
Testing of the first network-based sub-hypothesis examines the number of links between organizations at each level of communication channel richness. Figures 4.36-4.40 provide visual representations of the numbers of inter-organizational ties present in the network, first presenting the total network map (Figure 4.36) and then for each of the hierarchical levels (Figures 4.37- 4.40). In terms of the level of interconnectedness in the overall inter-organizational number of people communicated with network (Figure 4.36), there were 134 relational ties present out of a possible 240 ties (55.83%). Examination of the network ties present in the communication richness-based networks which take into account the number of people communicated with in each channel yielded the following results: Face-to-face communication (Figure 4.37) had 104 ties (43.33%), meetings-based communication (Figure 4.38) had 41 ties (17.08%), phone-based communication (Figure 4.39) had 12 ties (5.0%), and e-mail-based communication (Figure 4.40) had 84 inter-organizational ties (35.0%). The second network-based sub-hypothesis associated with H_4b states that communication channels with higher levels of richness will be associated with stronger relational ties in the networks measuring the number of people communicated with. Testing of this second

Figure 4.36: All Channels- Number of People in Contacts between Organizations



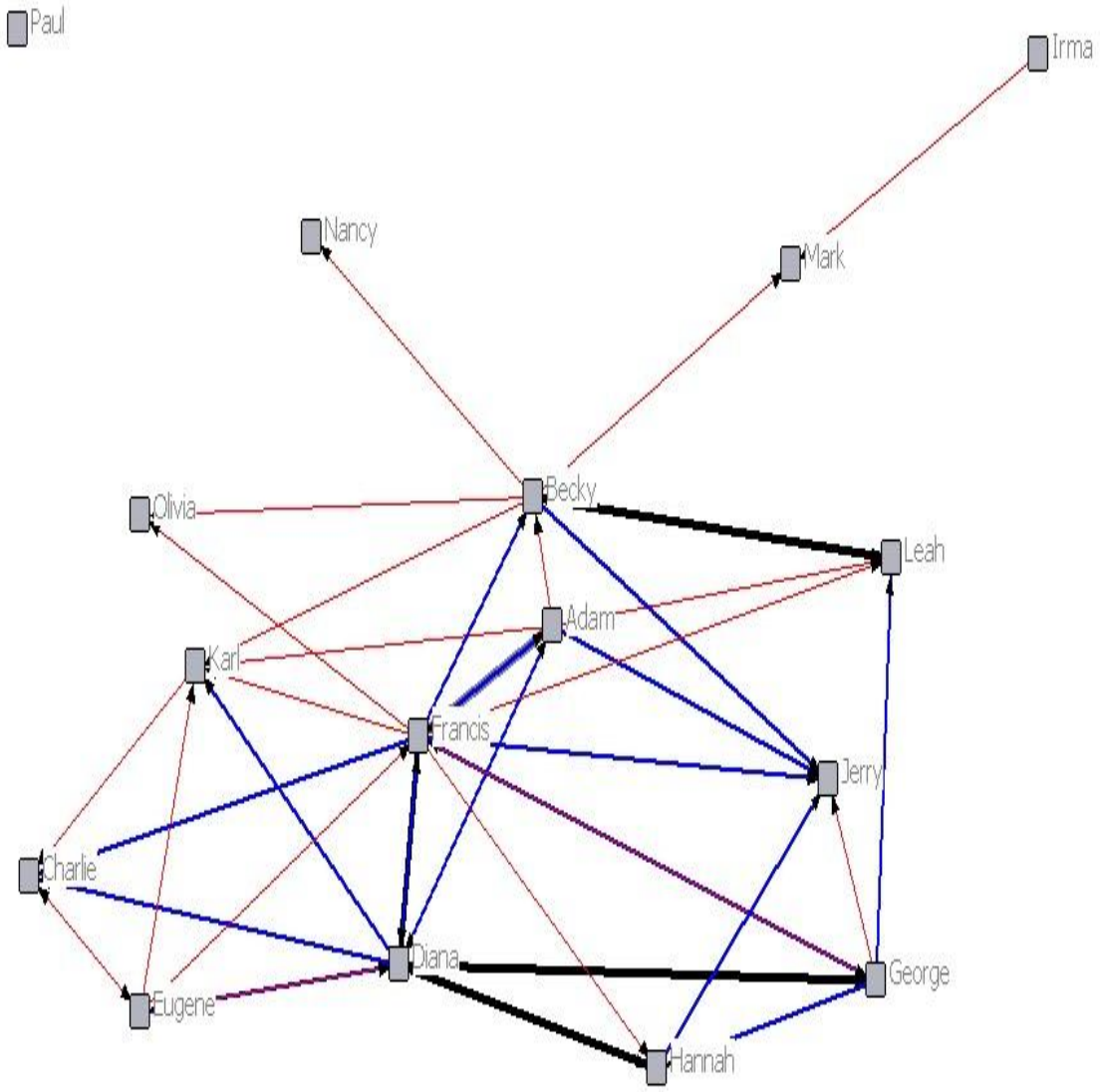
Legend	
Red = 1-2 People	Gray = 8-10 People
Blue = 3-4 People	Pink = 10+ People
Black = 5-7 People	

Figure 4.37: Face-to-Face/Informal- Number of People in Contacts



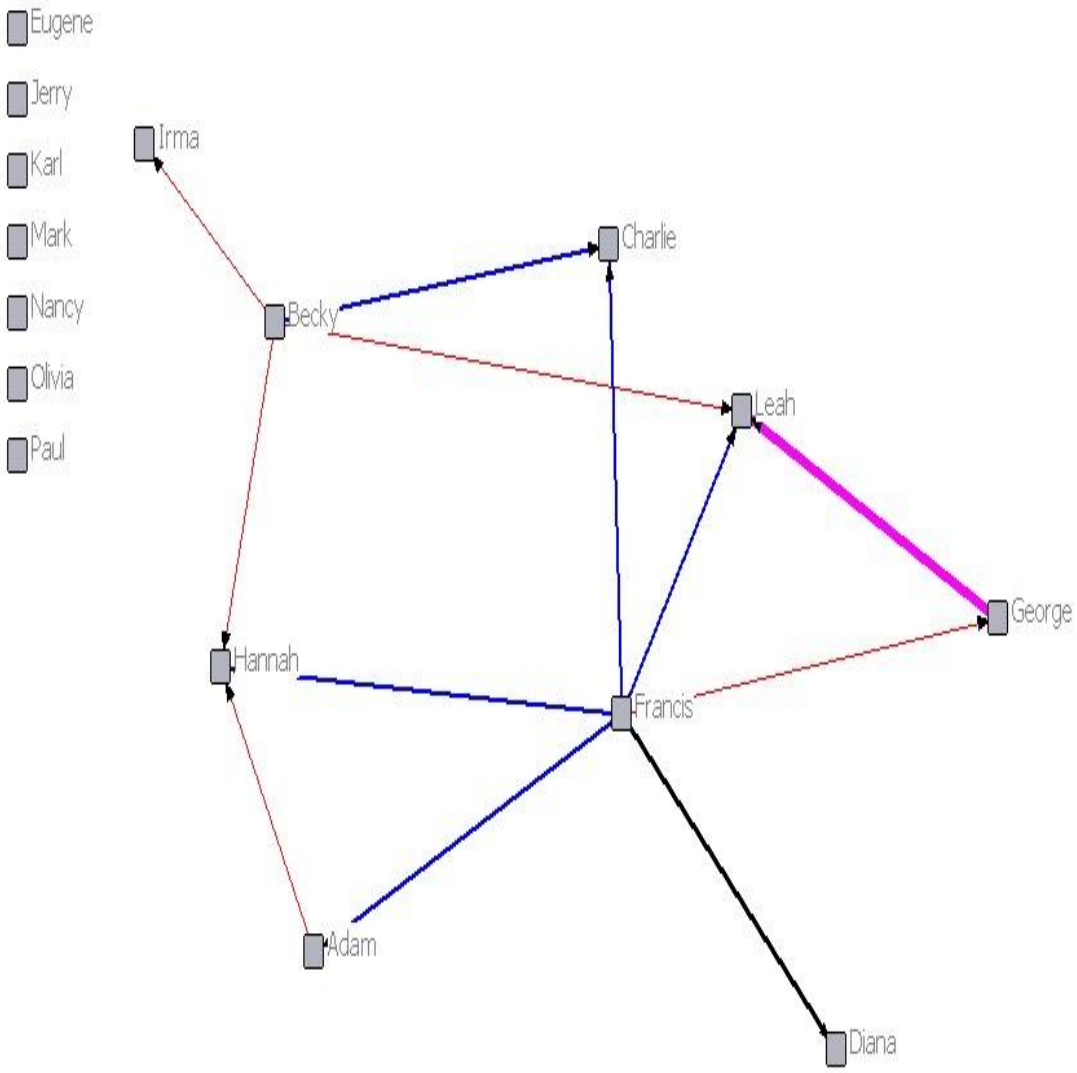
Legend	
Red = 1-2 People	Gray = 8-10 People
Blue = 3-4 People	Pink = 10+ People
Black = 5-7 People	

Figure 4.38: Meetings- Number of People in Contacts between Organizations



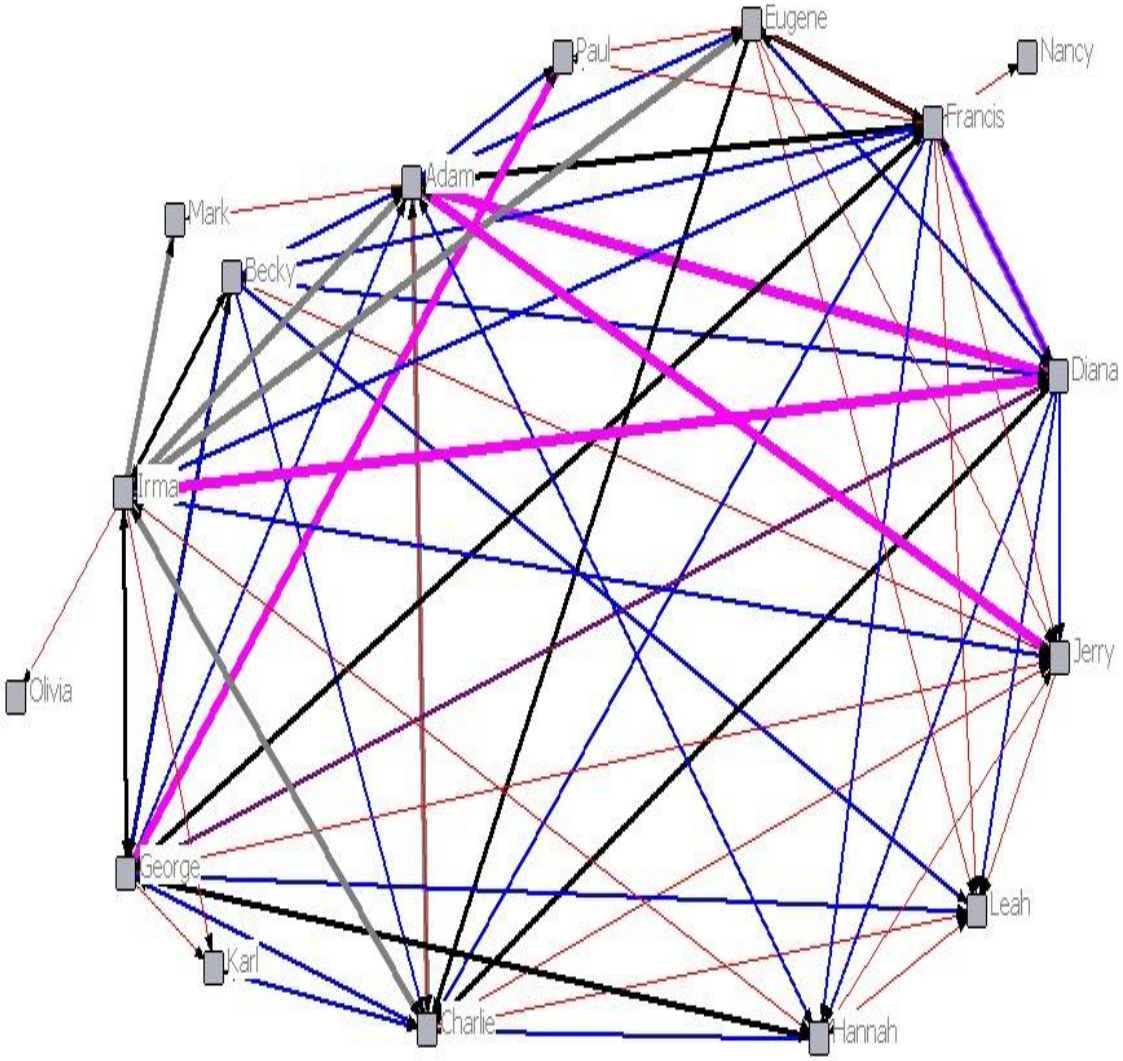
Legend	
Red = 1-2 People	Gray = 8-10 People
Blue = 3-4 People	Pink = 10+ People
Black = 5-7 People	

Figure 4.39: Phone- Number of People in Contacts between Organizations



Legend	
Red = 1-2 People	Gray = 8-10 People
Blue = 3-4 People	Pink = 10+ People
Black = 5-7 People	

Figure 4.40: E-mail- Number of People in Contacts between Organizations



Legend	
Red = 1-2 People	Gray = 8-10 People
Blue = 3-4 People	Pink = 10+ People
Black = 5-7 People	

network-based sub-hypothesis examines the average number of links (tie strength) between organizations at each level of communication richness. In terms of tie strength in the overall inter-organizational network (Figure 4.36), an average of 2.03 (3-4 people communicated with) was calculated. Examination of the network ties present in the channel richness-based networks yielded the following results: the face-to-face communication channel (Figure 4.37) had an average of 2.31 (3-4 people communicated with), meetings-based communication (Figure 4.38) had an average of 1.64 (1-2 people communicated with), phone-based communication (Figure 4.39) had an average of 1.85 (1-2 people communicated with), and e-mail based communication (Figure 4.40) had an average of 2.0 (3-4 people communicated with) in the communication network.

The second network-based supporting hypothesis for H_4b states that more rich communication channels will be associated with higher levels of network structural performance in the networks indicating the number of people communicated with. Again, two sub-hypotheses are posited. The first sub-hypothesis states that the richer communication channels will have fewer isolates; the second states that more rich communication channels will have greater levels of reciprocity when examined in terms of the numbers of people communicated with in inter-organizational relationships.

The presence of isolates can be seen in the network maps already presented (Figures 4.36- 4.40). The total ties map shows that there are no organizational isolates in the overall communication channel/ number of people communicated with network (Figure 4.36); this is also the case with the face-to-face communication channel/

number of people communicated with network (Figure 4.37). The meetings-based communication network (Figure 4.38) contains one isolate, while the phone-based communication/ number of people communicated with network (Figure 4.39) contains seven isolates. The network based on e-mail communication and the number of people communicated (Figure 4.40) with contains no isolates. The pendant analysis shows that there are no pendants in the overall number of people communicated with network, no pendants in the face-to-face/informal communication network, 2 pendants in the meetings-based communication network (Nancy and Irma), 2 pendants (Irma and Diana) in the phone-based communication network, and 2 pendants (Nancy and Olivia) in the e-mail communication network. The combined isolation scores for each of the networks in the analysis was therefore calculated as being 0 for both the overall network and the face-to-face/ informal communication network, 4 for the meetings-based communication network, 16 for the phone-based communication network, and 2 for the e-mail based communication network.

The final supporting network-based sub-hypothesis for H_4b states that more rich communication channels will have higher levels of reciprocity in the number of people communicated with network. Visual representations of the reciprocal ties in the organizational tie network are presented in Appendix C as Figures C31-C35; the first figure (C31) presents the total network, while the proceeding maps (C32-C35) present the visualized data for each level of communication channel richness tested. The reciprocity analyses conducted on each of these networks yielded the following results: the total network contains 55.81% reciprocal ties, the face-to-face/ informal

communication channel network is 46.48% reciprocal, the meetings-based/ number of people communicated with network contains 17.14% reciprocity, the phone-based communication channel network has a reciprocity of 0.0%, and the e-mail communication-based network is 40.0% reciprocal in nature.

The fifth hypothesis in this study proposes a relationship between the level of communication activity and the directional nature of the flow of communication. As with the previous three hypotheses, H_5 consists of two sub-hypotheses for the purposes of this analysis: H_5a posits a relationship between the frequency of communication activity and the directionality of the communication, while H_5b proposes a relationship between the numbers of people a respondent has contact with at a network organization and the directionality of communication flow.

Both of the independent variables used in this hypothesis were previously described in H_2 and H_4; the dependent variable for this analysis consists of and ordinal measure of the direction of communication flow consisting of the following four rank-ordered (low to high) categories: no contact, we really don't exchange work-related information, them to me/ me to them, and I can't tell- it varies a lot/ equally both ways.

A one-tailed Spearman's rho was also utilized for testing the relationship between the variables in H_5a, frequency of communication activity and directionality of communication activity. The rho analysis indicated that there is a very strong, positive, and statistically significant relationship between these two variables ($n= 1464$, $rho= .923$, $p< .05$). The Kendall's tau-b test run with the crosstabulation of the data for this hypothesis indicated that there were significant differences for communication

frequency between groups differing in terms of the directionality of communication flow (100.843, se= .010, $p < .05$).

Respondents indicated having no contact with other member organizations in 805 of the cases as related to this hypothesis, leaving 659 relationship cases with specific channel selection data. In general, out of the 659 relationships with channel selection data, respondents indicated that there was really no exchange of information in 77 of the relationships, indicated that there was one-directional flow in 86 of the relationships, and that there was multi-directional communication flow in 496 of the inter-organizational relationships. Table 8 provides detailed data concerning frequency of communication and communication directionality.

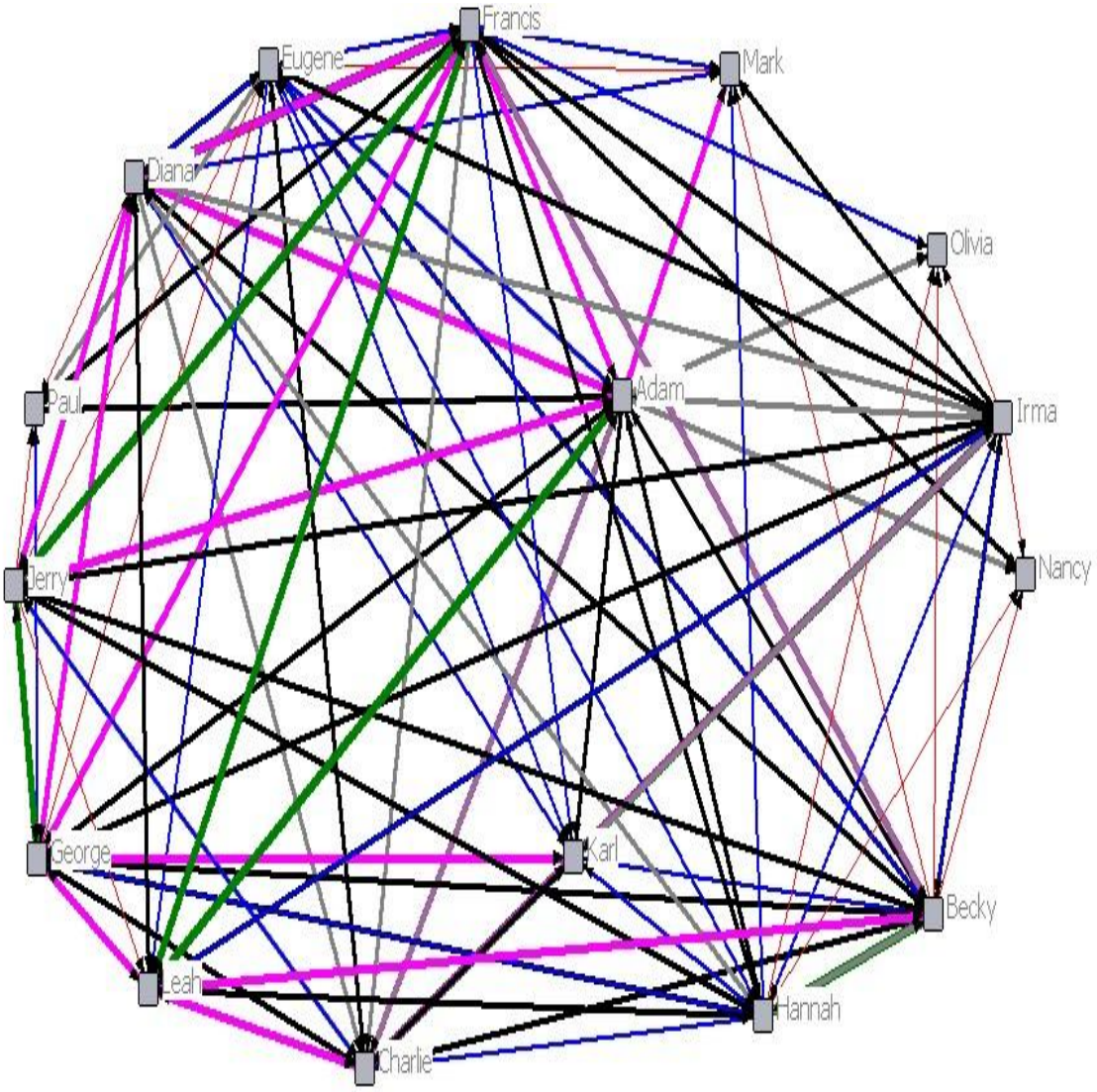
The first network-based supporting hypothesis for H_5a states that the communication networks representing increased directionality of communication flow will be associated with higher network density in the communication frequency network. Two sub-hypotheses are posited. The first states that increased directionality of communication flow will be associated with increased levels of interconnectedness; the second posits that increased directionality of communication flow will be associated with stronger relational ties (frequency of communication).

Testing of the first network-based sub-hypothesis examines the number of links between organizations at each level of communication directionality. Figures 4.41- 4.44 provide visual representations of the numbers of inter-organizational ties present in the network, first presenting the total network map (Figure 4.41) and then for each of the

Table 8*: Communication frequency by communication directionality*

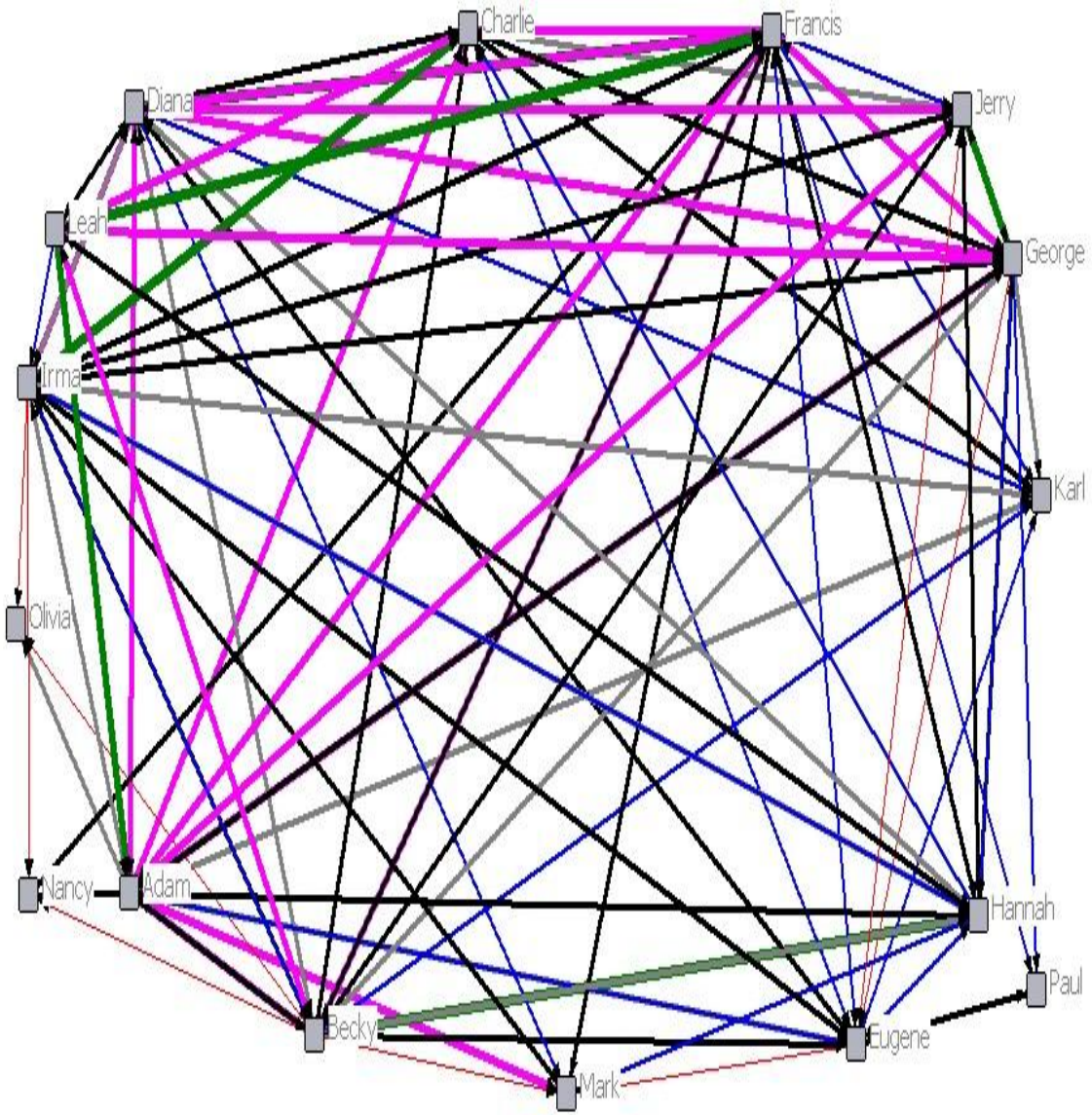
Direction of comm.		No contact	Don't really exchange work info	Unidirectional	Bidirectional/ Cybernetic	Total
Frequency of comm. activity	No contact	805	0	0	0	805
	Less than 1 per month	0	20	20	86	126
	Approx.1 per month	0	19	11	88	118
	Several per month	0	13	17	84	114
	Approx. 1 per week	0	12	13	72	97
	2-3 per week	0	4	13	57	74
	Almost daily	0	9	12	109	130
Total		805	77	86	496	1464

Figure 4.41: All Directions Frequency of Contact between Organizations



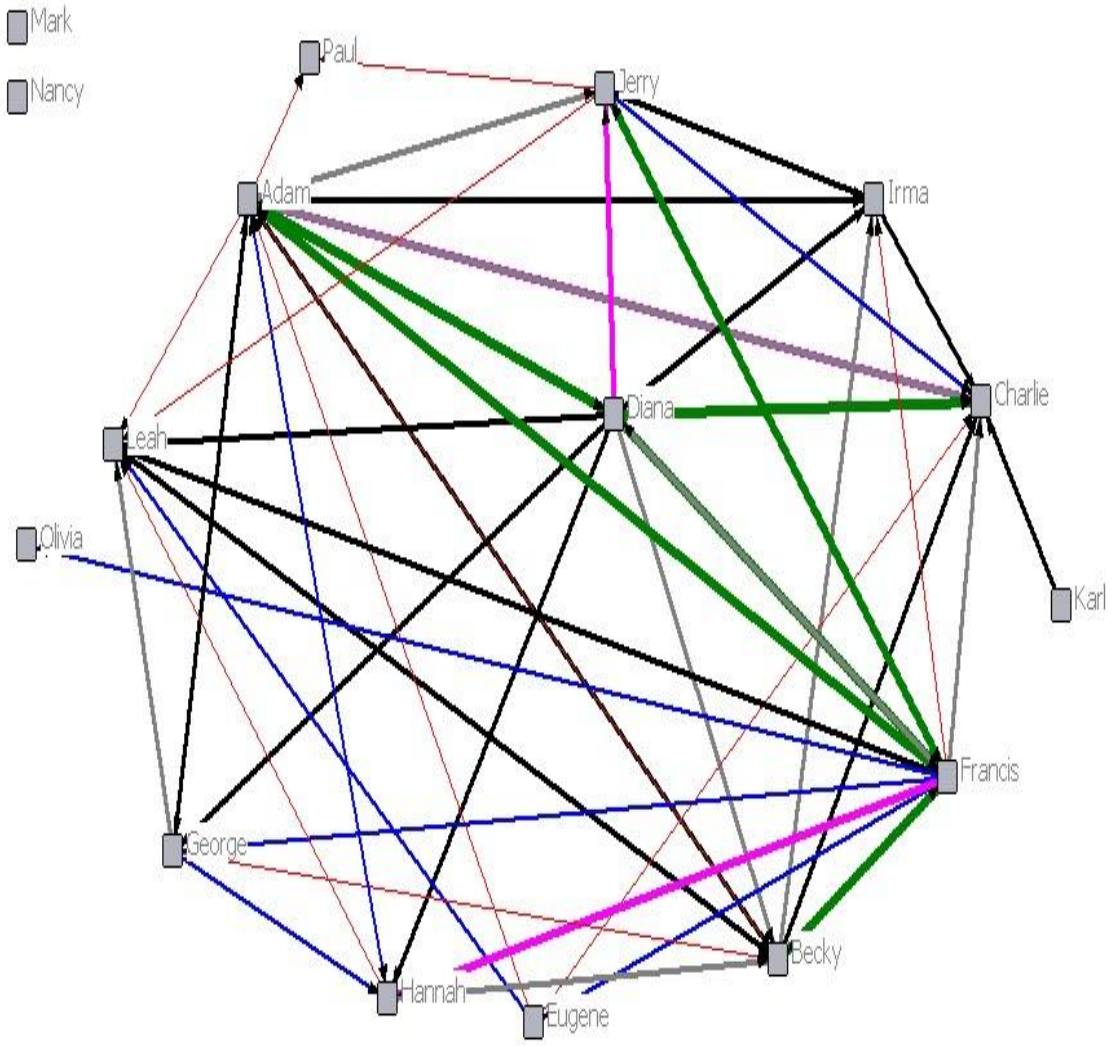
Legend	
Red = Less than Once per Month	Gray = Approx. Once per Week
Blue = Approx. Once per Month	Pink = 2-3 Times per Week
Black = Several Times per Month	Green = Almost Daily

Figure 4.42: Cybernetic Frequency of Contact between Organizations



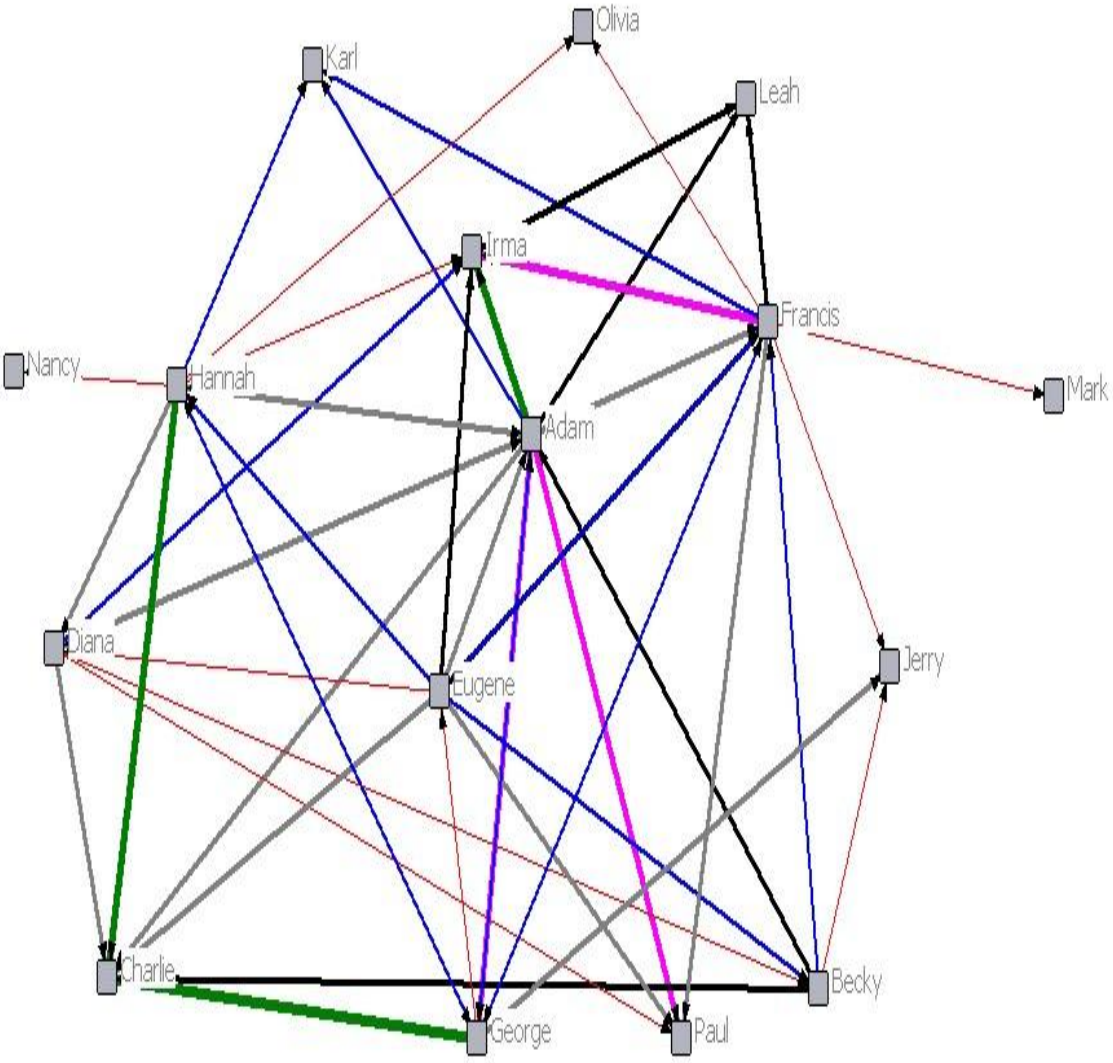
Legend	
Red = Less than Once per Month	Gray = Approx. Once per Week
Blue = Approx. Once per Month	Pink = 2-3 Times per Week
Black = Several Times per Month	Green = Almost Daily

Figure 4.43: Unidirectional Frequency of Contact between Organizations



Legend	
Red = Less than Once per Month	Gray = Approx. Once per Week
Blue = Approx. Once per Month	Pink = 2-3 Times per Week
Black = Several Times per Month	Green = Almost Daily

Figure 4.44: Don’t Exchange Information Frequency of Contact



Legend	
Red = Less than Once per Month	Gray = Approx. Once per Week
Blue = Approx. Once per Month	Pink = 2-3 Times per Week
Black = Several Times per Month	Green = Almost Daily

hierarchical levels (Figures 4.42- 4.44). In terms of the level of interconnectedness in the overall inter-organizational communication frequency networks (Figure 4.41), there were 136 relational ties present out of a possible 240 ties (56.76%). Examination of the network ties present in the communication directionality-based networks yielded the following results: cybernetic forms of communication (Figure 4.42) had 119 ties (49.58%), unidirectional communication (Figure 4.43) had 53 ties (22.08%), and non-work exchanging communication relationships (Figure 4.44) had 50 inter-organizational ties (20.83%).

The second sub-hypothesis states that increased levels of communication directionality will be associated with stronger relational ties in the communication frequency-based network. Testing of this second network-based sub-hypothesis examines the average number of links (tie strength) between organizations at each level of communication directionality. In terms of tie strength in the overall inter-organizational network (Figure 4.41), an average of 3.05 (several times per month) was obtained for communication frequency. Examination of the network ties present in the directionality-based networks yielded the following results: cybernetic forms of communication exchange (Figure 4.42) had an average of 3.19 (several times per month), unidirectional exchanges (Figure 4.43) had an average of 3.03 (several times per month), and non-work-related communication exchanges (Figure 4.44) had an average of 2.73 (approximately once per month).

The second network-based supporting hypothesis for H_5a states that the communication exchanges maintaining higher levels of directionality will be associated with higher levels of network structural performance in the network. Again, two sub-

hypotheses are posited. The first sub-hypothesis states that the networks of higher-level directionality of communication will have fewer isolates; the second states that the networks of higher-level communication directionality will have greater levels of reciprocity.

The presence of isolates can be seen in the network maps already presented (Figures 4.41- 4.44). The total ties map shows that there are no organizational isolates in the overall network (Figure 4.41); this is also the case with the network of cybernetic communication exchanges (Figure 4.42). The unidirectional exchange network (Figure 4.43) contains two isolates, while the non-work related exchanges (Figure 4.44) contain no isolates. The pendant analysis shows that there are no pendants in the overall frequency of contact network, no pendants in the cybernetic communication network, 2 pendants in the unidirectional communication network (Karl and Olivia), and 2 pendants (Mark and Nancy) in the non-work exchange communication network. The combined isolation scores for each of the networks in the analysis was therefore calculated as being 0 for both the overall network and the cybernetic communication network, 6 for the unidirectional communication network, and 2 for the non-work exchange communication network.

The final supporting network-based sub-hypothesis for H_5a states that higher-level communication directionality networks will have higher levels of reciprocity in the communication frequency networks. Visual representations of the reciprocal ties in the organizational tie network are presented in Appendix C as Figures C36-C39; the first figure (C36) presents the total network, while the proceeding maps (C37-C39) present the visualized data for each level of communication directionality tested. The

reciprocity analyses conducted on each of these networks yielded the following results: the total communication directionality network contains 56.32% reciprocal ties, the cybernetic communication network is 52.56% reciprocal, the unidirectional communication network contains 20.45% reciprocity, and the non-work related communication exchange network is 13.64% reciprocal in nature.

Following the posited directionality of the relationship between the dependent and independent variables, H_5b was tested utilizing the one-tailed Spearman's rho calculation; Spearman's rho indicated that there is a very strong, positive, and statistically significant relationship between the number of people in a network organization with whom communication is conducted and the directionality of the communication activity ($n= 1453$, $rho= .926$, $p< .05$). The Kendall's tau-b test run with the crosstabulation of the data for this hypothesis indicated that there were significant differences between groups differentiated by the number of people from the network organization whom the participant has contact with in terms of directionality of communication flow (100.793, $se= .009$, $p< .05$).

Respondents indicated having no contact with other member organizations in 805 of the cases as related to this hypothesis, leaving 648 relationship cases with specific channel selection data. In general, out of the 648 relationships with channel selection data, respondents indicated that there was really no exchange of information in 75 of the relationships, indicated that there was one-directional flow in 86 of the relationships, and that there was multi-directional communication flow in 487 of the inter-organizational relationships. Table 9 contains specific data concerning

Table 9*: Communication directionality by number of people communicated with*

Comm. direction		No contact	Don't really exchange	Unidirectional	Bidirectional/ Cybernetic	Total
Number of people communicated with	None	804	0	0	0	804
	1-2	1	38	28	172	239
	3-4	0	27	29	134	190
	5-7	0	1	15	70	86
	8-10	0	3	9	34	46
	10+	0	6	5	77	88
Total		805	75	86	487	1453

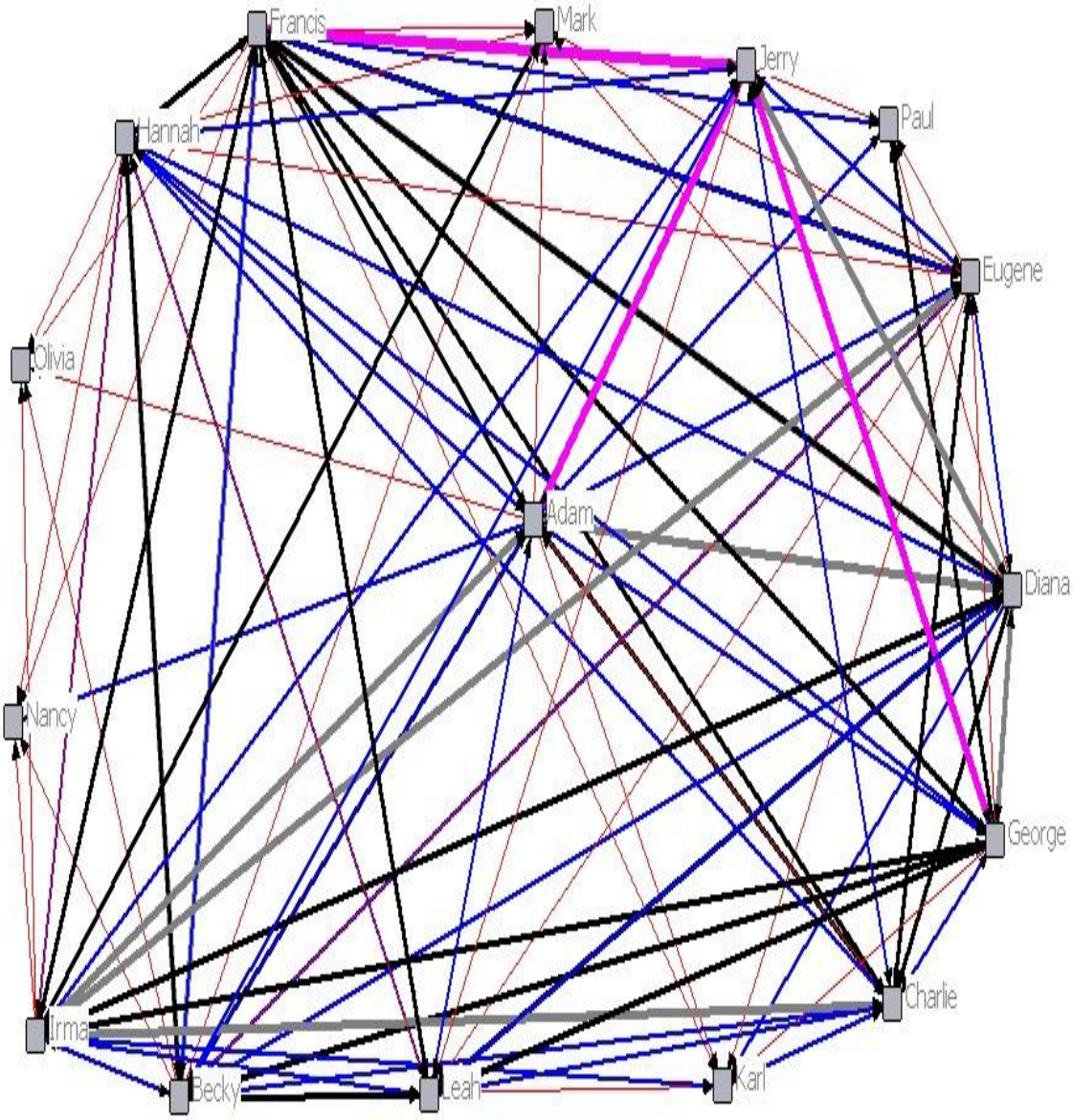
communication directionality and the number of people communicated with in an inter-organizational relationship.

The first network-based supporting hypothesis for H_5b states that the networks of higher levels of communication directionality will be associated with higher network density in the number of people communicated with network. Two sub-hypotheses are posited. The first states that higher-level communication directionality networks will be associated with increased levels of interconnectedness; the second posits that higher-level communication directionality networks will be associated with stronger relational ties (average number of people communicated with).

Testing of the first network-based sub-hypothesis examines the number of links between organizations at each level of communication directionality. Figures 4.45- 4.48 provide visual representations of the numbers of inter-organizational ties present in the network, first presenting the total network map (Figure 4.45) and then for each of the communication directionality levels (Figures 4.46- 4.48). In terms of the level of interconnectedness in the overall number of people communicated with/ communication directionality network (Figure 4.45), there were 134 relational ties present out of a possible 240 ties (55.83%). Examination of the network ties present in the communication directionality-based networks yielded the following results: cybernetic forms of communication exchange (Figure 4.46) had 118 ties (49.17%), unidirectional communication exchanges (Figure 4.47) had 52 ties (21.67%), and non-work related communication exchanges (Figure 4.48) had 48 inter-organizational ties (20.0%).

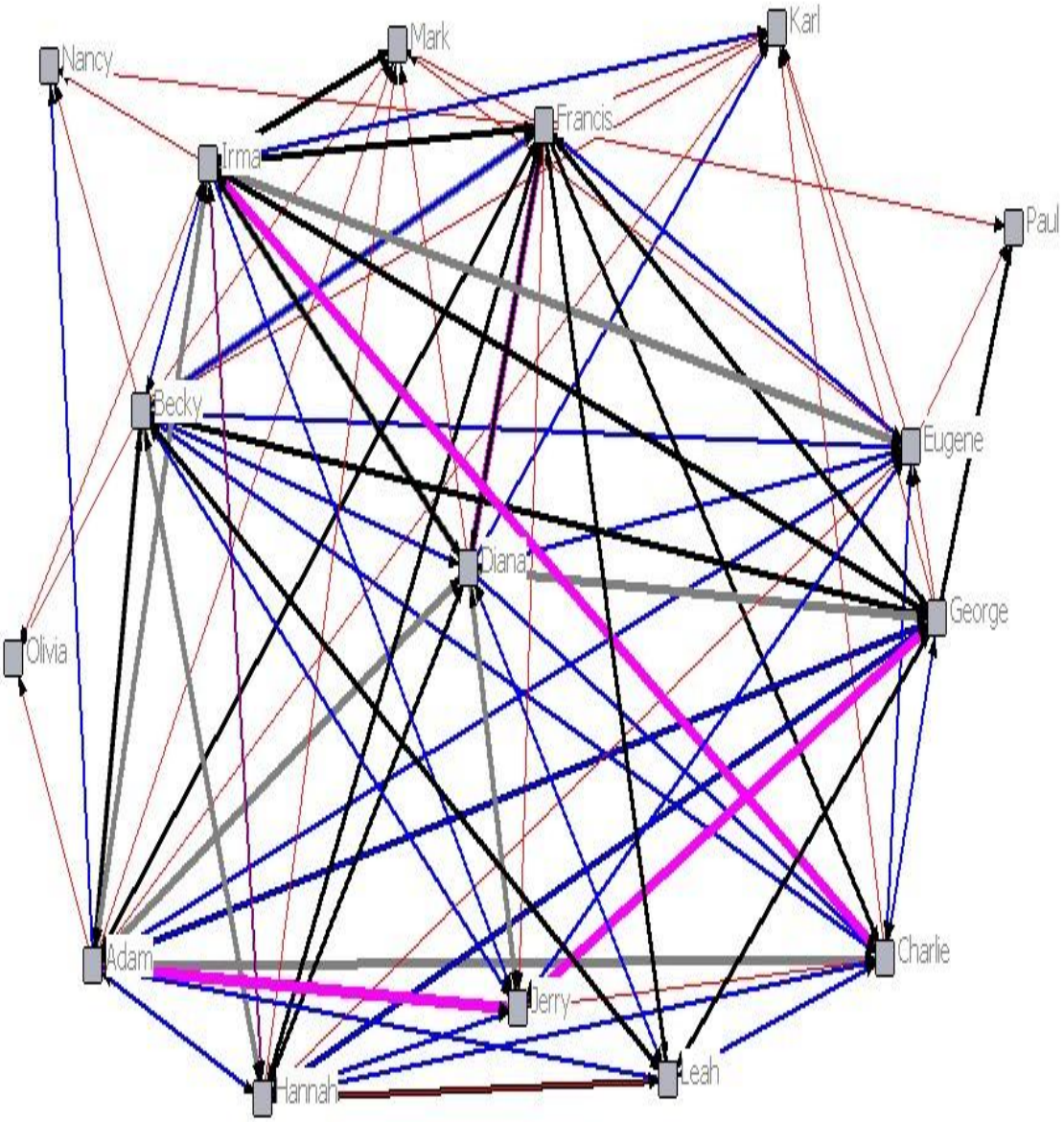
The second sub-hypothesis associated with H_5b states that higher-level communication directionality networks will be associated with stronger relational ties.

Figure 4.45: All Directions- Number of People in Contacts between Organizations



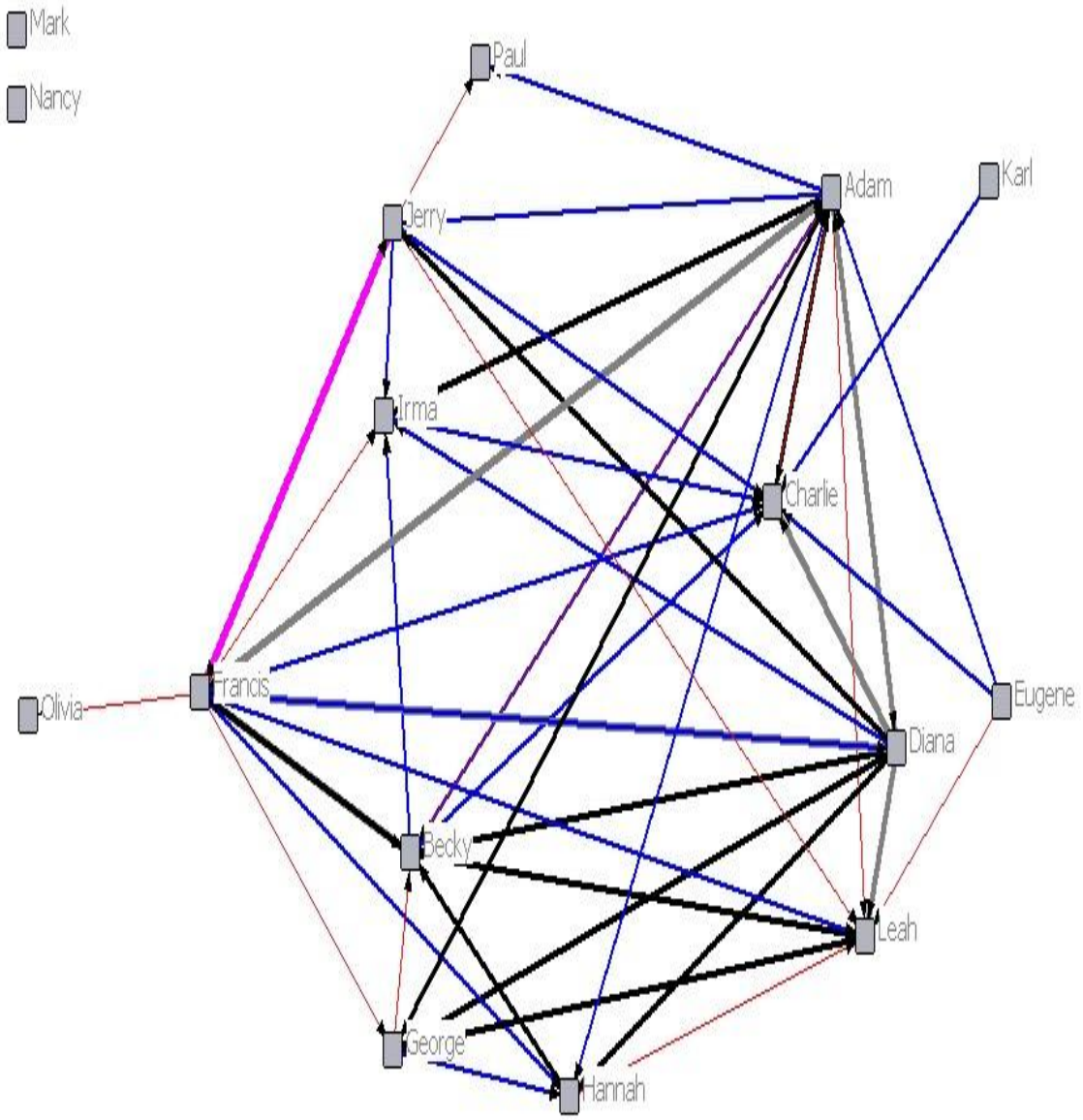
Legend	
Red = 1-2 People	Gray = 8-10 People
Blue = 3-4 People	Pink = 10+ People
Black = 5-7 People	

Figure 4.46: Cybernetic- Number of People in Contacts between Organizations



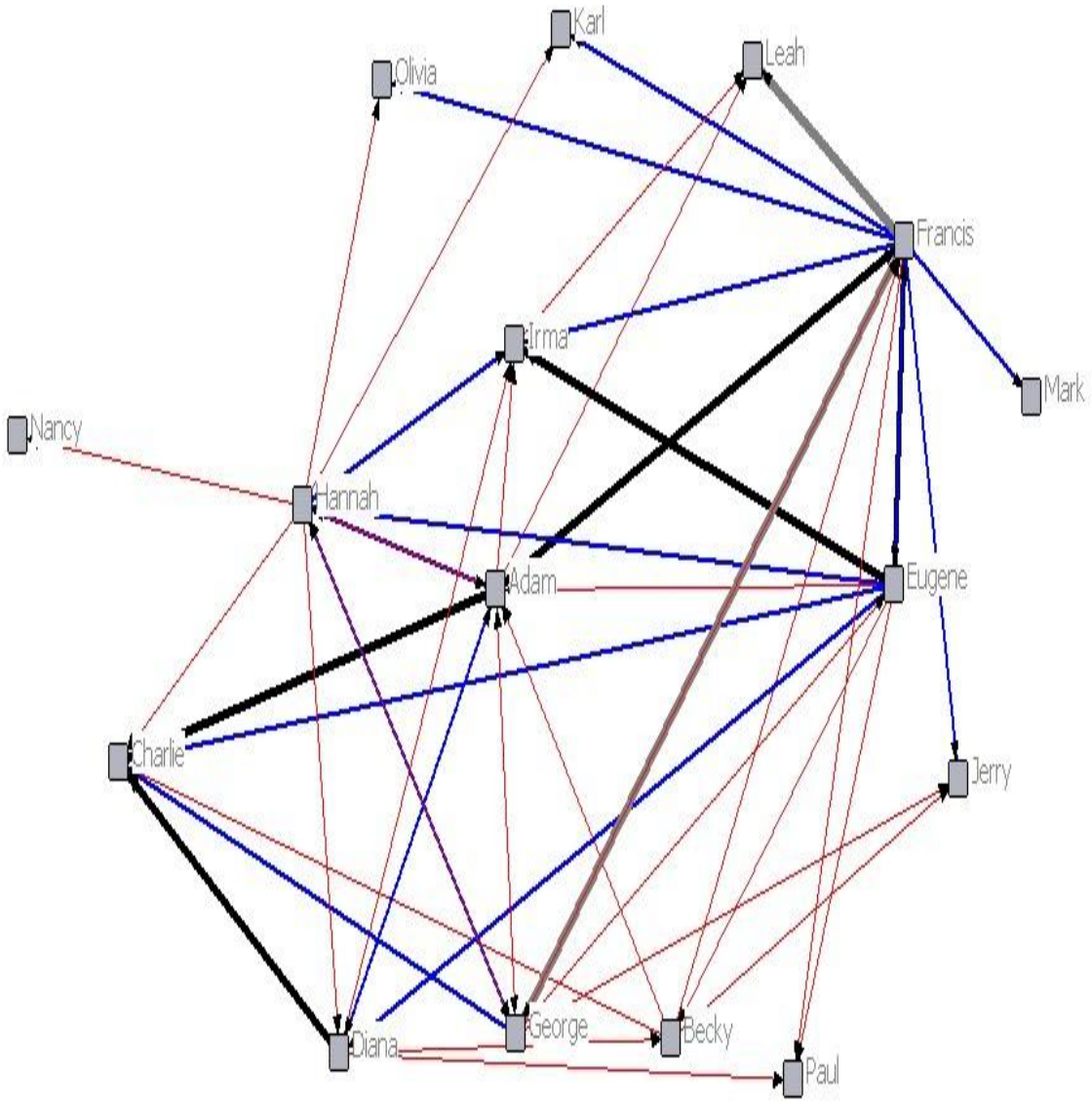
Legend	
Red = 1-2 People	Gray = 8-10 People
Blue = 3-4 People	Pink = 10+ People
Black = 5-7 People	

Figure 4.47: Unidirectional- Number of People in Contacts between Organizations



Legend	
Red = 1-2 People	Gray = 8-10 People
Blue = 3-4 People	Pink = 10+ People
Black = 5-7 People	

Figure 4.48: Don’t Exchange Information- Number of People in Contacts



Legend	
Red = 1-2 People	Gray = 8-10 People
Blue = 3-4 People	Pink = 10+ People
Black = 5-7 People	

Testing of this second network-based sub-hypothesis examines the average number of links (tie strength) between organizations at each level of communication directionality in the network. In terms of tie strength in the overall inter-organizational network (Figure 4.45), an average of 2.03 (3-4 people communicated with) was calculated. Examination of the network ties present in the communication directionality-based networks yielded the following results: cybernetic forms of communication exchange (Figure 4.46) had an average of 2.14 (3-4 people communicated with), unidirectional exchanges (Figure 4.47) had an average of 2.19 (3-4 people communicated with), and non-work related communication exchanges (Figure 4.48) had an average of 1.72 (1-2 people communicated with).

The second network-based supporting H_5b states that the networks of higher-level communication directionality will be associated with higher levels of network structural performance in the number of people communicated with network. Again, two sub-hypotheses are posited. The first sub-hypothesis states that the networks of higher-levels of communication directionality will have fewer isolates; the second states that the networks of higher-level communication directionality will have greater levels of reciprocity.

The presence of isolates can be seen in the network maps already presented (Figures 4.45- 4.48). The total ties map shows that there are no organizational isolates in the overall network (Figure 4.45) or in the cybernetic communication network (Figure 4.46). The network of unidirectional communication exchanges (Figure 4.47) contains one isolate, and the network of non-work related exchanges (Figure 4.48)

contains no isolated organizations. The pendant analysis shows that there are no pendants in the overall number of people communicated with network, no pendants in the cybernetic communication network, 2 pendants in the unidirectional communication network (Olivia and Karl), and 2 pendants (Nancy and Mark) in the non-work exchange communication network. The combined isolation scores for each of the networks in the analysis was therefore calculated as being 0 for both the overall network and the cybernetic communication network, 6 for the unidirectional communication network, and 2 for the non-work exchange communication network.

The final supporting network-based sub-hypothesis for H_5b states that higher-level communication directionality networks will have higher levels of reciprocity in the number of people communicated with network. Visual representations of the reciprocal ties in the organizational tie network are presented in Appendix C as Figures C40-C43; the first figure (C40) presents the total network, while the proceeding maps (C41-C43) present the visualized data for each level of communication directionality tested. The reciprocity analyses conducted on each of these networks yielded the following results: the total network contains 55.81% reciprocal ties, the cybernetic network is 53.25% reciprocal, the unidirectional communication network contains 20.93% reciprocity, and the non-work related communication exchange network is 14.29% reciprocal in nature.

The sixth hypothesis posited in this study asserts that there is a relationship between the richness of communication channels utilized and perceptions of collaboration at both the individual-to-organization and organization-to-organization

levels. Similarly to hypotheses 2-5, two sub-hypotheses were used in testing the broader main hypothesis. H_6a suggests that there is a positive association between the richness of channels selected for inter-organizational communication activity and perception of increased levels of collaboration at the individual-to-organization level. H_6b asserts that there will also be a positive relationship between communication channel richness and perception of collaboration at the organization-to- organization level.

All of the variables utilized in H_6 have already been described in previous hypotheses; communication channel richness was utilized as the dependent variable for H_4, while the scales measuring collaboration levels were utilized as the dependent variables in H_3. As in H_3, the sub-hypotheses in H_6 both consist of ordinal level independent variables and interval level (for the purpose of this analysis) dependent variables. Additionally, both of the sub-hypotheses in H_6 are directional in nature, therefore the Spearman's rho statistic is once again utilized in assessing the level of correlation between the variables. Concerning H_6a, the rho analysis indicates that there is a very strong, positive, and statistically significant relationship between the richness of the communication channel utilized for inter-organizational communication and perceptions of collaboration at the individual-to organization level ($n= 1459$, $rho= .910$, $p< .05$).

Since the dependent variables in H_6a are measured using an interval-level scale, a one-way ANOVA was conducted to provide additional insight into the relationship between the variables. The one-way ANOVA analysis indicated that significant differences existed between the levels of communication channel richness in regard to

perceptions of individual-to-organization collaboration and that the variation in channel richness has a large effect on perceptions of individual-to-organization collaboration perceptions ($F(4, 1454)= 636.259$, $\eta^2= .636$, $p< .05$).

Relationships in which e-mail was the primary communication channel reported the lowest average level of perceived individual-to-organization collaboration (m= 2.10, sd= 1.068). Relationships in which face-to-face or informal communication was the primary communication channel reported the second-to-lowest levels of perceived individual-to-organization collaboration (m= 2.30, sd= 1.368). Relationships in which meetings were the primary communication channel reported the next highest levels of perceived individual-to-organization collaboration (m= 2.34, sd= 1.287), while relationships in which the phone was the primary communication channel reported the highest level of individual-to-organization collaboration (m= 2.94, sd= 1.029).

The Tukey's HSD analysis indicated that statistically significant differences existed between three of the groups for H_6a. Relationships in which e-mail was the primary form of communication and those in which the phone was primarily utilized were found to have significantly different perceived levels of individual-to-organization collaboration (se= .134, $p< .05$). Relationships in which the phone was the primary form of communication and those in which face-to-face or informal conversations were primarily utilized were also found to have significantly different perceived levels of individual-to-organization collaboration (se= .212, $p< .05$).

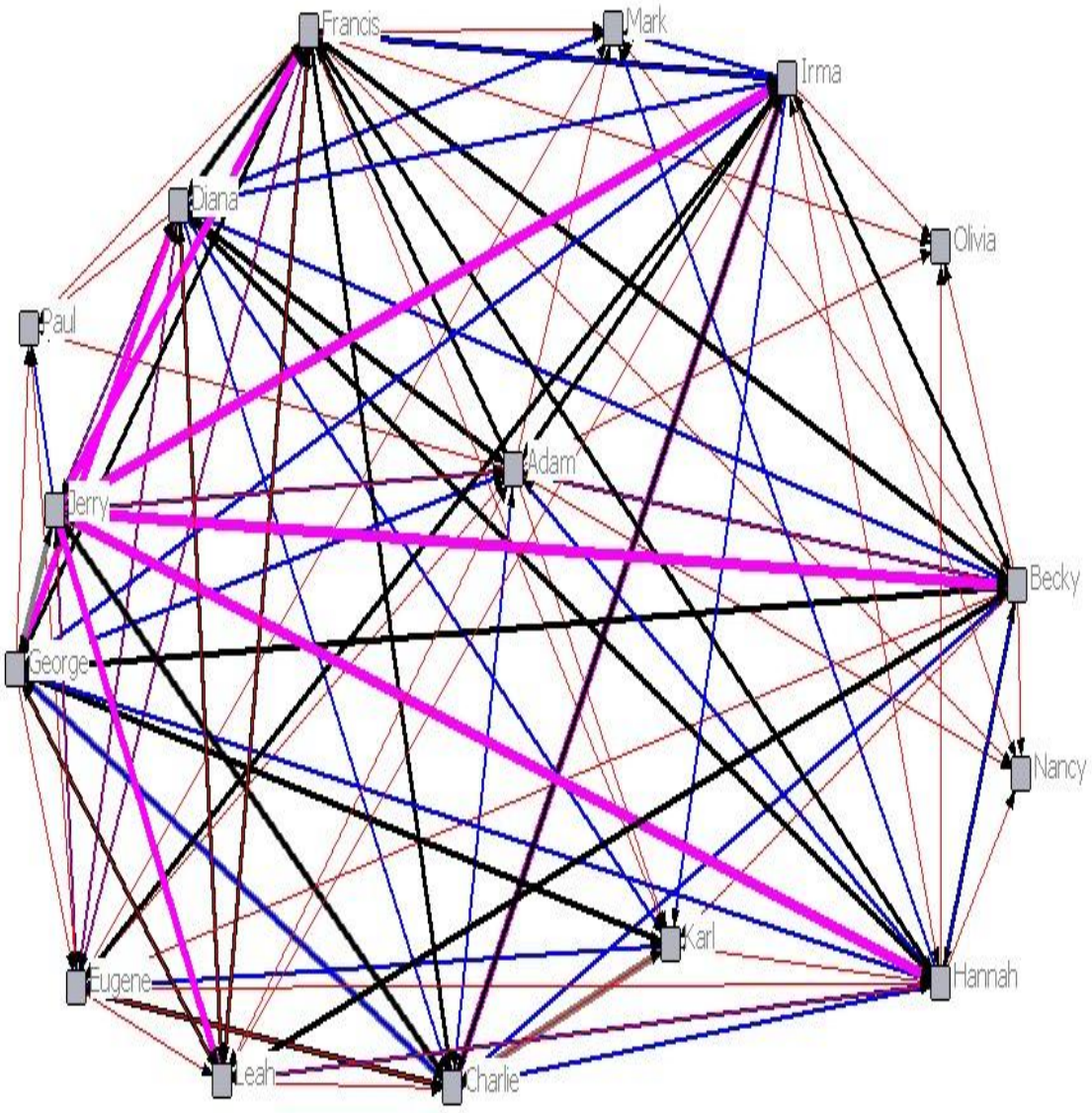
The first network-based supporting hypothesis for H_6a states that the more rich communication channel networks will be associated with higher network density in the

individual-to-organization perceived level of collaboration network. Two sub-hypotheses are posited. The first states that more rich communication channel networks will be associated with increased levels of interconnectedness; the second posits that more rich communication channel networks will be associated with stronger relational ties (average perceived level of individual-to-organization collaboration).

Testing of the first network-based sub-hypothesis associated with H_6a examines the number of links between organizations at each level of communication channel richness. Figures 4.49- 4.53 provide visual representations of the numbers of inter-organizational ties present in the individual-to-organization perceived collaboration level network, first presenting the total network map (Figure 4.49) and then for each of the communication channel richness levels (Figures 4.50- 4.53). In terms of the level of interconnectedness in the overall individual-to-organization perceived collaboration inter-organizational networks (Figure 4.49), there were 136 relational ties present out of a possible 240 ties (56.67%). Examination of the network ties present in the communication channel-based networks yielded the following results: face-to-face/ informal communication channels (Figure 4.50) had 101 ties (42.08%), meetings-based communication channels (Figure 4.51) had 42 ties (17.5%), phone-based communication exchanges (Figure 4.52) had 12 ties (5.0%), and the e-mail communication network (Figure 4.53) had 82 inter-organizational ties (34.17%).

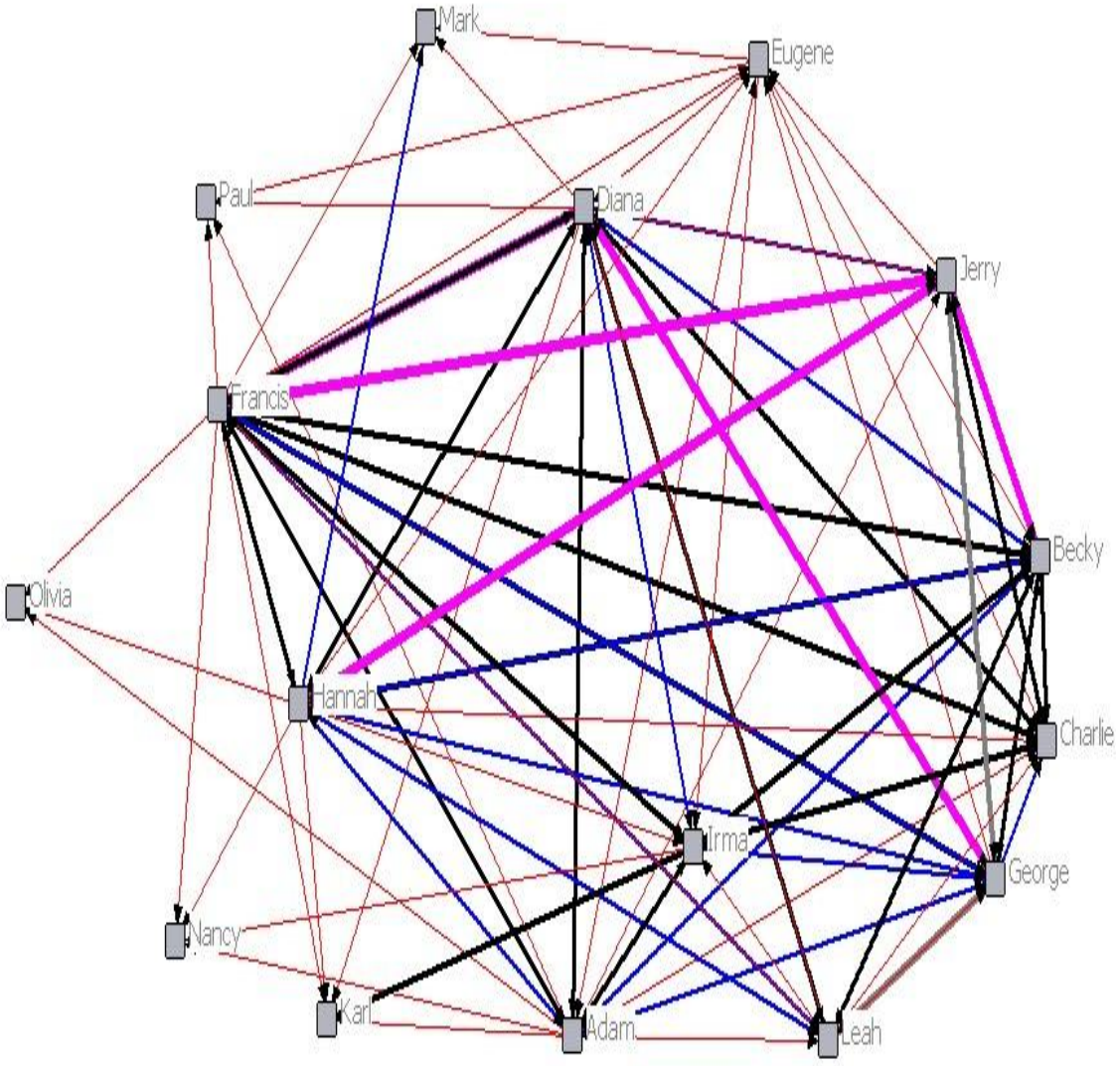
The second sub-hypothesis associated with H_6a states that higher-level communication channel richness networks will be associated with stronger relational

Figure 4.49: All Channels Individual-to-Organization Collaboration



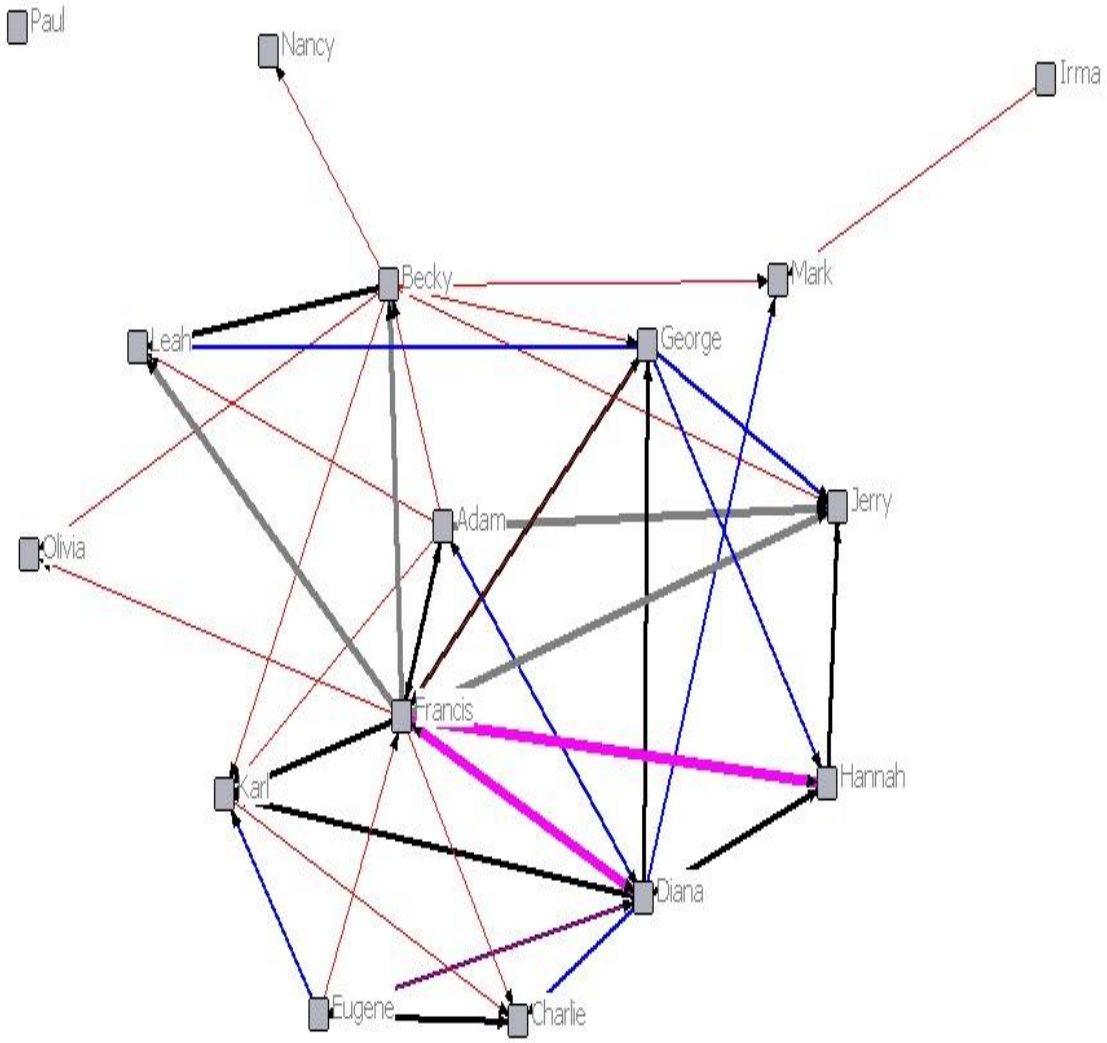
Legend	
Red = Networking	Gray = Coalition
Blue = Cooperation	Pink = Collaboration
Black = Coordination	

Figure 4.50: Face-to-Face/Informal Individual-to-Organization Collaboration



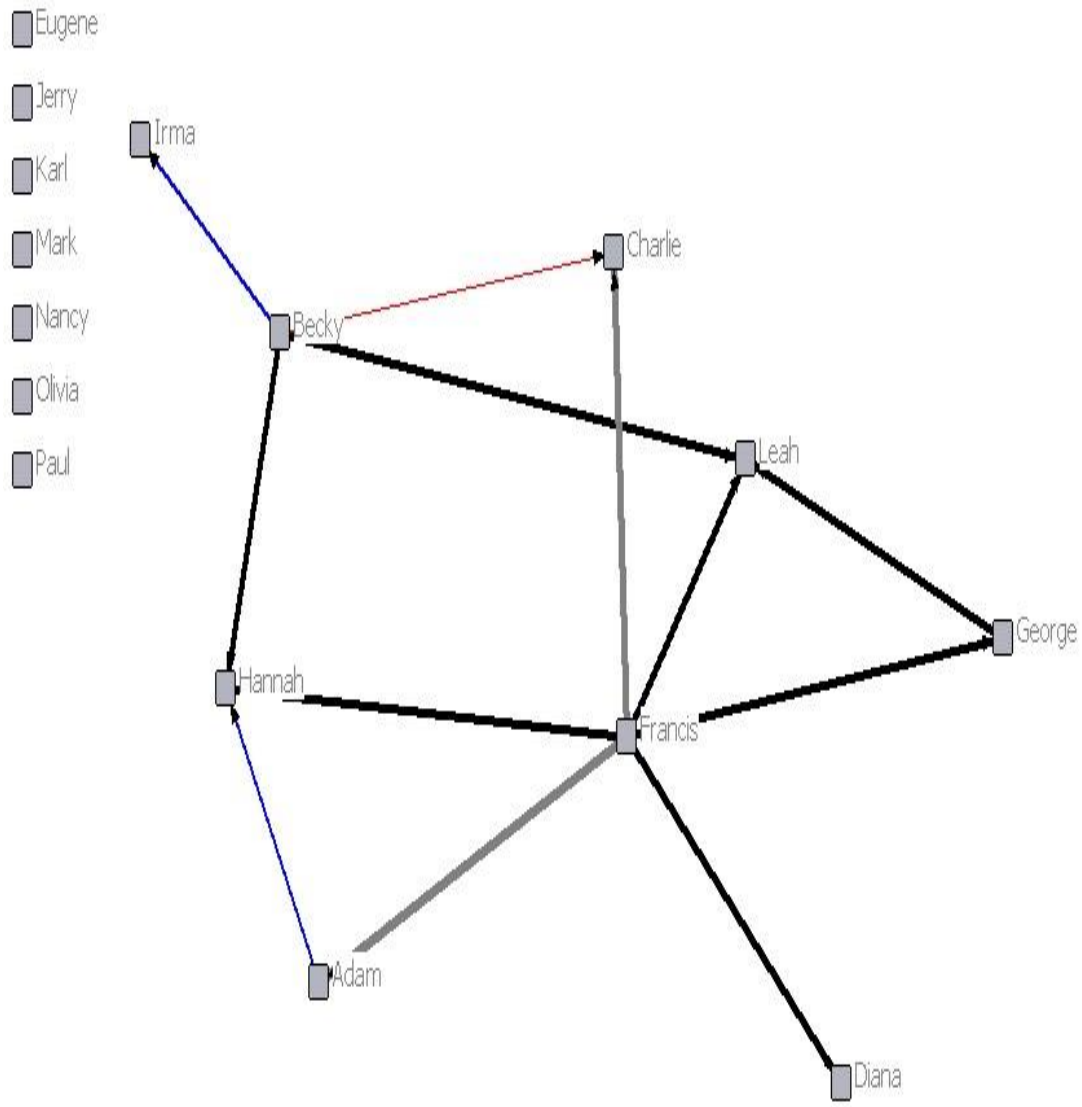
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Red = Networking	Gray = Coalition
Blue = Cooperation	Pink = Collaboration
Black = Coordination	

Figure 4.51: Meetings Individual-to-Organization Collaboration



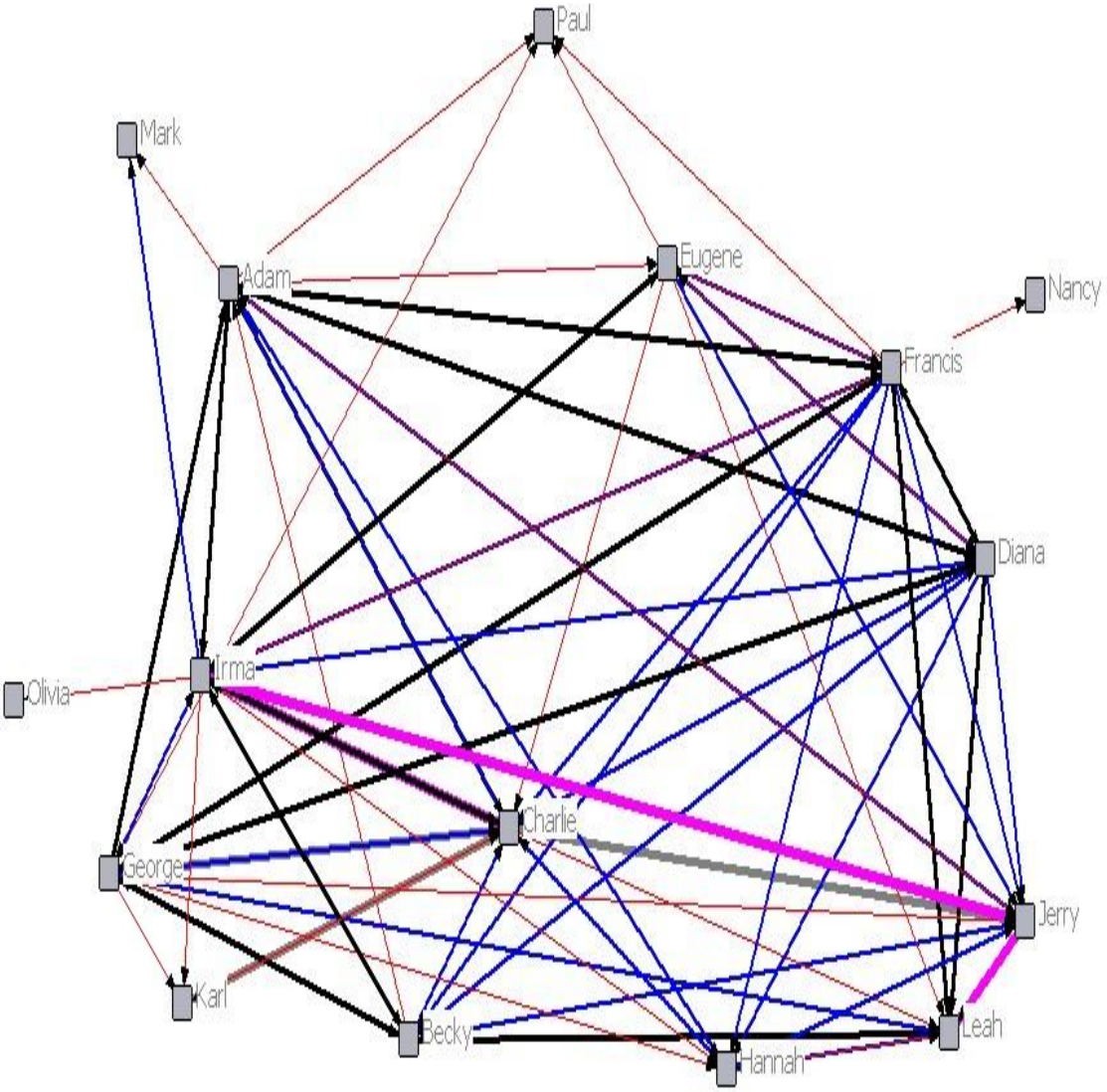
Legend	
Red = Networking	Gray = Coalition
Blue = Cooperation	Pink = Collaboration
Black = Coordination	

Figure 4.52: Phone Individual-to-Organization Collaboration



Legend	
Red = Networking	Gray = Coalition
Blue = Cooperation	Pink = Collaboration
Black = Coordination	

Figure 4.53: E-mail Individual-to-Organization Collaboration



Legend	
Red = Networking	Gray = Coalition
Blue = Cooperation	Pink = Collaboration
Black = Coordination	

ties in the individual-to-organization collaboration network. Testing of this second network-based sub-hypothesis examines the average number of links (tie strength) between organizations at each level of communication channel richness. In terms of tie strength in the overall inter-organizational network (Figure 4.49), an average of 2.09 (cooperation) was calculated for the network. Examination of the network ties present in the channel richness-based networks yielded the following results: face-to-face/ informal communication channels (Figure 4.50) had an average of 2.15 (cooperation), meetings-based communications (Figure 4.51) had an average of 2.43 (cooperation), phone-based communication exchanges (Figure 4.52) had an average of 3.12 (coordination), and e-mail based exchanges (Figure 4.53) had an average of 2.20 (cooperation).

The second network-based supporting hypothesis for H_6a states that the networks consisting of more rich communication channels will be associated with higher levels of network structural performance. Again, two sub-hypotheses are posited. The first sub-hypothesis states that the networks of more rich communication channels will have fewer isolates; the second states that the networks of more rich communication channels will have greater levels of reciprocity.

The presence of isolates can be seen in the network maps already presented (Figures 4.49- 4.53). The total ties map (Figure 4.49) shows that there are no organizational isolates in the overall network, nor are there any isolated organizations in the face-to-face/ informal communication channel network (Figure 4.50). The network of meetings-based communication (Figure 4.51) contains one isolate while the phone-based network (Figure 4.52) contains seven isolated organizations. The e-mail-based

network (Figure 4.53) also contains no isolated organizations. The pendant analysis shows that there are no pendants in the overall individual-to-organization perceived collaboration level network, no pendants in the face-to-face/informal communication network, 2 pendants in the meetings-based communication network (Nancy and Irma), 2 pendants (Irma and Diana) in the phone-based communication network, and 2 pendants (Nancy and Olivia) in the e-mail communication network. The combined isolation scores for each of the networks in the analysis was therefore calculated as being 0 for both the overall network and the face-to-face/informal communication network, 4 for the meetings-based communication network, 16 for the phone-based communication network, and 2 for the e-mail based communication network.

The final supporting network-based sub-hypothesis for H_6a states that higher-richness networks will have higher levels of reciprocity in the individual-to-organization perceived collaboration network. Visual representations of the reciprocal ties in the organizational tie network are presented in Appendix C as Figures C44-C48; the first figure (C44) presents the total network, while the proceeding maps (C45-C48) present the visualized data for each level of channel richness tested. The reciprocity analyses conducted on each of these networks yielded the following results: the total network contains 56.32% reciprocal ties, the face-to-face/ informal communication network is 48.61% reciprocal, the meetings-based network contains 16.22% reciprocity, the phone-based communication network has a reciprocity level of 0.0%, and the e-mail based communication network is 40.0% reciprocal in nature.

The one-tailed Spearman's rho correlation analysis for H_6b indicates that there is a very weak, positive, and statistically significant relationship between the richness of channels selected for inter-organizational communication and perceived levels of organization-to-organization collaboration in the inter-organizational network (n= 638, rho= .094, $p < .01$). As in H_6a, the presence of an interval-level dependent variable enables further investigation into the relationship between the two variables utilizing the one-way ANOVA. The one-way ANOVA analysis indicated that significant differences existed between the levels of communication channel richness in regard to perceptions of organization-to-organization collaboration though the effect size was small ($F(3, 634)= 5.632$, $\eta^2= .026$, $p < .05$).

Relationships in which e-mail was the primary communication channel reported the lowest average level of perceived organization-to-organization collaboration (m= 2.33, sd= 1.101). Relationships in which meetings were the primary communication channel reported the second-to-lowest levels of perceived organization-to-organization collaboration (m= 2.57, sd= 1.208). Relationships in which face-to-face or informal conversations were the primary communication channel reported the next highest levels of perceived organization-to-organization collaboration (m= 2.71, sd= 1.365), while relationships in which the phone was the primary communication channel reported the highest level of organization -to-organization collaboration (m= 3.41, sd= 1.121).

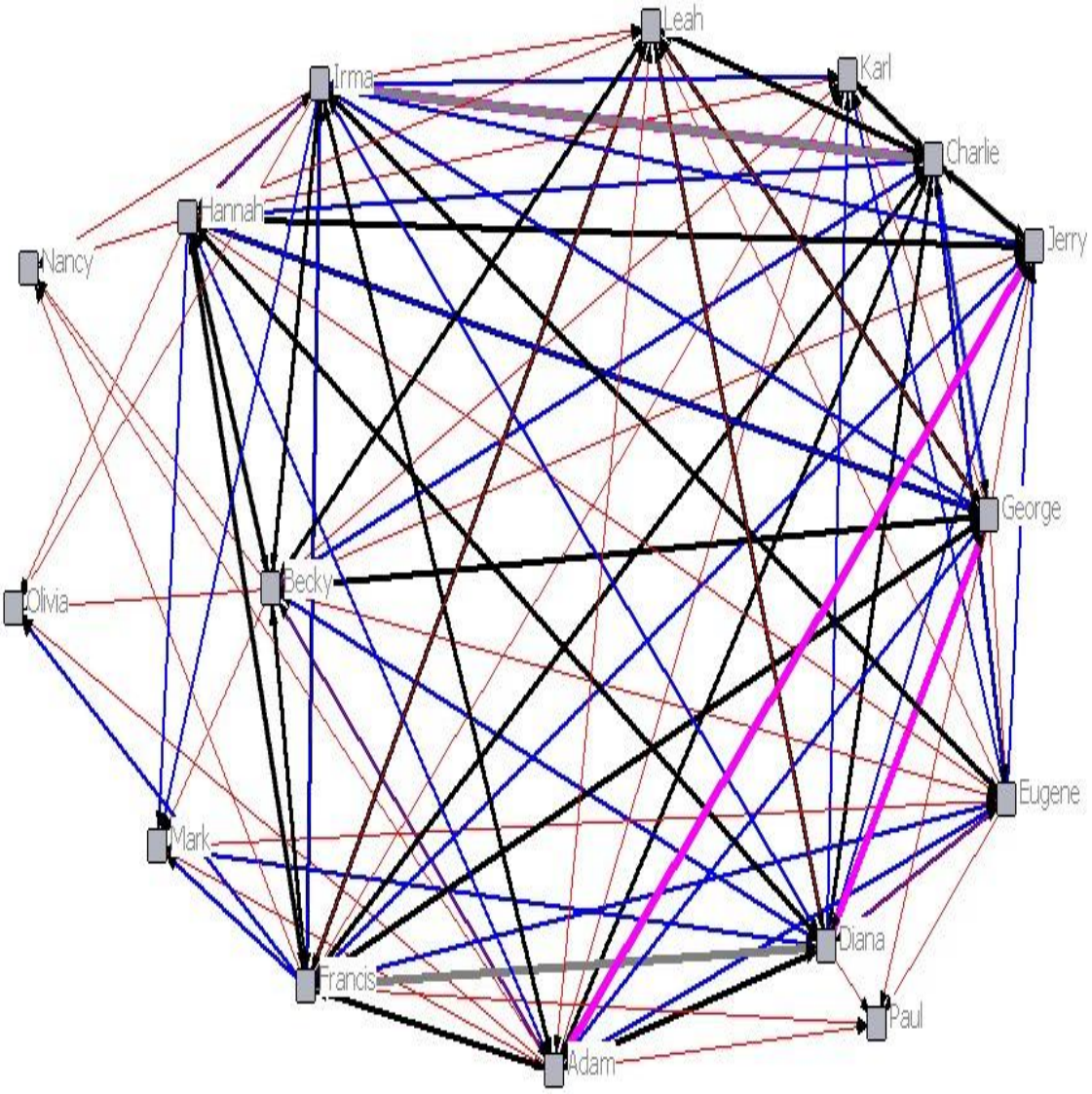
The Tukey's HSD analysis indicated that statistically significant differences existed between three of the groups. Relationships in which e-mail was the primary form of communication and those in which the phone was primarily utilized were found

to have significantly different perceived levels of organization-to-organization collaboration (se= .326, p< .05). Relationships in which e-mail was the primary form of communication and those in which face-to-face or informal conversations were primarily utilized were also found to have significantly different perceived levels of organization-to-organization collaboration (se= .117, p< .05).

The first network-based supporting hypothesis for H_6b states that the networks consisting of more rich communication channels will be associated with higher network density in the organization-to-organization perceived collaboration level network. Two sub-hypotheses are posited. The first states that more rich communication channel networks will be associated with increased levels of interconnectedness; the second posits that more rich communication channel networks will be associated with stronger relational ties (perceived levels of organization-to-organization collaboration).

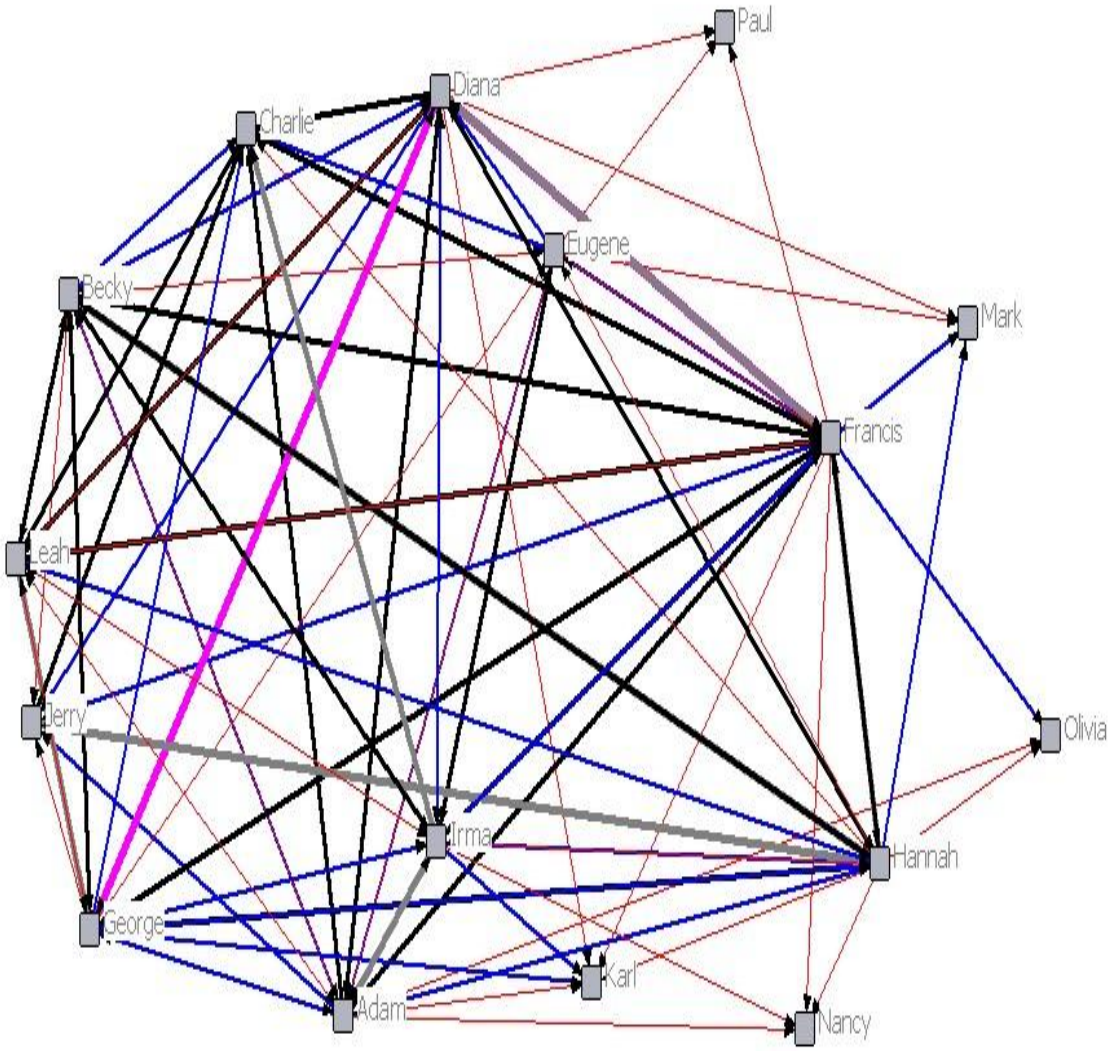
Testing of the first network-based sub-hypothesis examines the number of links between organizations at each level of communication channel richness. Figures 4.54-4.58 provide visual representations of the numbers of inter-organizational ties present in the networks, first presenting the total network map (Figure 4.54) and then for each of the channel richness levels (Figures 4.55- 4.58). In terms of the level of interconnectedness in the overall network (Figure 4.54), there were 127 relational ties present out of a possible 240 ties (52.92%). Examination of the network ties present in the channel richness-based networks yielded the following results: face-to-face/ informal communication channels (Figure 4.55) had 101 ties (42.08%), meetings-based communication (Figure 4.56) had 42 ties (17.5%), the phone-based network (Figure

Figure 4.54: All Channels Organization-to-Organization Collaboration



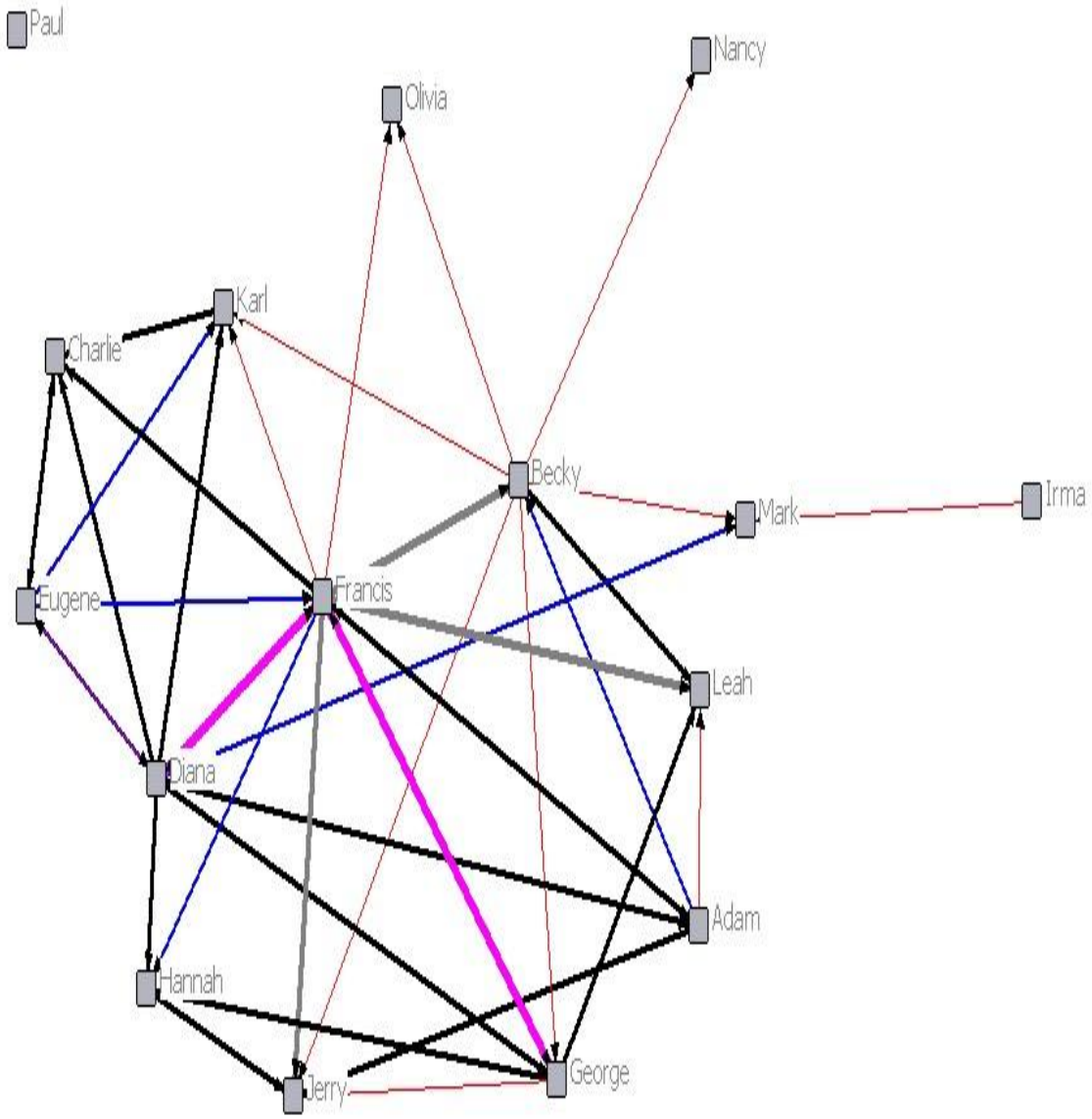
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Red = Networking	Gray = Coalition
Blue = Cooperation	Pink = Collaboration
Black = Coordination	

Figure 4.55: Face-to-Face/Informal Organization-to-Organization Collaboration



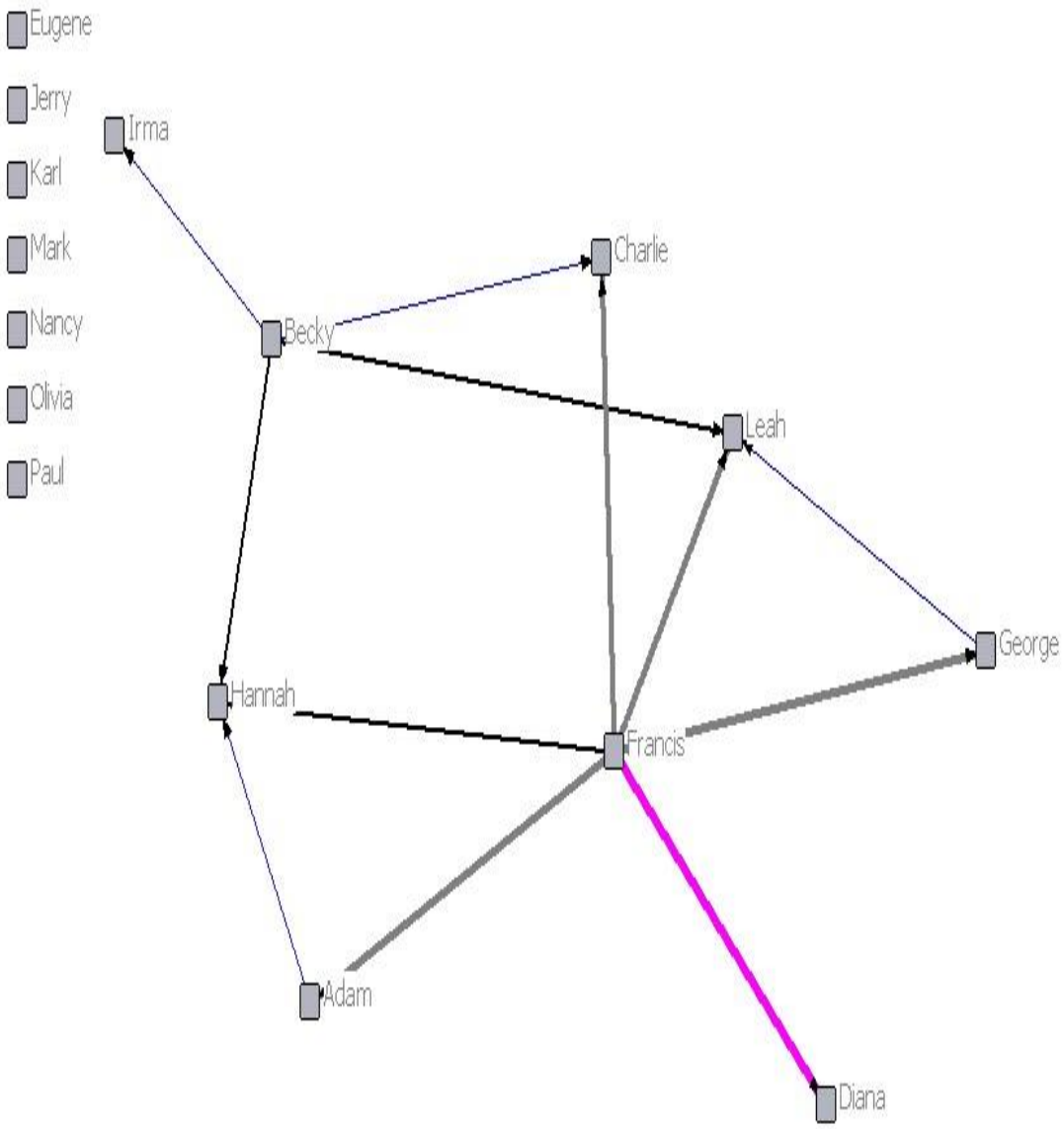
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Blue = Cooperation	Pink = Collaboration
Black = Coordination	

Figure 4.56: Meetings Organization-to-Organization Collaboration



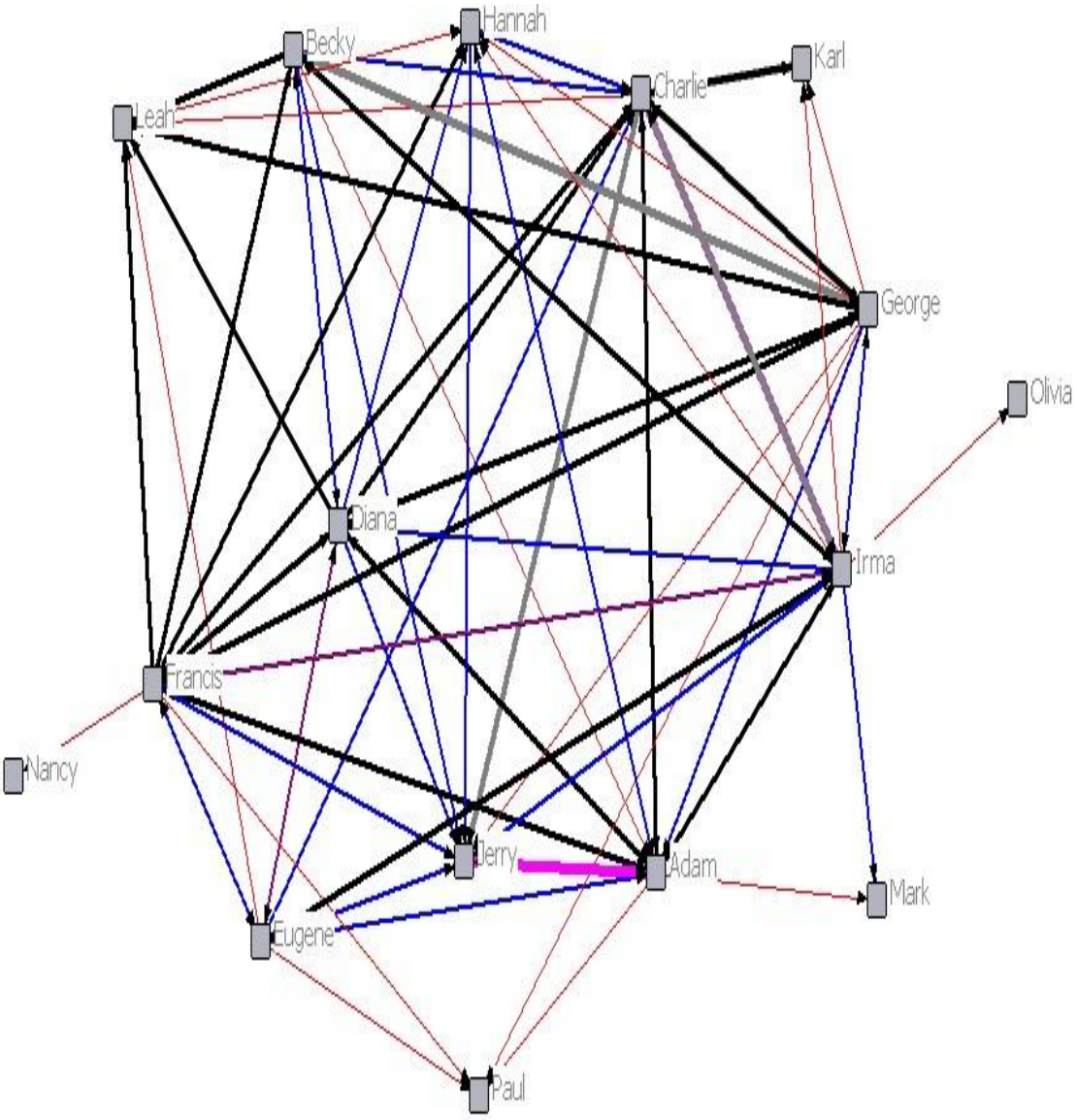
Legend	
Red = Networking	Gray = Coalition
Blue = Cooperation	Pink = Collaboration
Black = Coordination	

Figure 4.57: Phone Organization-to-Organization Collaboration



Legend	
Red = Networking	Gray = Coalition
Blue = Cooperation	Pink = Collaboration
Black = Coordination	

Figure 4.58: E-mail Organization-to-Organization Collaboration



Legend	
Red = Networking	Gray = Coalition
Blue = Cooperation	Pink = Collaboration
Black = Coordination	

4.57) had 12 ties (5.0%), and the e-mail communication network (Figure 4.58) had 82 inter-organizational ties (34.17%).

The second sub-hypothesis associated with H_6b states that more rich communication channel networks will be associated with stronger relational ties in the organization-to-organization perceived collaboration network. Testing of this second network-based sub-hypothesis examines the average number of links (tie strength) between organizations at each level of communication channel. In terms of tie strength in the overall inter-organizational network (Figure 4.54), an average of 2.09 (cooperation) was calculated. Examination of the network ties present in the communication channel-based networks yielded the following results: face-to-face/ informal communication channels (Figure 4.55) had an average of 2.15 (cooperation), meetings-based communication relationships (Figure 4.56) had an average of 2.43 (cooperation), the phone-based network (Figure 4.57) had an average of 3.12 (coordination), and the e-mail based network (Figure 4.58) had an average of 2.20 (cooperation).

The second network-based supporting hypothesis for H_6b states that more rich communication channel networks will be associated with higher levels of network structural performance. Again, two sub-hypotheses are posited. The first sub-hypothesis states that more rich communication channel networks will have fewer isolates; the second states that more rich communication channel networks will have greater levels of reciprocity in the organization-to-organization perceived collaboration level network.

The presence of isolates can be seen in the network maps already presented (Figures 4.54- 4.58). The total ties map (Figure 4.54) shows that there are no

organizational isolates as does the network of face-to-face/ informal communication (Figure 4.55). The network of meetings-based communication (Figure 4.56) contains one isolate, and the phone-based network (Figure 4.57) contains seven isolates. Once again, there are no isolates found in the e-mail communication network (Figure 4.58). The pendant analysis shows that there are no pendants in the overall perceived level of organization-to-organization collaboration network, no pendants in the face-to-face/informal communication network, 2 pendants in the meetings-based communication network (Nancy and Irma), 2 pendants (Irma and Diana) in the phone-based communication network, and 2 pendants (Nancy and Olivia) in the e-mail communication network. The combined isolation scores for each of the networks in the analysis was therefore calculated as being 0 for both the overall network and the face-to-face/informal communication network, 4 for the meetings-based communication network, 16 for the phone-based communication network, and 2 for the e-mail based communication network.

The final supporting network-based sub-hypothesis for H6b states that more rich communication channel networks will have higher levels of reciprocity in the organization-to-organization communication network. Visual representations of the reciprocal ties in the organizational tie network are presented in Appendix C as Figures C49-C53; the first figure (C49) presents the total network, while the proceeding maps (C50-C53) present the visualized data for each level of hierarchy tested. The reciprocity analyses conducted on each of these networks yielded the following results: the total network contains 49.41% reciprocal ties, the face-to-face/ informal network is 39.24% reciprocal, the meetings-based network contains 16.67% reciprocity, the phone-based

communication network has a reciprocity level of 0.0%, and the e-mail communication network is 39.98% reciprocal in nature.

The seventh and final hypothesis proposes that there is a positive relationship between the level of directionality in communication flow and perceptions of collaboration at both the individual-to-organization and organization-to-organization levels. Similarly to hypotheses 2-6, two sub-hypotheses were used in testing the broader main hypothesis. H_7a suggests that there is a positive association between the level of directionality in communication flow and perception of increased levels of collaboration at the individual-to-organization level. H_7b asserts that there will also be a positive relationship between the level of directionality in communication flow and perception of collaboration at the organization-to-organization level. All of the variables utilized in H_7 have already been described in previous hypotheses; directionality of communication flow was utilized as the dependent variable for H_5, while the scales measuring collaboration levels were utilized as the dependent variables in H_3 and H_6. As in H_3 and H_6, the sub-hypotheses in H_7 both consist of ordinal level independent variables and interval level (for the purpose of this analysis) dependent variables. Additionally, both of the sub-hypotheses in H_7 are directional in nature, therefore the Spearman's rho statistic is once again utilized in assessing the level of correlation between the variables. Concerning H_7a, the one-tailed Spearman's rho analysis indicates that there is a very strong, positive, and statistically significant relationship between the directionality of inter-organizational communication and perceptions of collaboration at the individual-to organization level ($n= 1469$, $rho= .943$, $p< .05$).

Since the dependent variables in H_7a are measured using an interval-level scale, a one-way ANOVA was conducted to provide additional insight into the relationship between the variables. The one-way ANOVA analysis indicated that significant differences existed between the levels of communication directionality in regard to perceptions of individual-to-organization collaboration and that the variation in channel richness has a large effect on perceptions of individual-to-organization collaboration perceptions ($F(3, 1459)= 1014.550$, $\eta^2= .676$, $p< .05$).

Of the responses in which there was contact indicated, those relationships in which work-related information was not exchanged reported the lowest average level of perceived individual-to-organization collaboration (m= 1.03, sd= .160). Relationships in which the communication was one-directional reported the second-to-lowest levels of perceived individual-to-organization collaboration (m= 2.19, sd= 1.079). Relationships in which communication contained exchanges both ways between the parties involved reported the highest levels of perceived individual-to-organization collaboration (m= 2.46, sd= 1.311).

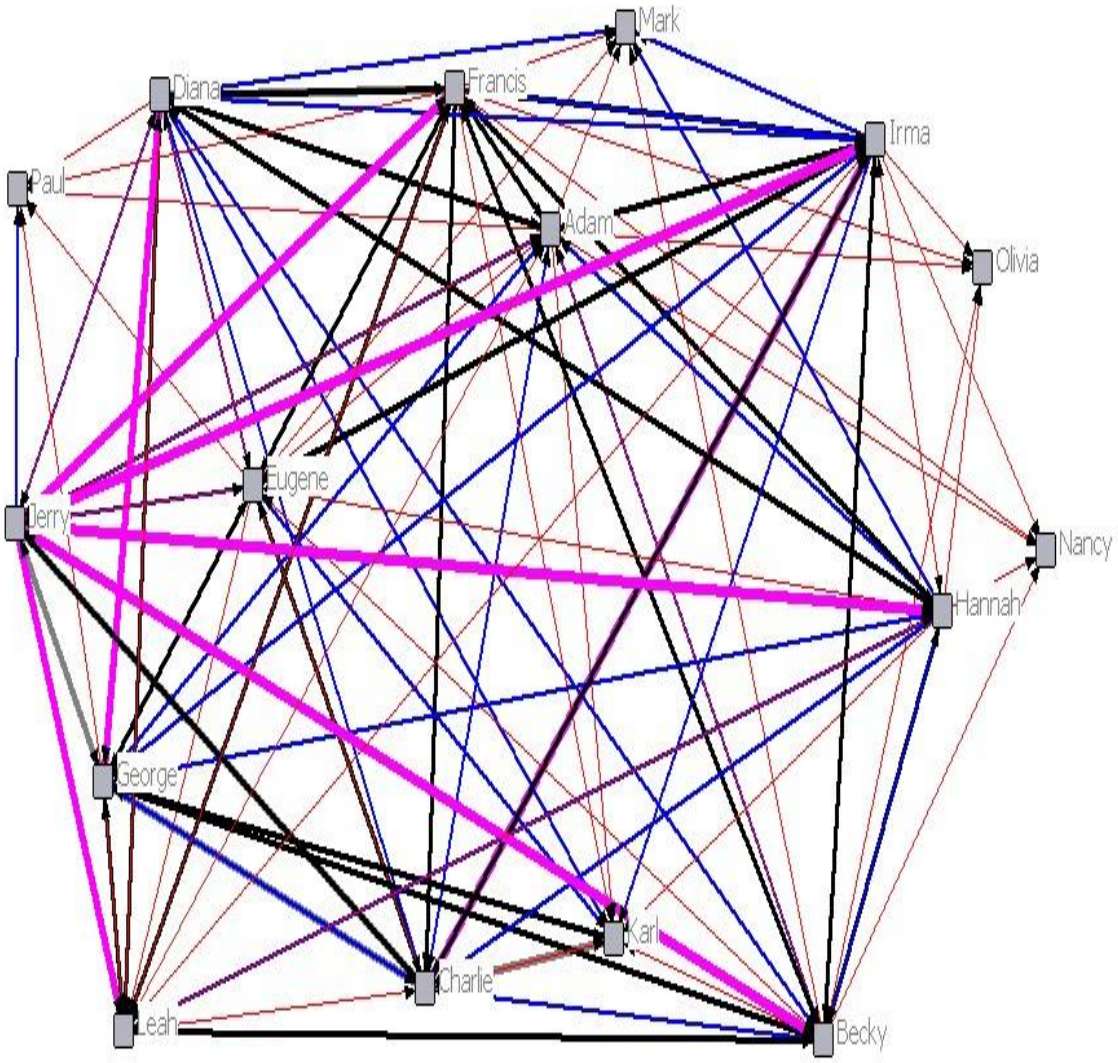
The Tukey's HSD analysis indicated that statistically significant differences existed between all three of the groups in which there was some form of communication exchange for H_7a. Relationships in which work-related information was not exchanged and those in which there was primarily a one-way exchange of communication were found to have significantly different perceived levels of individual-to-organization collaboration (se= .127, $p< .05$). Additionally, there were significant differences between those relationships in which work-related information was not exchanged and those in which communication primarily consisted of exchanges both ways between the

parties were also found to have significantly different perceived levels of individual-to-organization collaboration (se= .099, p< .05). Finally significant differences in perceived levels of individual-to-organization collaboration were found between those relationships in which communication consisted primarily of one-way exchanges of information and those in which the exchange of communication was primarily bi-directional in nature (se= .094, p< .05).

The first network-based supporting hypothesis for H_7a states that the networks with higher levels of communication directionality will be associated with higher network density in the individual-to-organization perceived collaboration level network. Two sub-hypotheses are posited. The first states that higher-level communication directionality networks will be associated with increased levels of interconnectedness; the second posits that higher-level communication directionality networks will be associated with stronger relational ties (average level of perceived individual-to-organization collaboration).

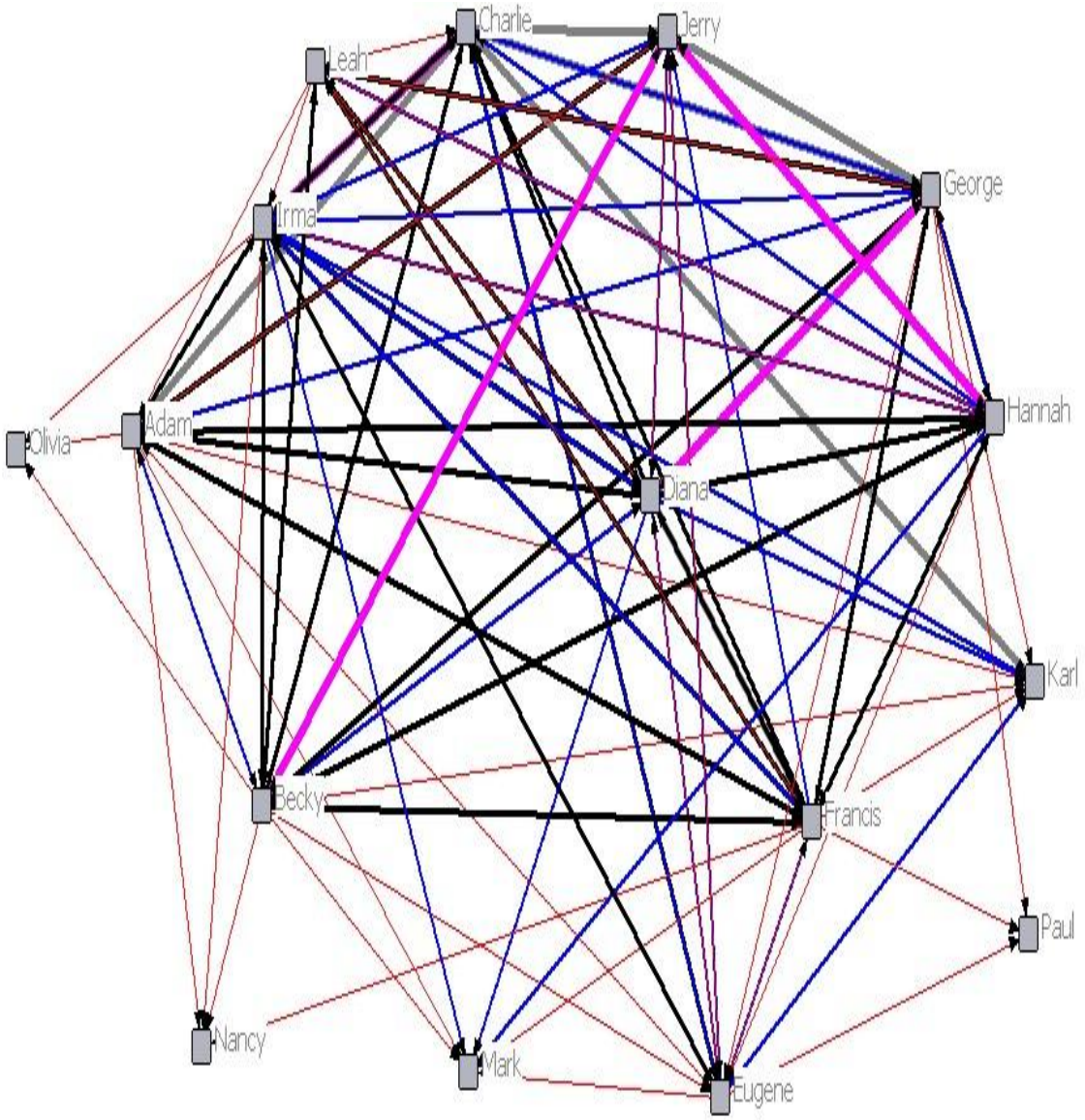
Testing of the first network-based sub-hypothesis associated with H_7a examines the number of links between organizations at each level of communication directionality. Figures 4.59- 4.62 provide visual representations of the numbers of inter-organizational ties present in the network, first presenting the total network map (Figure 4.59) and then for each of the communication directionality levels (Figures 4.60- 4.62). In terms of the level of interconnectedness in the overall individual-to-organization perceived collaboration level inter-organizational network (Figure 4.59), there were 136 relational ties present out of a possible 240 ties (56.67%). Examination of the network ties present in the communication directionality-based networks yielded the following

Figure 4.59: All Directions Individual-to-Organization Collaboration



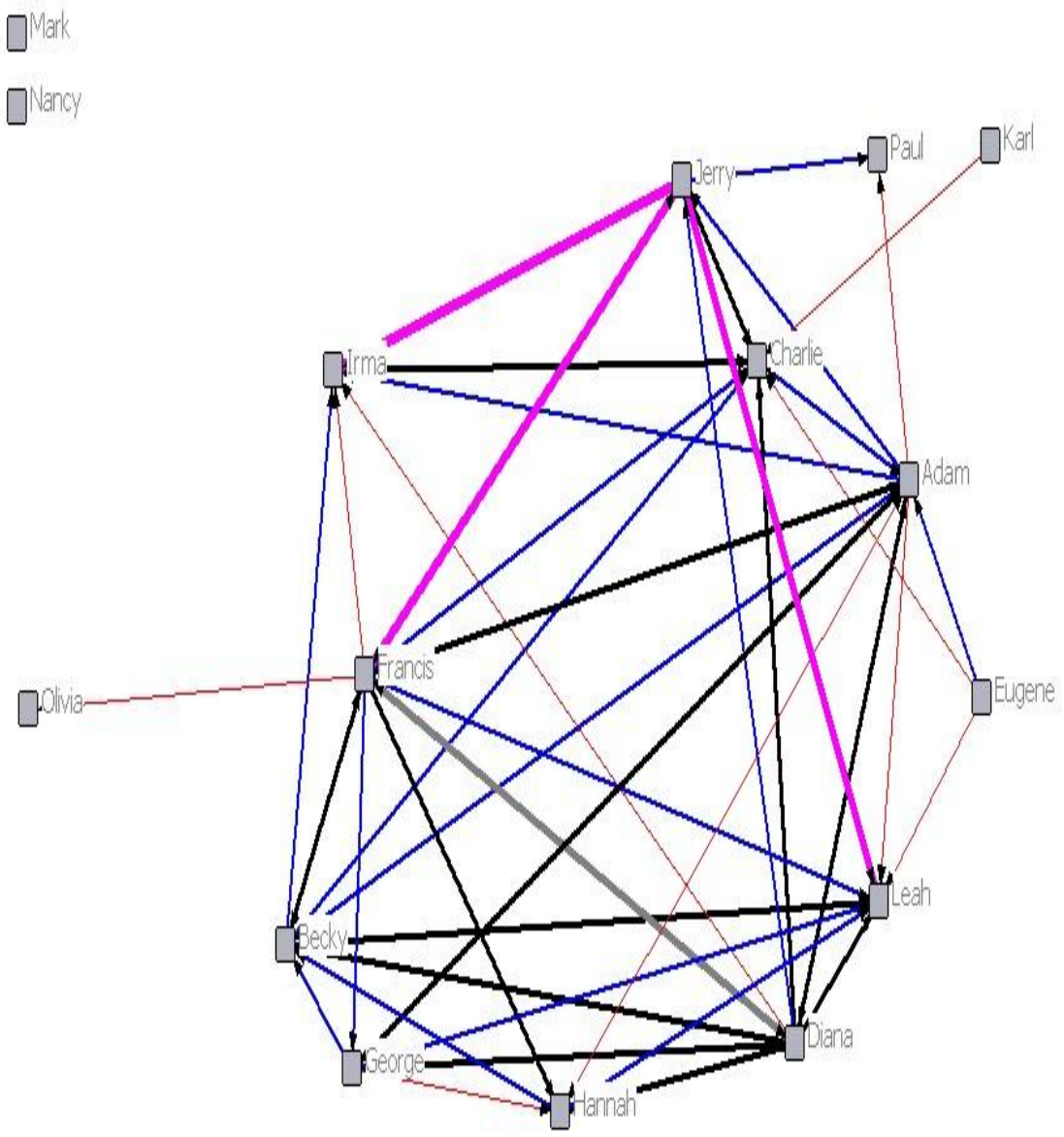
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Red = Networking	Gray = Coalition
Blue = Cooperation	Pink = Collaboration
Black = Coordination	

Figure 4.60: Cybernetic Individual-to-Organization Collaboration



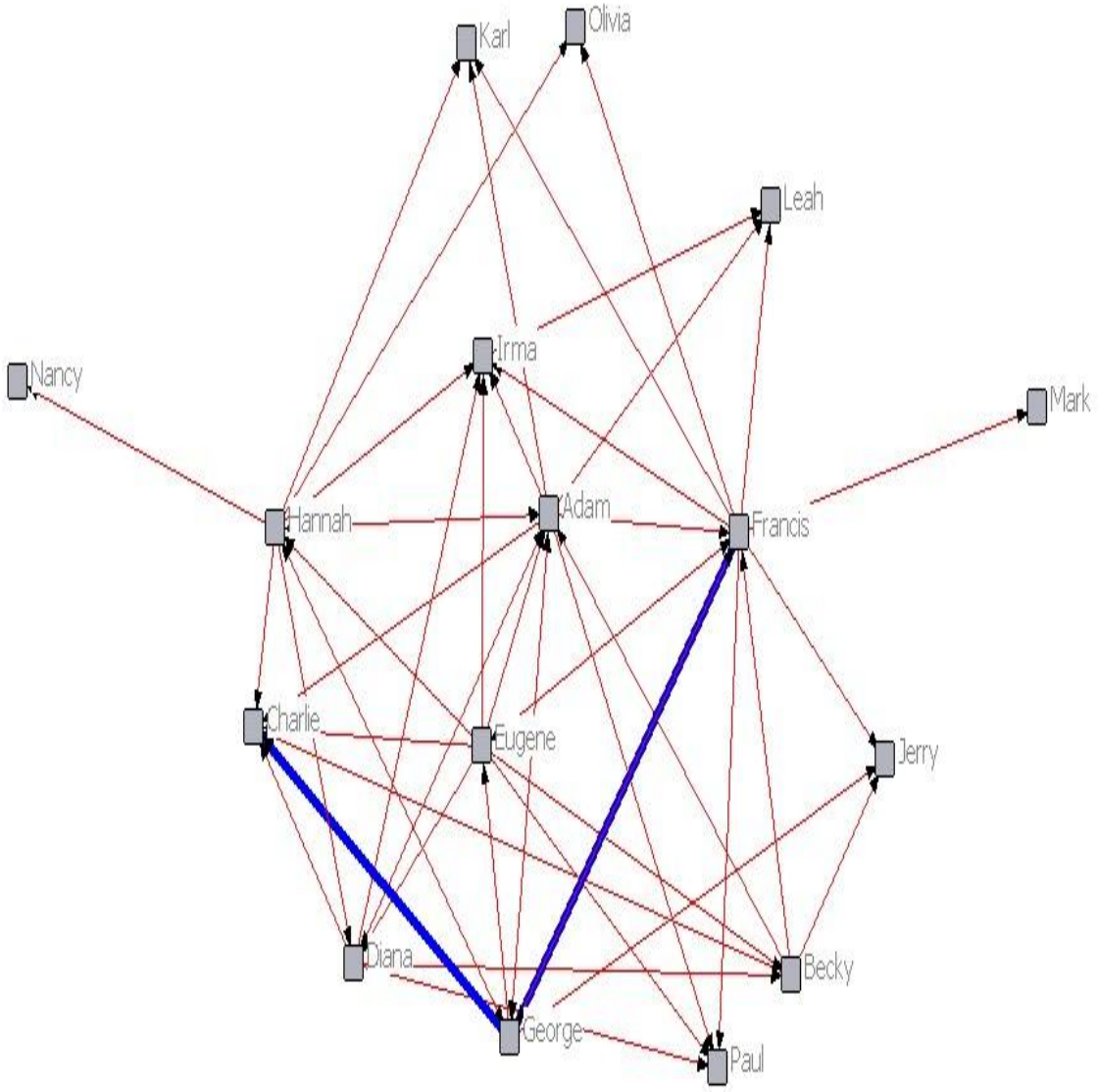
Legend	
Red = Networking	Gray = Coalition
Blue = Cooperation	Pink = Collaboration
Black = Coordination	

Figure 4.61: Unidirectional Individual-to-Organization Collaboration



Legend	
Red = Networking	Gray = Coalition
Blue = Cooperation	Pink = Collaboration
Black = Coordination	

Figure 4.62: Don’t Exchange Information Individual-to-Organization Collaboration



Legend	
Red = Networking	Gray = Coalition
Blue = Cooperation	Pink = Collaboration
Black = Coordination	

results: the cybernetic network (Figure 4.60) had 119 ties (49.58%), the unidirectional network (Figure 4.61) had 52 ties (21.67%), and the non-work related communication exchange network (Figure 4.62) had 50 inter-organizational ties (20.83%).

The second sub-hypothesis states that higher-level communication directionality networks will be associated with stronger relational ties in the individual-to-organization perceived collaboration level network. Testing of this second network-based sub-hypothesis examines the average number of links (tie strength) between organizations at each level of communication directionality. In terms of tie strength in the overall inter-organizational network (Figure 4.59), an average of 1.99 (networking/ cooperation) was calculated. Examination of the network ties present in the communication directionality-based networks yielded the following results: the cybernetic network (Figure 4.60) had an average of 2.09 (cooperation), the unidirectional network (Figure 4.61) had an average of 2.18 (cooperation), and the non-work related communication exchange network (Figure 4.62) had an average of 1.04 (networking).

The second network-based supporting hypothesis for H_7a states that the networks of higher-level communication directionality will be associated with higher levels of network structural performance. Again, two sub-hypotheses are posited. The first sub-hypothesis states that the higher directionality of communication exchange networks will have fewer isolates; the second states that the higher directionality of communication exchange networks will have greater levels of reciprocity.

The presence of isolates can be seen in the network maps already presented (Figures 4.59- 4.62). The total ties map (Figure 4.59) shows that there are no

organizational isolates in the overall network. The cybernetic network (Figure 4.60) also contains no isolates. The unidirectional communication network (Figure 4.61) has two isolates, while the non-work related communication network (Figure 4.62) also has no isolates. The pendant analysis shows that there are no pendants in the overall individual-to-organization perceived level of collaboration network, no pendants in the cybernetic communication network, 2 pendants in the unidirectional communication network (Karl and Olivia), and 2 pendants (Nancy and Mark) in the non-work exchange communication network. The combined isolation scores for each of the networks in the analysis was therefore calculated as being 0 for both the overall network and the cybernetic communication network, 6 for the unidirectional communication network, and 2 for the non-work exchange communication network.

The final supporting network-based sub-hypothesis for H_7a states that higher-level communication directionality networks will have higher levels of reciprocity. Visual representations of the reciprocal ties in the organizational tie network are presented in Appendix C as Figures C54-C57; the first figure (C54) presents the total network, while the proceeding maps (C55-C57) present the visualized data for each level of hierarchy tested. The reciprocity analyses conducted on each of these networks yielded the following results: the total network contains 56.32% reciprocal ties, the cybernetic network is 52.56% reciprocal, the unidirectional network contains 20.93% reciprocity, and the non-work related communication exchange network is 13.64% reciprocal in nature.

The one-tailed Spearman's rho correlation analysis for H_7b indicates that there is a very weak, positive, and statistically significant relationship between the richness of

channels selected for inter-organizational communication and perceived levels of organization-to-organization collaboration in the inter-organizational network (n= 642, rho= .249, p< .01). As in H_7a, the presence of an interval-level dependent variable enables further investigation into the relationship between the two variables utilizing the one-way ANOVA. The one-way ANOVA analysis indicated that significant differences existed between the levels of communication directionality in regard to perceptions of organization-to-organization collaboration though the effect size was relatively small ($F(2, 639)= 27.778$, $\eta^2= .080$, $p< .05$).

Of those relationships in which some form of communication contact was reported, those relationships in which there was primarily no exchange of work-related information communication channel reported the lowest average level of perceived organization-to-organization collaboration (m= 1.63, sd= .882). Relationships in which communication was primarily one-directional reported the second-to-lowest levels of perceived organization-to-organization collaboration (m= 2.49, sd= .997). Relationships in which communication consisted primarily of two-way exchanges reported the highest levels of perceived organization-to-organization collaboration (m= 2.77, sd= 1.323).

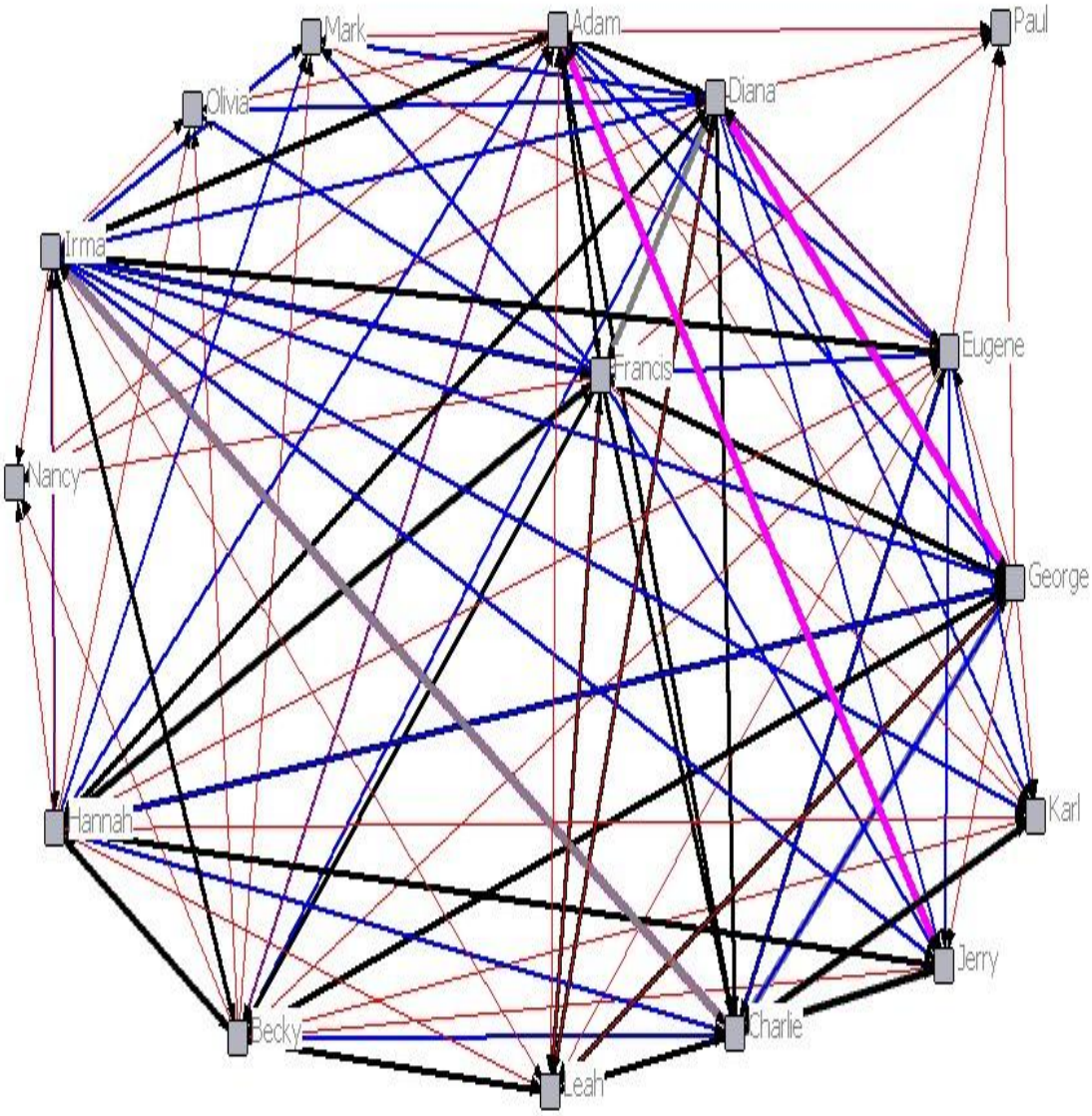
The Tukey's HSD analysis indicated that statistically significant differences existed between two of the three groups. Relationships in which work-related communication was not exchanged and those in which the communication was primarily one-directional were found to have significantly different perceived levels of organization-to-organization collaboration (se= .198, p< .05). Significant differences also existed between relationships in which work-related communication was not exchanged and those in which the communication was primarily two-directional (se=

.154, p< .05). No statistically significant difference was identified between those relationships in which communication was primarily one-way and those in which communication was primarily two-way in terms of perceived levels of organization-to-organization collaboration.

The first network-based supporting hypothesis for H_7b states that the networks containing higher levels of communication directionality will be associated with higher network density in the organization-to-organization perceived collaboration level network. Two sub-hypotheses are posited. The first states that higher-level communication directionality networks will be associated with increased levels of interconnectedness; the second posits that higher-level communication directionality networks will be associated with stronger relational ties (average levels of perceived organization-to-organization collaboration).

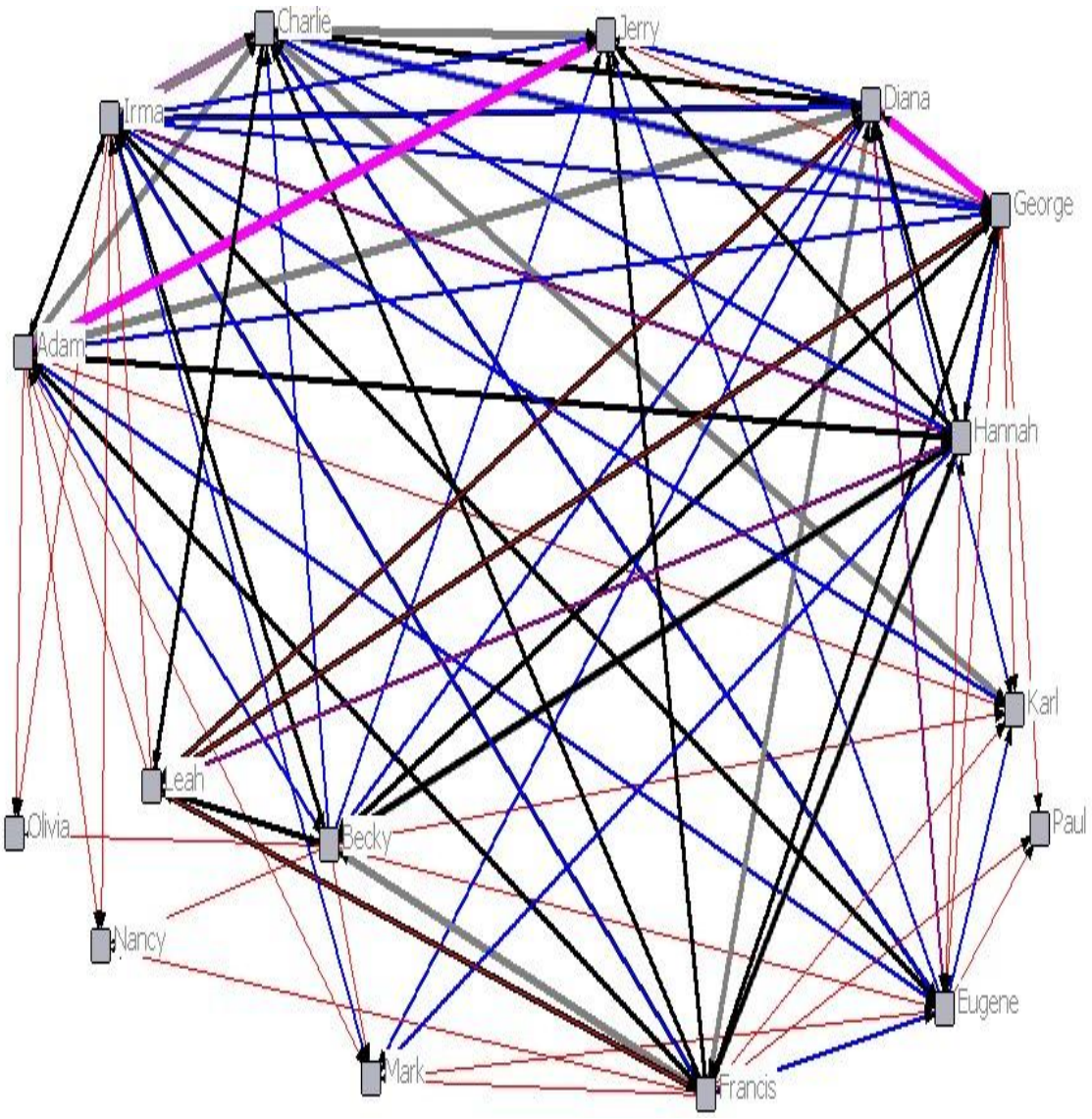
Testing of the first network-based sub-hypothesis associated with H_7b examines the number of links between organizations at each level of communication directionality. Figures 4.63- 4.66 provide visual representations of the numbers of inter-organizational ties present in the network, first presenting the total network map (Figure 4.63) and then for each of the communication directionality levels (Figures 4.64- 4.66). In terms of the level of interconnectedness in the overall organization-to-organization perceived collaboration level inter-organizational network (Figure 4.63), there were 129 relational ties present out of a possible 240 ties (53.75%). Examination of the network ties present in the communication directionality-based networks yielded the following results: the cybernetic network (Figure 4.64) had 114 ties (47.50%), the unidirectional

Figure 4.63: All Directions Organization-to-Organization Collaboration



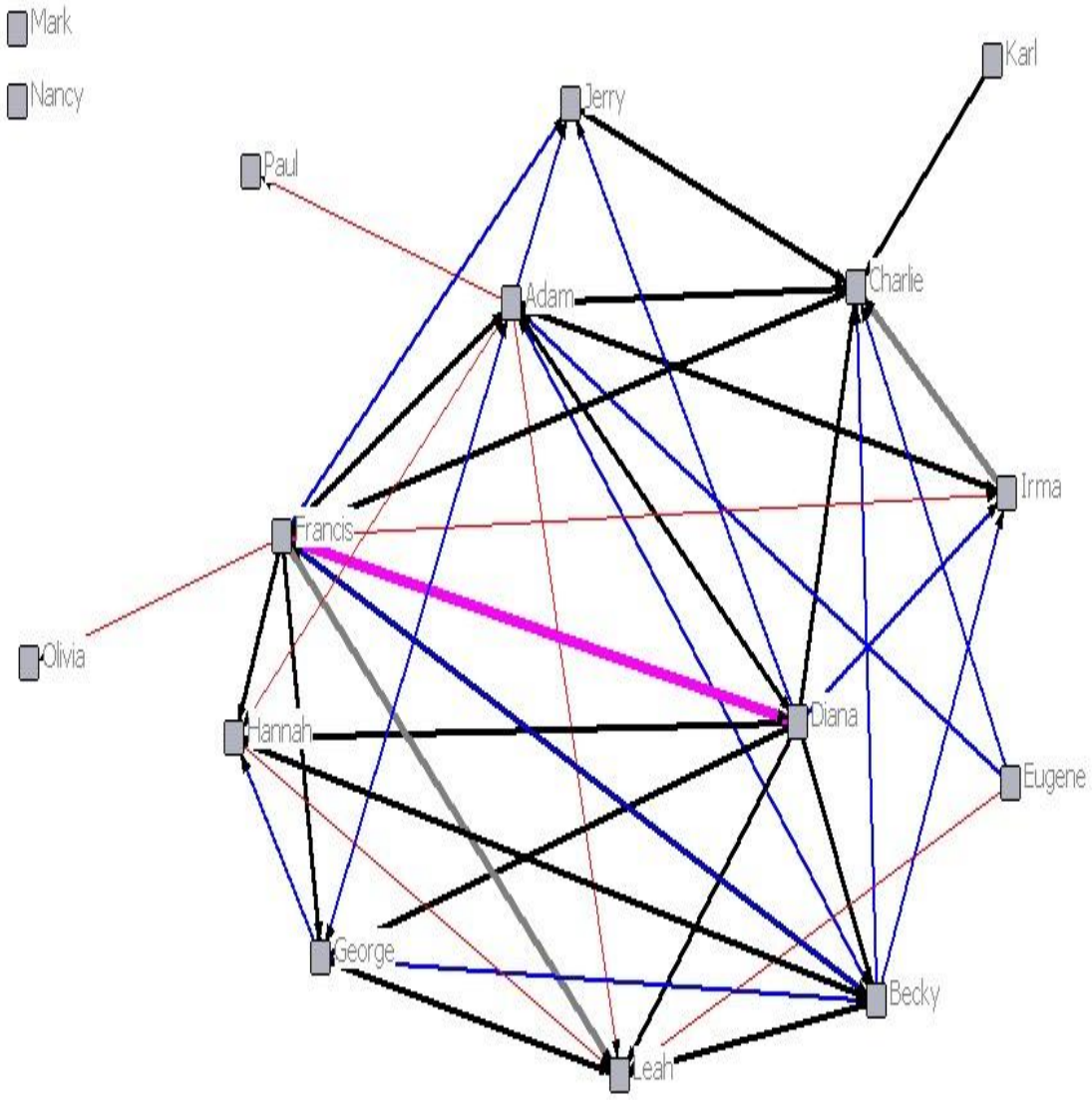
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Red = Networking	Gray = Coalition
Blue = Cooperation	Pink = Collaboration
Black = Coordination	

Figure 4.64: Cybernetic Organization-to-Organization Collaboration



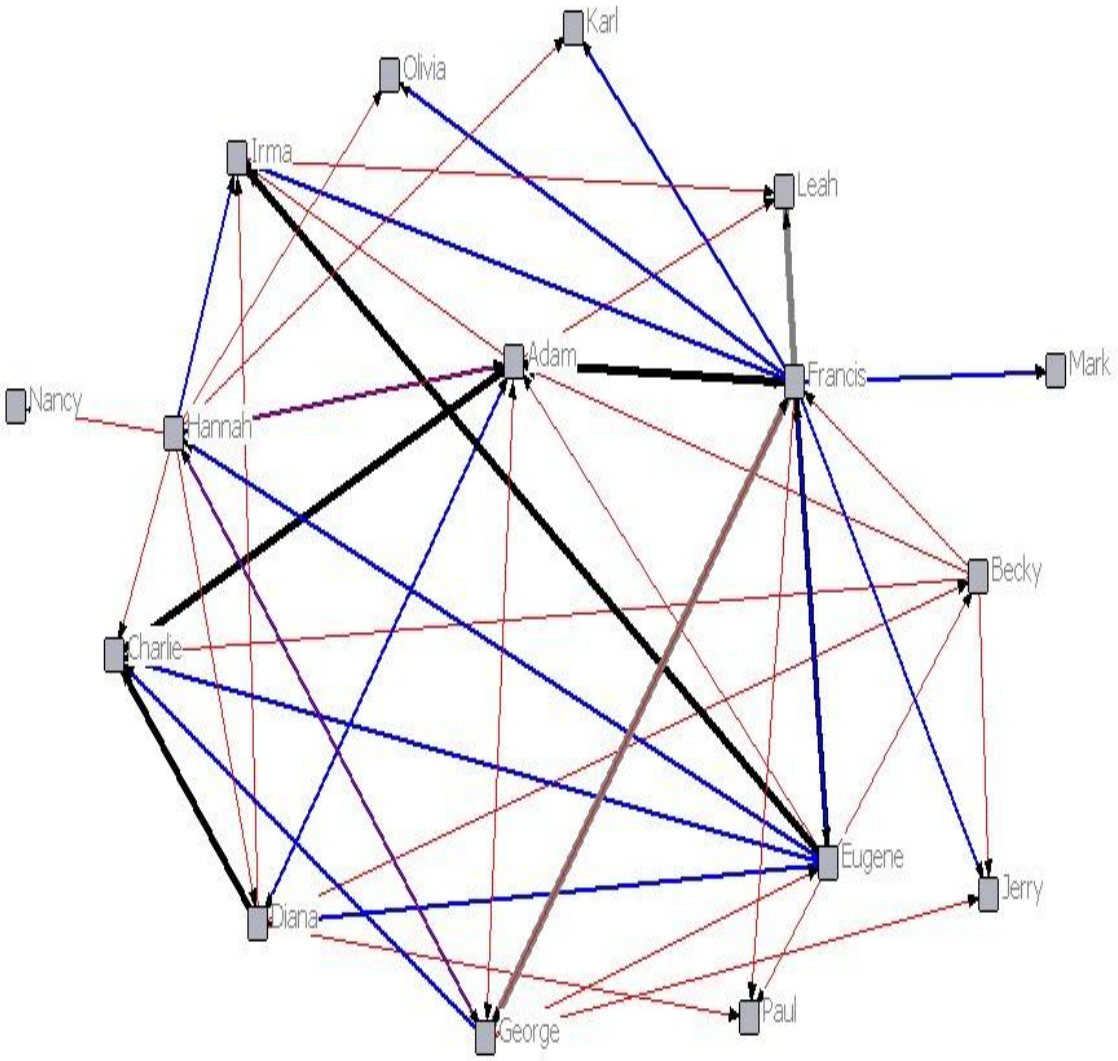
Legend	
Red = Networking	Gray = Coalition
Blue = Cooperation	Pink = Collaboration
Black = Coordination	

Figure 4.65: Unidirectional Organization-to-Organization Collaboration



Legend	
Red = Networking	Gray = Coalition
Blue = Cooperation	Pink = Collaboration
Black = Coordination	

Figure 4.66: Don’t Exchange Information Organization-to-Organization Collaboration



Legend	
Red = Networking	Gray = Coalition
Blue = Cooperation	Pink = Collaboration
Black = Coordination	

network (Figure 4.65) had 48 ties (20.0%), and the non-work related communication exchange network (Figure 4.66) had 48 inter-organizational ties (20.0%).

The second sub-hypothesis associated with H_7b states that higher-level communication directionality networks will be associated with stronger relational ties in the organization-to-organization perceived collaboration level network. Testing of this second network-based sub-hypothesis examines the average number of links (tie strength) between organizations at each level of communication directionality. In terms of tie strength in the overall inter-organizational network (Figure 4.63), an average of 2.08 (cooperation) was calculated. Examination of the network ties present in the communication directionality-based networks yielded the following results: the cybernetic network (Figure 4.64) had an average of 2.22 (cooperation), the unidirectional communication network (Figure 4.65) had an average of 2.32 (cooperation), and the non-work related communication exchange network (Figure 4.66) had an average of 1.58 (networking).

The second network-based supporting hypothesis for H_7b states that the networks of higher-level communication directionality will be associated with higher levels of network structural performance. Again, two sub-hypotheses are posited. The first sub-hypothesis states that the higher-level communication directionality networks will have fewer isolates; the second states that the higher-level communication directionality networks will have greater levels of reciprocity in the organization-to-organization perceived collaboration level network.

The presence of isolates can be seen in the network maps already presented (Figures 4.63- 4.66). The total ties map (Figure 4.63) shows that there are no

organizational isolates in the overall network. The network of cybernetic communication exchanges (Figure 4.64) also contains no isolates. The unidirectional communication exchange network (Figure 4.65) contains two isolates, and the non-work related communication exchange network (Figure 4.66) is also free of organizational isolates. The pendant analysis shows that there are no pendants in the overall perceived level of organization-to-organization collaboration network, no pendants in the cybernetic communication network, 3 pendants in the unidirectional communication network (Olivia, Paul and Karl), and 2 pendants (Nancy and Mark) in the non-work exchange communication network. The combined isolation scores for each of the networks in the analysis was therefore calculated as being 0 for both the overall network and the cybernetic communication network, 7 for the unidirectional communication network, and 2 for the non-work exchange based communication network.

The final supporting network-based sub-hypothesis for H_7b states that higher-level communication directionality networks will have higher levels of reciprocity in the organization-to-organization perceived collaboration level network. Visual representations of the reciprocal ties in the organizational tie network are presented in Appendix C as Figures C58-C61; the first figure (C58) presents the total network, while the proceeding maps (C59-C61) present the visualized data for each level of hierarchy tested. The reciprocity analyses conducted on each of these networks yielded the following results: the total network contains 48.28% reciprocal ties, the cybernetic network is 46.15% reciprocal, the unidirectional communication network contains

20.0% reciprocity, and the non-work related communication exchange network is 14.29% reciprocal in nature.

Research Question

As the final step in the statistical analysis, two linear regressions were conducted in order to explore possible answers to the research question posed in this study. The first linear regression examines the organizational and behavioral factors which impact perceptions of individual-to-organization collaboration levels, while the second analysis focuses on factors impacting perceptions of organization-to-organization collaboration. The analysis of the factors impacting collaboration perceptions at the individual-to-organization level was calculated using multiple linear regression. Using the variables of communication frequency, job function, communication channel richness, and directionality of communication flow, a significant linear regression equation was found ($F(5, 1188)= 690.027$, $p< .001$), with an R^2 value of .744 and an adjusted R^2 value of .743. While all of the variables enter into the regression equations, only two of the independent variables were found to be statistically significant predictors of perceived levels of individual-to-organization collaboration. The number of people communicated with in a network organization ($\beta= .197$, $p< .001$) and the frequency of communication activity ($\beta= .322$, $p< .001$) were found to be significant predictors of perceived individual-to-organization collaboration levels.

An analysis of the factors impacting perceived levels of collaboration at the organization-to-organization level was also conducted using a multiple linear regression equation. Using the variables of communication frequency, job function, communication channel richness, and directionality of communication flow, a

significant linear regression equation was found ($F(5, 508)= 37.178$, $p< .001$), with an R^2 value of .268 and an adjusted R^2 value of .261. With the exception of the channel richness variable, all of the other independent variables were found to be statistically significant predictors of perceived levels of individual-to-organization collaboration. The respondents function in their organization was found to be a significant though negative predictor of perceived levels of organization-to-organization collaboration ($\beta= -.118$, $p< .05$). Positive predictors of perceptions concerning organization-to-organization collaboration included the directionality of communication activity ($\beta= .224$, $p< .001$), the number of people communicated with from member organizations ($\beta= .135$, $p< .05$), and the frequency of communication activity ($\beta= .316$, $p< .001$).

The responses to the open-ended questions of the survey instrument provide additional insight into participant's feelings regarding the organizational network's efforts to foster proximity as a means of collaboration as well as their perceptions concerning the effectiveness of those efforts. Respondents were asked to provide feedback as to what extent the co-location of the organizations had affected their connections with other organizations in the network, to what extent their organization's collaboration with other network organizations had been impacted by the co-location, and what could be done to further improve collaboration between the member of the organizations and the organizational entities in the inter-organizational network. The responses summarized below are representative of the responses obtained to each of these open-ended questions.

When asked how the co-location of the organizations in the network had impacted their personal levels of collaboration with other member organizations, the

responses generated seem to be classifiable into four groups: those that perceived little to no impact on collaboration, those that perceived positive impacts from the co-location, those that perceived the co-location to have had negative impacts on collaboration, and those responses in which there was a mixture of positive and negative perceptions.

Responses reflecting little to no impact on collaboration included "[i]t hasn't", "[n]one", "[t]here is not too much change, most people stick within their organization", and "[t]he change has been slight. [m]aybe more casual contact but little impact on my actual job function or performance". One particularly informative response in this vein was "[p]ersonally, not much at all. [i]t has essentially eliminated the drive from our old office, but hasn't changed the frequency or quality of communications".

Responses which asserted that the co-location had a positive impact on collaboration included: "I believe communication has increased especially interpersonal interactions", "[t]he move has increased my awareness of the other groups and what they do, and has made communication more convenient (especially face-to-face)", "networking has seemed to increase 100%", "[o]verall, there is much more direct communication/networking…", "…[t]his has lead to some collaborations which I believe wouldn't have been possible without the [shared campus]", and "[m]oving to the [shared campus] has greatly enhanced our communication in the [area of mutual interest] community…". A final quote from this group of responses perhaps best summarizes their character:

"It has made interacting with people from other organizations much easier. When organizations [sic] were in separate buildings, communication other than

email or phone had to be planned and was infrequent. Now communication and interaction is much easier, because one can easily go to another office and research facilities can be readily shared. Consequently, communication, planning, and collaborative research are all considerably enhanced…"

These positive responses would seem to support the arguments asserting the effectiveness of establishing proximity as a means of enhancing communication, and many of the responses provided reflected a generally positive perception of the co-location's impact on collaboration between the individuals and the other organizations in the network.

On the proverbial flip side of the coin, there were also a large portion of the responses which indicated that collaboration between themselves and other organizations had been negatively impacted by the co-location process. Responses reflecting a negative perception included: "[i]t has decreased it significantly", "I have made zero new contacts as a result of moving to the [shared campus]… my communication/networking with other organizations in the [shared area of interest] community has DECREASED…", "[c]loser proximity to organizations, but effort both ways for communication has changed very little", "[i]t has actually made it less… I feel we have less communication and sharing of ideas", and "[i]t changed communication a great deal. [g]enerally speaking, I see people less often…".

Several of the respondents provided more detailed information concerning what particular facets of the co-location had had a negative impact on their ability to collaborate. These specific factors included a decreased in scheduled meetings, Issues with the security systems of the buildings at the co-location causing barriers between

groups, the lack of communal kitchens, washrooms, and coffee machines (now being separated by floors and/or buildings), and feelings that the new location had resulted in the organizations being "put in its own box or corner of the building".

The final category of responses given in response to the question concerning individual contact with other organizations in the network as a result of the co-location were those that were mixed, identifying both positive and negative impacts on collaboration due to the co-location. Generally, these responses acknowledged the opportunities for increased communication with members from other organizations, but framed those interactions as potential or real disruptions to productivity. Respondents in this general category discussed how accomplishing tasks took longer (especially non-work tasks such as restroom breaks, traveling to and from meal breaks, etc.) due to increased stops to converse with members of other organizations. While acknowledging that there were inconveniences caused by the co-location in terms of productivity and time, most of the respondents in this category either expressed that the benefits to collaboration outweighed the inconveniences or indicated that they treated the delays or productivity losses as subject matter for humor.

Responses to the second open-ended question were (unsurprisingly) similar to the responses to the first question in terms of basic themes and attitudinal representations; once again, comments could be found in the neutral, positive, negative, and mixed varieties in relation to how co-location had impacted organization-to-organization collaboration. Rather than dwelling on exemplars from these already-discussed themes, attention in the description of responses to the second question will

focus on highlighting those comments which provided new insights specific to organization-to-organization collaboration factors.

Most of the comments in response to the second open-ended question reflected a generally positive perception of the impact of co-location on organization-to-organization collaboration, common themes included convenience of interaction, opportunities for informal communication, and increased awareness of what other organizations did (leading to explorations of mutual interest areas between organizations and collaborative efforts in the area of mutual interest). In other words, one of the benefits of co-location can be described as having a positive impact on the transfer of knowledge between organizations and the accumulation of knowledge about other organizations. As one respondent stated,

> "More people in the [shared area of interest] community know who [organization name] is now. Previously, administrators might attitudes have been familiar with us. Now, more personnel are familiar with who we are, what our mission is, and how we might be able to collaborate together in the future".

Of course, this response was not indicative of the whole response set. Several of the respondents indicated that the impact on actual collaboration had been negligible, though the co-location had increased the speed of communication; stating that:

> "My organization has continued to interact with mainly the same … organizations that we did prior to moving into the [shared campus]. So, other than potential for faster contact with these organizations due to the proximity of

the individuals, I haven't seen a strong indicator of the move being a positive for improved communication/networking".

Another fairly common theme in response to the second open-ended question concerned perceptions that co-location's impacts had been largely concentrated in the higher levels of the organizational hierarchies. Responses from those in lower status positions commonly reported that they either were not sure how organization-to-organization communication had been impacted, that they assumed communication between organizations had improved, or that they perceived it to be an administrative (i.e. upper-level management) issue. As one respondent stated:

> "It did have a favorable effect on communication and networking, but the improvement was not as great as on an individual level, because the administrative folks in the various organizations have been meeting together regularly for quite a while".

A final interesting response to the second open-ended question illustrates that even when collaborative conditions are created, individual factors relative to commitment and workload determine collaborative inclusion and success. What is especially interesting in this response is that it raises the concern of collaborative overload, which is perhaps related to the concept of communication overload utilized in the hypotheses tested in this study. The respondent stated that:

> "The opportunities for collaboration have definitely created a learning curve. At first, I was talking to the new neighbors in the building and coming up with so many ideas it was overwhelming. Yet, you begin to filter out what is possible

and also who is really dedicated to the collaboration and the idea. From this experience, I have been able to identify a core group of dedicated collaborators who follow through rather than just talk about potential projects. However, others have also discovered these dedicated collaborators so they are usually overwhelmed with requests to be on other teams and projects".

The third open-ended question asked participants to provide feedback as to what could be done to further improve collaboration in the inter-organizational network. Responses to this question can be categorized into four general themes: informal and formal communication opportunities, formal communication structures, addressing cultural difference issues, and improving organizational leadership.

While a few of the respondents shared opinions that there needed to be more formal channels of communication (inter-organizational newsletters, group meetings, mass e-mails, etc.), a truly dominant theme was the desire for more opportunities for informal communication and socialization opportunities. These responses included statements such as "…morning tea was a great idea…", "…[m]ore social function…", "[b]ring back the Sundae on Monday!", "I would like to see a social mixer…", and the like. Additionally, respondents indicated that they desired centralized kitchens, eating spaces and break areas, as well as informal meetings and informal seminars. These responses clearly indicate that one of the collaboration factors of perceived importance to individuals involves a concentration opportunities for informal, social interactions.

Respondents also perceived that there was disconnect in collaboration between some of the organizations in the network due to cultural differences between the

organizations. One respondent stated that "… the "cultural differences" between the [academic unit] folks and the [government agency] unit folks (not [organization name]) are immense. Almost like a liberal vs. conservative environment". A second response in this same vein noted that "… there are significant differences between the cultures of the [academic unit] groups and the [government agency] groups, probably owing to the different core missions".

The final theme appears to offer possible paths for finding solutions to the cultural differences mentioned in the above paragraph. Specifically, respondents called for a focus on increased effectiveness of organizational leadership. Responses in this vein included comments such as "[h]ave the leaders of the organizations on the same page", "[t]he organization leaders should share more information about important activities going on in their units", "be more supportive/ encouraging of employees attending seminars", "[s]tabilize agency funding so that employees have time to interact", and the need for leaders to make "… a more concentrated effort to get feedback from…" other organizations in the network. It is interesting and perhaps significant (in light of the arguments of this study concerning the centrality of communication in collaborative success) to note that many of these critical comments concerning leadership focused on greater communication efforts; either in terms of communicating information throughout their organization or in terms of more effectively communicating about their organization to other organizations in the network.

Chapter V

Discussion

Summary of Findings

Based on Deetz' (1992) arguments concerning managerialism, the first hypothesis proposed that an individual who is located in higher-level positions of their organization's hierarchy will have more inter-organizational network communication linkages than those in lower-level positions in the bureaucratic structure of their organization. This hypothesis was tested using a Spearman's rho to calculate the relationship between the two variables in the hypothesis as well as a one-way ANOVA with a Tukey's HSD post-hoc test to explore the specific nature of the relationships between them. The first hypothesis was found to be supported by the data from this study, though at a moderate level. The support for this hypothesis suggests that those with higher positions in their organization's hierarchy do maintain communication links with more organizations in the network than those in lower level positions in their organizations.

The network map analysis conducted in association with H_1 consisted of two supporting hypotheses, each of which contained two sub-hypotheses for testing. The first network-based hypothesis offered in support of H_1 stated that the communication linkage networks of those in higher positions in an organizational hierarchy would be denser than the networks of those in lower positions in an organizational hierarchy. The sub-hypothesis stating that the networks of those in higher-level positions would be more interconnected than the networks of those in lower positions was supported by the

data collected in this study; the sub-hypothesis stating that the networks of those in higher-level positions would be associated with increased tie strength as compared to the networks of those in lower-level positions was not supported. The data from this study appears to indicate that increased hierarchical position in an organization impacts the number of network organizations an individual is connected with, but does not appear to impact the structure of one's inter-organizational network in terms of the number of people each organization with which an individual communicates.

The second supporting network-based hypothesis offered for H_1 states that the networks of those in higher positions in their organization's hierarchy will have indications of increased network performance as compared to the networks of those in lower-level positions. The first sub-hypothesis states that higher-level networks will have fewer isolates and pendants; this hypothesis was not supported by the data from this study. The second sub-hypothesis states that higher-level networks will have increased levels of relationship reciprocity; this hypothesis was supported by the data.

Overall, the findings associated with the first hypothesis posited in the study indicate that those employees who are in higher levels of their organizations hierarchy do maintain relationships with more organizations in an inter-organizational network. While the data did not appear indicate a relationship between either tie strength or isolation level in relation to the communication linkage networks and hierarchical positions, the networks of those in higher level positions were found to be more interconnected and to contain more reciprocal relationships than the communication linkage networks of those in lower level positions. The supported findings associated

with H_1 indicate there is a managerial bias present in the inter-organizational communication linkage network. Further, the managerial bias also appears to have an impact on network interconnectedness and relationship reciprocity.

The second hypothesis was also based on arguments provided by Deetz (1992) concerning managerialism, proposing that an individual who is located in higher-level positions of their organization's hierarchy would have increased levels of communication activity as compared to individuals in lower-level positions within their organizations hierarchy. Two sub-hypotheses were used to test this proposed relationship. The first sub-hypothesis proposes that an individual who is located in higher-level positions of their organization's hierarchy will have increased levels of communication frequency with other network organizations. The first sub-hypothesis was tested using the Spearman's rho statistic to determine level of correlation between the variables, and cross-tabulations were run to determine the specific nature of the relationship (selected as appropriate due to the ordinal nature of both variables in the hypothesis). The second sub-hypothesis for H_2 proposes that an individual who is located in higher-level positions of their organization's hierarchy will communicate with more people from other network organizations. As was the case with the first sub-hypothesis, this sub-hypothesis was tested using Spearman's rho for calculating the correlation between the two variables, while cross-tabulations were utilized to provide in-depth information concerning their relationship to one another.

Statistically significant results were obtained from the correlation analysis for both of the sub-hypotheses associated with the second main hypothesis, though the

association between the two variables was small. Both the correlation and the more detailed cross-tabulation analysis indicated that the relationships between the independent and dependent variables ran in the hypothesized direction. Though the small levels of association make the conclusions for this hypothesis tentative, the study does provide evidence that those in higher positions in their organizational hierarchy do maintain greater levels of communication activity than those in lower levels in the organizational hierarchy.

The network map analyses associated with H_2a posited two supporting hypotheses, each consisting of two sub-hypotheses that were subjected to testing. The first network-based supporting hypothesis for H_2a states that the communication frequency networks of those in higher-level organizational positions will be associated with increased network density as compared to the networks of those in lower-level positions. The first sub-hypothesis for H_2a_1 states that the higher-level communication frequency networks will have higher levels of interconnectedness; the data from the study supports this sub-hypothesis. The second sub-hypothesis for H_2a_1 states that higher-level communication frequency networks will have increased tie strength as compared to the communication frequency networks of those in lower-level positions. This sub-hypothesis was not supported by the data from the study; the pattern of decreasing levels of tie strength in the communication frequency networks was partial and interrupted by a higher-than anticipated level of tie strength in the networks of the technical/administrative employees.

The second network-based hypothesis supporting H_2a states that the communication frequency networks of those in higher levels in their organizational hierarchy will be associated with indicators of increased network performance. The first sub-hypothesis associated with H_2a_2 states that the communication frequency networks of those in higher-level positions will be associated with fewer isolates and pendants than the networks of those in lower-level positions; this sub-hypothesis was not supported by the data. While it appears that the relationship does seem to generally run in the hypothesized direction, the pattern is broken by the student researcher network, which has a lower overall isolation score than the technical/ administrative employee network. The second sub-hypothesis associated with H_2a_2 states that the higher-level communication frequency networks will be associated with increased levels of relationship reciprocity; this sub-hypothesis was not supported by the data. As was the case with H_2a_1b, the reciprocity data seemed to run in the hypothesized direction with the exception of the communication frequency network of the technical/ administrative employees.

The network map analyses associated with H_2b is similar to the network analysis conducted in association with H_1 and H_2a; two supporting hypotheses are posited, each consisting of two sub-hypotheses that were subjected to testing. The first network-based supporting hypothesis for H_2b states that the networks measuring the number of people communicated with for those in higher-level organizational positions will be associated with increased network density as compared to the networks of those in lower-level positions. The first sub-hypothesis for H_2b_1 states that the higher-level number of

people communicated with networks will have higher levels of interconnectedness; the data from this study supports this sub-hypothesis. The second sub-hypothesis for H_2b_1 states that higher-level number of people communicated with networks will have increased tie strength as compared to the networks of those in lower-level positions; this sub-hypothesis was not supported by the data from the study.

The second network-based hypothesis supporting H_2b states that the network measuring the number of people communicated with for those in higher levels in their organizational hierarchy will be associated with indicators of increased network performance. The first sub-hypothesis associated with H_2b_2 states that the networks of those in higher-level positions will be associated with fewer isolates and pendants than the networks of those in lower-level positions; this sub-hypothesis was not supported by the data. As with the related sub-hypothesis from H_2a, the relationship does appear to generally run in the hypothesized direction with the exception of the student researcher network, which again produced a lower overall isolation score than the network of the technical/ administrative employees. The second sub-hypothesis associated with H_2b_2 states that the higher-level communication frequency networks will be associated with increased levels of relationship reciprocity; this sub-hypothesis was not supported by the data. As was the case with H_2a_1b, the reciprocity data seemed to run in the hypothesized direction with the exception of the communication frequency network of the technical/ administrative employees.

The overall findings associated with the second hypothesis proposed in the study indicate that those employees who are in higher levels of their organizations hierarchy

do maintain both more frequent levels of inter-organizational communication activity and inter-organizational relationships with greater numbers of people the networks of those in higher level positions; the networks of higher-level employees were also found to be more interconnected than the communication activity networks of those in lower level positions in both of the communication activity (frequency or number of people) networks. The data did not appear indicate a relationship between tie strength, isolation level or relationship reciprocity in relation to either of the communication activity networks and hierarchical positions; however, there does appear to be partial support for the hypotheses related to tie strength in the communication frequency network and in terms of reciprocity in both of the communication activity networks. In the cases of these three sub-hypotheses, only the technical/ administrative employee networks produced measures that ran contradictory to the hypothesized relationships; this may be indicative of a need to either adjust or clarify to the survey instrument and will need to be further examined in future research.

The third hypothesis, also drawing from the arguments made by Deetz (1992) proposes that an individual who is located in higher-level positions of their organization's hierarchy will perceive higher levels of collaboration with other network organizations than those in lower positions in the organizational hierarchy. As was the case with the second hypothesis, two sub-hypotheses were utilized in the analysis.

The first sub-hypothesis contains the proposition that an individual who is located in higher-level positions of their organization's hierarchy will perceive higher levels of individual-to-organization collaboration with other network organizations.

Spearman's rho was again utilized as the preferred statistic for measuring correlations, with a one-way ANOVA and post-hoc analysis utilizing Tukey's HSD used to provide specific insights concerning the nature of the relationships. The second sub-hypothesis associated with H_3 proposes that an individual who is located in higher-level positions of their organization's hierarchy will have higher levels of perceived organization-to-organization collaboration than those in lower levels of the organization's hierarchy. Spearman's rho was again utilized as the preferred statistic for measuring correlations, with a one-way ANOVA and post-hoc analysis utilizing Tukey's HSD were used to provide specific insights concerning the nature of the relationships.

Statistically significant results were obtained from the correlation analysis for both of the sub-hypotheses associates with the third hypothesis, though the association between the two variables was small in both of these hypotheses. Both the correlation and the more detailed cross-tabulation analysis indicated that the relationships between the independent and dependent variables ran in the hypothesized direction for the sub-hypothesis concerning perceptions of individual-to-organization collaboration. Contrary to the relationship proposed in the second sub-hypothesis associated with H_3, the evidence from this study found that there is a negative relationship between position in the organizational hierarchy and perceptions of organization-to-organization collaboration.

Though the small levels of association make the conclusions for this hypothesis tentative, the study does provide evidence that those in higher positions in their organizational hierarchy do perceive that they maintain higher levels of inter-

organizational collaboration on the individual-to-organization level. The negative relationship found between hierarchical position and perceived levels of organization-to-organization collaboration ran contrary to the direction proposed, perhaps not surprisingly so. Explanation for this finding could be derived from the argument that those in lower positions in the organizational hierarchy may perceive that collaboration between their organization and other organizations in the network at hierarchical levels above their own, while those in high positions in the organizational hierarchy may perceive that their collaborative efforts at inter-organizational relationships are not reflected throughout their organization. both in terms of the frequency of communication activity with members of other organizations in the inter-organizational network and in terms of the number of people from the other organizations with which higher-level organizational members have contact in the inter-organizational relationships. Based on this supposition, it is clear that more research is required in order to fully explain the relationships between the variables examined in this hypothesis.

The network map analyses associated with H_3a is similar to the network analysis conducted in the previous hypotheses; two supporting hypotheses are posited, each consisting of two sub-hypotheses that were subjected to testing. The first network-based supporting hypothesis for H_3a states that the networks measuring perceived levels of individual-to-organization collaboration for those in higher-level organizational positions will be associated with increased network density as compared to the networks of those in lower-level positions. The first sub-hypothesis for H_3a_1 states that the higher-

level individual-to-organization collaboration level networks will have higher levels of interconnectedness; the data from this study supports this sub-hypothesis. The second sub-hypothesis for H_3a_1 states that higher-level individual-to-organization collaboration level networks will have increased tie strength as compared to the networks of those in lower-level positions; this sub-hypothesis was not supported by the data from the study. As with the previous unsupported hypotheses, the exception to the hypothesized direction for the relationships was found in the networks of the technical/ administrative employees.

The second network-based hypothesis supporting H_3a states that the network measuring perceived levels of individual-to-organization collaboration for those in higher levels in their organizational hierarchy will be associated with indicators of increased network performance. The first sub-hypothesis associated with H_3a_2 states that the networks of those in higher-level positions will be associated with fewer isolates and pendants than the networks of those in lower-level positions; this sub-hypothesis was not supported by the data. As with the previous isolation-based hypotheses associated with H_2, the exception to the hypothesized direction of the relationships was found in the student researcher network, which again produced a lower overall isolation score than the technical/ administrative employee network. The second sub-hypothesis associated with H_3a_2 states that the higher-level individual-to-organization collaboration level networks will be associated with increased levels of relationship reciprocity; this sub-hypothesis was not supported by the data. As was the case with the previous unsupported reciprocity-based hypotheses, the reciprocity data

seemed to run in the hypothesized direction with the exception of the communication frequency network of the technical/ administrative employees.

The network map analyses associated with H_3b are similar to the network analysis conducted for the previous network-based hypotheses; two supporting hypotheses are posited, each consisting of two sub-hypotheses that were subjected to testing. The first network-based supporting hypothesis for H_3b states that the networks measuring perceived levels of organization-to-organization collaboration for those in higher-level organizational positions will be associated with increased network density as compared to the networks of those in lower-level positions. The first sub-hypothesis for H_3b_1 states that the higher-level networks will have higher levels of interconnectedness; the data from this study supports this sub-hypothesis. The second sub-hypothesis for H_3b_1 states that higher-level networks will have increased tie strength as compared to the networks of those in lower-level positions. This sub-hypothesis was not supported by the data from the study; the relationship is linear, but runs in the opposite direction from that which was hypothesized.

The second network-based hypothesis supporting H_3b states that the network measuring perceived levels of organization-to-organization collaboration for those in higher levels in their organizational hierarchy will be associated with indicators of increased network performance. The first sub-hypothesis associated with H_3b_2 states that the networks of those in higher-level positions will be associated with fewer isolates and pendants than the networks of those in lower-level positions; this sub-hypothesis was not supported by the data. While the relationship seems to generally run

in the hypothesized direction, once again the student researcher network produced a lower overall isolation score than the network of technical/ administrative employees. It is worth noting, however that in the case of H_3b_2a the disparity between the isolation of the student research network and the network of technical/ administrative employees was greatly reduced as compared to the results in the previous isolation-based hypotheses. The second sub-hypothesis associated with H_3b_2 states that the higher-level organization-to-organization collaboration level networks will be associated with increased levels of relationship reciprocity; this sub-hypothesis was not supported by the data. As was the case with H_2a_1b, the reciprocity data seemed to run in the hypothesized direction with the exception of the network of the technical/ administrative employees.

The overall findings associated with the third hypothesis indicate that those employees who are in higher levels of their organizations hierarchy do perceive higher levels of individual-to-organization collaboration than those employees in lower-level positions; contrary to the hypothesized relationship, it was found that higher positions in an organizational hierarchy generally resulted in a lower perceived level of organization-to-organization collaboration (though the relationship was not completely linear). The networks of higher-level employees were also found to be more interconnected than the networks of those in lower level positions in both of the perceived collaboration level (individual-to-organization and organization-to-organization) networks. The data did not appear indicate a relationship between tie strength, isolation level or relationship reciprocity in relation to either of the perceived

collaboration level networks and hierarchical positions. The technical/ administrative employee networks produced contrary results in the tie strength and relationship reciprocity sub-hypotheses in the individual-to-organization network as well as in the relationship reciprocity measure in the organization-to-organization network. In the cases of these three sub-hypotheses, this may be indicative of a need to either adjust or clarify to the survey instrument and will need to be further examined in future research. In the organization-to-organization perceived collaboration level network the tie strength measure ran opposite to the hypothesized direction.

Overall, the findings associated with the first three hypotheses in this study seem to indicate that one's position in their organization's hierarchy has a significant impact on both levels of inter-organizational communication as well as on perceptions of individual-to-organization and organization-to-organization collaboration. Further, the network analyses associated with the first three hypotheses seem to indicate that the networks of those in higher-level positions generally demonstrate measureable advantages in terms of interconnectedness and reciprocity; there is partial evidence that network tie strength may also me impacted by an individual's position in their organization's hierarchy. The evidence from this study therefore lends further support to the arguments made by Deetz (1992) concerning the concentration of power in the higher-level managerial class, while at the same time expanding on Deetz' work by looking at how these factors influence inter-organizational networking activities in relation to efforts at collaboration and by providing evidence that managerial biases

impact inter-organizational communication networks in terms of both network structure and network performance indicators.

Having examined the hypotheses related to the arguments concerning managerialism, the next four hypotheses seek to examine the specific boundary-spanner behaviors that impact collaborative efforts, drawing on those theories concerning boundary spanners, media richness, and media selection described in the literature review. Specifically, H_4 and H_5 seek to explore how increases in inter-organizational communication activity impact choices in communication channels and the level of between-party flow of communication. Following from those hypotheses, H_6 and H_7 seek to provide explanation as to how the communication outcomes derived from H_4 and H_5 impact perceptions concerning inter-organizational collaboration at the individual-to-organization and organization-to-organization level.

The fourth hypothesis examined in this study proposes that increased individual-to-network inter-organizational communication activity will be associated with decreased richness in communication channel selection. Two sub-hypotheses are posited in relation to H_4; the first stating that increases in the frequency of communication activity will result in decreased levels of communication channel richness, and the second stating that increases in the number of people communicated with from another organization will result in the selection of less rich channels for communication. Spearman's rho was utilized to measure the correlation between the two variables in both sub-hypotheses, while crosstabulation tests were used to provide for a more in-depth analysis.

The analyses of the sub-hypotheses associated with H_4 indicated that there were very strong associations between the independent and dependent variables; however, it was found that the relationships run on the opposite directions of those proposed. Increases in both frequencies of inter-organizational communication and in the number of people from other organizations communicated with resulted in the selection of more rich channels for communication, with very high levels of face-to-face interaction for those relationships in which levels of communication activity were high. Based on the evidence found for the sub-hypothesis, there appears to be support for the importance of communication activity level in determining communication channel richness; however, there is an overall lack of support for the direction of that relationship as hypothesized.

As was the case with the contrary-to-proposed findings in the third hypothesis, it is possible that an explanation for the indicated direction of the relationships between the variables utilized in H_4 can be found. In the case of this hypothesis, it is perhaps likely that the proximity of the organizations in the study has had a significant impact on promoting the use of communication channels that are richer despite the potentially straining factors associated with increased communication that might lead to the selection of less rich mediums for communication. As was also the case with the findings of the third hypothesis, more research is clearly needed in order to promote understanding of the specific factors involved in communication channel selection for inter-organizational collaboration efforts, specifically (as will be addressed in further detail in the final chapter of this study) in terms of examining the communication

channel selections related to inter-organizational collaboration in non-proximate networks.

The network map analyses associated with H_4a is similar to the network analysis conducted previously; two supporting hypotheses are posited, each consisting of two sub-hypotheses that were subjected to testing. The first network-based supporting hypothesis for H_4a states that the communication frequency networks with higher levels of communication channel richness will be associated with increased network density as compared to the networks of those of less rich communication channels. The first sub-hypothesis for H_4a_1 states that the higher-level channel richness networks will have higher levels of interconnectedness; the data from this study does not support this sub-hypothesis. The relationships appeared to largely move in the hypothesized direction, with the exception of the e-mail communication channel which yielded higher-than anticipated levels of interconnectedness. The second sub-hypothesis for H_4a_1 states that higher-level channel richness networks will have increased tie strength as compared to the networks associated with less rich communication channels; this sub-hypothesis was not supported by the data from the study.

The second network-based hypothesis supporting H_4a states that the communication frequency networks for more rich communication channels will be associated with indicators of increased network performance. The first sub-hypothesis associated with H_4a_2 states that the networks of more rich communication channels will be associated with fewer isolates and pendants than the networks of less rich channels for communication; this sub-hypothesis was not supported by the data. As with the

previous isolation-based hypotheses, one set of networks ran contrary to the hypothesized direction; the e-mail network produced a lower overall isolation level than the phone-based communication network. The second sub-hypothesis associated with H_4a_2 states that the higher-level communication channel richness networks will be associated with increased levels of relationship reciprocity; this sub-hypothesis was not supported by the data. As was the case with H_4a_1a, the reciprocity data seemed to run in the hypothesized direction with the exception of the e-mail communication channel network.

The network map analyses associated with H_4b is similar to the network analysis conducted in the previously examined hypotheses; two supporting hypotheses are posited, each consisting of two sub-hypotheses that were subjected to testing. The first network-based supporting hypothesis for H_4b states that the networks measuring communication frequency for more rich communication channels will be associated with increased network density as compared to the networks of less rich channels. The first sub-hypothesis for H_4b_1 states that the higher-level communication channel richness networks will have higher levels of interconnectedness; the data from this study does not support this sub-hypothesis. Once again, the relationships between communication frequency, communication channel, and network interconnectedness run primarily in the hypothesized direction with the exception of the e-mail communication channel network. The second sub-hypothesis for H_4b_1 states that the more rich communication channel networks will have increased tie strength as

compared to the networks of less rich communication channels; this sub-hypothesis was not supported by the data from the study.

The second network-based hypothesis supporting H_4b states that the communication frequency network for more rich channels of communication will be associated with indicators of increased network performance. The first sub-hypothesis associated with H_4b_2 states that the networks of more rich communication channels will be associated with fewer isolates and pendants than the networks of less rich channels; this sub-hypothesis was not supported by the data. As was the case with the isolation-based hypothesis associated with H_4a, the exception to the hypothesized direction of the network isolation levels consisted of a lower level of isolation in the e-mail based network in comparison to the phone-based communication network. The second sub-hypothesis associated with H_4b_2 states that the higher-level communication channel richness networks will be associated with increased levels of relationship reciprocity; this sub-hypothesis was not supported by the data. Once again, the e-mail channel of communication proved to be the exception to the hypothesized direction of the relationships between the tested variables.

To summarize the findings related to the fourth hypothesis, indications are found that there are very strong associations between interorganizational communication activity and communication channel richness; contrary to the hypothesized relationship, it was found that increases in communication activity (both in terms of communication frequency and the number of people communicated with in inter-organizational relationships) were associated with more rich communication channels. None of the

network-based sub-hypotheses related to H_4 were supported; the e-mail channel of communication networks were anomalous in the interconnectedness and the relationship reciprocity hypotheses for both communication activity networks. In the cases of these four sub-hypotheses, this may be indicative of a need to either adjust or clarify to the survey instrument and will need to be further examined in future research.

The fifth hypothesis in this study proposed that increased inter-organizational communication activity would be found to be associated with decreased directionality in communication flow. Once again, two sub-hypotheses were designed to facilitate the testing of the relationships posed in the main hypothesis for H_5. The first sub-hypothesis proposed that increased frequency of individual-to-organization communication activity would be associated with decreased directionality in communication flow, while the second proposed that increases in the number of people from other network organizations communicated with would be associated with decreased directionality in communication flow. Testing using Spearman's rho in conjunction with cross-tabulations were determined to be the appropriate tools to use for the statistical analyses for the relationships between the variables proposed in H_5.

Similar to the findings from H_4, it was found that there was evidence suggesting strong associations between the independent and dependent variables in both of the sub-hypotheses for H_5; it was also found that these relationships ran in the opposite direction to the direction proposed in the hypothesis. Increases in both frequency of communication activity and the number of people communicated with from other organizations were found to be highly correlated with increased directionality of

communication flow, meaning that the more communication activity occurred, the more likely that it was that the communication would contain two-way flow. Again, these findings can perhaps be explained as being a unique feature of the proximate inter-organizational network utilized in this study. Further research examining these relationships in non-proximate inter-organizational networks may in fact yield findings that support the relationships between the variables proposed in this study.

The network map analyses associated with H_5a is similar to the network analysis conducted previously; two supporting hypotheses are posited, each consisting of two sub-hypotheses that were subjected to testing. The first network-based supporting hypothesis for H_5a states that the communication frequency networks with higher levels of communication directionality will be associated with increased network density as compared to the networks of those of less directional communication. The first sub-hypothesis for H_5a_1 states that the higher-level communication directionality networks will have higher levels of interconnectedness; the data from this study supports this sub-hypothesis. The second sub-hypothesis for H_5a_1 states that higher-level communication directionality networks will have increased tie strength as compared to the networks associated with less directional communication; this sub-hypothesis was also supported by the data from the study.

The second network-based hypothesis supporting H_5a states that the communication frequency networks for more directional communication will be associated with indicators of increased network performance. The first sub-hypothesis associated with H_5a_2 states that the networks of more directional communication will be

associated with fewer isolates and pendants than the networks of less directional communication; this sub-hypothesis was not supported by the data. The unidirectional communication network produced the highest overall isolation score, as opposed to the hypothesized relationship in which the non-work related exchange network should have produced the highest overall level of isolation. The second sub-hypothesis associated with H_5a_2 states that the higher-level communication directionality networks will be associated with increased levels of relationship reciprocity; this sub-hypothesis was supported by the data.

The network map analyses associated with H_5b is similar to the network analysis conducted in the previously examined hypotheses; two supporting hypotheses are posited, each consisting of two sub-hypotheses that were subjected to testing. The first network-based supporting hypothesis for H_5b states that the networks measuring the number of people communicated with for more directional communication relationships will be associated with increased network density as compared to the networks of less directional communication relationships. The first sub-hypothesis for H_5b_1 states that the higher-level communication directionality networks will have higher levels of interconnectedness; the data from this study supports this sub-hypothesis. The second sub-hypothesis for H_5b_1 states that the more directional communication relationship networks will have increased tie strength as compared to the networks of less directional communication relationships; this sub-hypothesis was not supported by the data from the study.

The second network-based hypothesis supporting H_5b states that the network measuring the number of people communicated with for more directional communication relationships will be associated with indicators of increased network performance. The first sub-hypothesis associated with H_5b_2 states that the networks of more directional communication relationships will be associated with fewer isolates and pendants than the networks of less directional relationships; this sub-hypothesis was not supported by the data. As was the case with the isolation-based hypothesis associated with H_5a, the unidirectional network (as opposed to the hypothesized non-work exchange network) produced the highest overall isolation level. The second sub-hypothesis associated with H_5b_2 states that the higher-level communication directionality networks will be associated with increased levels of relationship reciprocity; this sub-hypothesis was supported by the data.

The overall findings associated with the fifth hypothesis from this study indicate that there is a strong association between levels of communication activity and directionality of communication in inter-organizational relationships; contrary to the hypothesized relationship, it was found that higher levels of communication activity were associated with increased directionality in the communication relationships. The networks of higher-directional communication were also found to be more interconnected and more reciprocal in both of the communication activity level networks. The data supported the existence of a relationship between communication directionality and tie strength in the communication frequency network, but the related sub-hypothesis was not supported in the network measuring the number of people

communicated with. The data did not appear indicate a relationship between isolation level in relation to either of the communication activity networks and communication directionality.

The supported findings associated with H_5 indicate that increases in levels of inter-organizational network communication activity are associated with increases in the level of communication directionality; the network-based analyses conducted on both of the communication activity networks while measuring the impact of directionality demonstrates that increases in communication directionality in the communication activity networks impact levels of interconnectedness and relationship reciprocity; additionally the hypothesized relationship between tie strength in the communication activity and directionality network was supported in the communication frequency network, though it was not supported in the number of people communicated with network.

The third hypothesis derived from the communication-based theories involving communication channels (H_6) proposes that increased richness in communication channel selection will be associated with higher levels of perceived collaboration. Yet again, two sub-hypotheses were utilized in the examination of the main hypothesis, one examined the impact of channel richness on perceptions of individual-to-organization collaboration and the second examined the impact of channel richness on perceptions of organization-to-organization collaboration. Based on the levels of the variables being measured, the Spearman's rho analysis was used to examine the level of correlation between the variables, with one-way ANOVAs and Tukey's post-hoc tests being

utilized in examining the specific natures of the relationships between the variables examined in H_6.

Channel richness was found to have a statistically significant relationship that ran in the hypothesized direction for both of the sub-hypotheses examined in H_6. Perhaps interestingly, it was found that channel richness had a very strong relationship with perceptions of individual-to-organization collaboration, but a very weak relationship with perceived levels of organization-to-organization collaboration. According to the data analysis of this study, communication channel richness had a very strong relationship to perceptions of individual-to-organization collaboration, while only maintaining a very weak relationship with perceptions of organization-to-organization collaboration.

These findings support the assertion that the dependent variables concerning different types of collaboration are indeed conceptually disparate. The differences between the explanatory value of the independent variable on the dependent variables also makes logical sense; it would be expected that the communication channels that a boundary spanner utilizes for inter-organizational communication reflect primarily on their personal relationship to the other organization and would therefore have a significant impact on their perception of their own level of collaboration with the other organization. Conversely, it is not surprising to find that this determinate of perceived individual-to-organization collaboration would be less central to an individual's perceptions concerning their organization's collaboration with another organization, as the organizational-level collaboration would potentially be maintained using more

disparate channels and forms overall. Overall, the sixth hypothesis is tentatively supported by the data analyzed in the study and it is found that communication channel richness plays a significant role in determining perceptions concerning inter-organizational collaboration levels.

The network map analyses associated with H_6a is similar to the network analysis conducted previously; two supporting hypotheses are posited, each consisting of two sub-hypotheses that were subjected to testing. The first network-based supporting hypothesis for H_6a states that the perceived level of individual-to-organization collaboration networks with higher levels of communication channel richness will be associated with increased network density as compared to the networks of those of less rich communication channels. The first sub-hypothesis for H_6a_1 states that the higher-level channel richness networks will have higher levels of interconnectedness; the data from this study does not support this sub-hypothesis. The relationships appeared to largely move in the hypothesized direction, with the exception of the e-mail communication channel which yielded higher-than anticipated levels of interconnectedness. The second sub-hypothesis for H_6a_1 states that higher-level channel richness networks will have increased tie strength as compared to the networks associated with less rich communication channels; this sub-hypothesis was not supported by the data from the study.

The second network-based hypothesis supporting H_6a states that the perceived level of individual-to-organization collaboration networks for more rich communication channels will be associated with indicators of increased network performance. The first

sub-hypothesis associated with H_6a_2 states that the networks of more rich communication channels will be associated with fewer isolates and pendants than the networks of less rich channels for communication; this sub-hypothesis was not supported by the data. The relationship appears to generally run in the hypothesized direction, with the exception being that the e-mail communication network produced a lower overall isolation level than the phone-based communication network. The second sub-hypothesis associated with H_6a_2 states that the higher-level communication channel richness networks will be associated with increased levels of relationship reciprocity; this sub-hypothesis was not supported by the data. As was the case with H_4a_1a, the reciprocity data seemed to run in the hypothesized direction with the exception of the e-mail communication channel network.

The network map analyses associated with H_6b is similar to the network analysis conducted in the previously examined hypotheses; two supporting hypotheses are posited, each consisting of two sub-hypotheses that were subjected to testing. The first network-based supporting hypothesis for H_6b states that the networks measuring perceived levels of individual-to-organization collaboration for more rich communication channels will be associated with increased network density as compared to the networks of less rich channels. The first sub-hypothesis for H_6b_1 states that the higher-level communication channel richness networks will have higher levels of interconnectedness; the data from this study does not support this sub-hypothesis. Once again, the relationships run primarily in the hypothesized direction with the exception of the e-mail communication channel network. The second sub-hypothesis for H_6b_1 states

that the more rich communication channel networks will have increased tie strength as compared to the networks of less rich communication channels; this sub-hypothesis was not supported by the data from the study.

The second network-based hypothesis supporting H_6b states that the perceived level of individual-to-organization collaboration network for more rich channels of communication will be associated with indicators of increased network performance. The first sub-hypothesis associated with H_6b_2 states that the networks of more rich communication channels will be associated with fewer isolates and pendants than the networks of less rich channels; this sub-hypothesis was not supported by the data. Yet again, the e-mail communication network produced lower levels of overall isolation than the phone-based communication network. The second sub-hypothesis associated with H_6b_2 states that the higher-level communication channel richness networks will be associated with increased levels of relationship reciprocity; this sub-hypothesis was not supported by the data. Once again, the e-mail channel of communication proved to be the exception to the hypothesized direction of the relationships between the tested variables.

The completed findings associated with H_6 indicate that more rich communication channels are associated with increased levels of perceived inter-organizational collaboration, having a strong association with perceived levels of individual-to-organization collaboration but a weak association with perceptions of organization-to-organization collaboration. The network-based analyses associated with H_6 were all unsupported; however, the e-mail communication channel was anomalous

in the measurements of interconnectedness and relationship reciprocity in both of the collaboration perceptions networks. In the cases of these four sub-hypotheses, this may be indicative of a need to either adjust or clarify to the survey instrument and will need to be further examined in future research.

The final hypothesis for this study has the same relationship to H_5 as the sixth hypothesis does to H_4. The seventh hypothesis proposed that increased levels of directionality in communication flow would be associated with higher levels of perceived collaboration. As was the case in the previous five hypotheses, two sub-hypotheses are related to H_7. The first sub-hypothesis proposed that increased levels of directionality in communication flow would be associated with higher levels of perceived individual-to-organization collaboration, while the second sub-hypothesis proposed that increased levels of directionality in communication flow will be associated with higher levels of perceived organization-to-organization collaboration with other network organizations. The Spearman's rho was once again selected as the appropriate tool for analyzing the correlations between the variables and one-way ANOVAs (including Tukey's HSD post-hoc analytical measures) were chosen for the more in-depth examination of the specific relationships between the variables in both sub-hypotheses.

As was the case in hypothesis H_6, the analysis of H_7 provides evidence to support the significance of the relationships between the independent and dependent variables in the analyses of the sub-hypotheses; additionally, the relationships in both sub-hypotheses ran in the proposed direction. Further similarity between the outcomes

of H_6 and H_7 can be found in the fact that in both hypotheses the independent variables were found to explain a large proportion of perceptions individual-to-organization collaboration levels while explaining very little of the variation in perceptions of organization-to-organization collaboration. In the case of H_7, it was found that the effect size for communication directionality in relation to perceived levels of individual-to-organization collaboration was very high, while the effect size of directionality of communication in relation to organization-to-organization collaboration levels was very low.

Similar to H_6, the findings concerning H_7 support the assertion that the dependent variables concerning different types of collaboration are indeed conceptually different. The differences between the explanatory value of the independent variable on the dependent variables also makes logical sense; it would be expected that the directional nature of the communication that a boundary spanner utilizes for inter-organizational communication reflect primarily on their personal relationship to the other organization while not significantly impacting an individual's perceptions concerning their organization's collaboration with another organization, using the same logic concerning likely perceptions involving other communication exchanges between the organizations besides those of the respondent. Overall, the seventh and final hypothesis is tentatively supported by the evidence analyzed in this study and it is found that the directional flow of communication plays a significant role in determining perceptions concerning inter-organizational collaboration levels.

The network map analyses associated with H_7a is similar to the network analysis conducted previously; two supporting hypotheses are posited, each consisting of two sub-hypotheses that were subjected to testing. The first network-based supporting hypothesis for H_7a states that the perceived level of organization-to-organization collaboration networks with higher levels of communication relationship directionality will be associated with increased network density as compared to the networks of those of less directional communication relationships. The first sub-hypothesis for H_7a_1 states that the higher-level communication directionality networks will have higher levels of interconnectedness; the data from this study supports this sub-hypothesis. The second sub-hypothesis for H_7a_1 states that higher-level communication directionality networks will have increased tie strength as compared to the networks associated with less directional communication; this sub-hypothesis was not supported by the data from the study.

The second network-based hypothesis supporting H_7a states that the perceived level of organization-to-organization collaboration networks for more directional communication relationships will be associated with indicators of increased network performance. The first sub-hypothesis associated with H_7a_2 states that the networks of more directional communication relationships will be associated with fewer isolates and pendants than the networks of less rich channels for communication; this sub-hypothesis was not supported by the data. The unidirectional network (as opposed to the hypothesized non-work exchange network) produced the highest overall isolation levels. The second sub-hypothesis associated with H_7a_2 states that the higher-level

directional communication relationship networks will be associated with increased levels of relationship reciprocity; this sub-hypothesis was supported by the data.

The network map analyses associated with H_7b is similar to the network analysis conducted in the previously examined hypotheses; two supporting hypotheses are posited, each consisting of two sub-hypotheses that were subjected to testing. The first network-based supporting hypothesis for H_7b states that the perceived level of organization-to-organization collaboration networks for more directional communication relationships will be associated with increased network density as compared to the networks of less rich channels. The first sub-hypothesis for H_7b_1 states that the higher-level communication directionality networks will have higher levels of interconnectedness; the data from this study seems to partially support this sub-hypothesis. The second sub-hypothesis for H_7b_1 states that the more directional communication relationship networks will have increased tie strength as compared to the networks of less directional communication relationships; this sub-hypothesis was not supported by the data from the study.

The second network-based hypothesis supporting H_7b states that the perceived organization-to-organization collaboration level network for more directional communication relationships will be associated with indicators of increased network performance. The first sub-hypothesis associated with H_7b_2 states that the networks of more directional communication relationships will be associated with fewer isolates and pendants than the networks of less directional communication relationships; this sub-hypothesis was not supported by the data. The unidirectional communication network

again produced the highest level of overall isolation, as opposed to the hypothesized relationship in which the non-work exchange network would produce the highest isolation level score. The second sub-hypothesis associated with H_7b_2 states that the higher-level directional communication relationship networks will be associated with increased levels of relationship reciprocity; this sub-hypothesis was supported by the data.

The overall findings associated with the final hypothesis in this study suggest that increasing levels of directionality in inter-organizational communication relationships are associated with increased perceptions of inter-organizational network collaboration; it was found that increased levels of directionality were strongly associated with increased levels of perceived individual-to-organization collaboration, but less strongly associated with perceived levels of organization-to-organization collaboration. It was also found that communication directionality impacted relationship reciprocity in the perceived collaboration level network. The hypothesized relationship between communication directionality in the collaboration networks and network interconnectedness was supported in the individual-to-organization network, but only partially supported in the organization-to-organization collaboration network. In the cases of this sub-hypothesis, further examination of the support for the hypothesized relationships is required in future research endeavors.

The final analyses undertaken in this study were made in an effort to answer the research question posed in the literature review. This research question asks what organizational structures and boundary spanner behaviors impact perceived levels of

individual-to-organization and organization-to-organization collaboration in inter-organizational networks.

The regression equation examining which factors influence perceptions of individual-to-organization collaboration indicated that the factors examined in this study explained almost 75% (74.3%) of the variation in perceived levels of individual-to-organization collaboration when combined, which would be a very high level of explanatory value in social science research if confirmed in future research efforts. The primary (i.e. statistically significant) factors that provided explanation for perceived levels of individual-to-organization collaboration were the number of people communicated with in another organization and the frequency of the communication activity between the individual and the other organization's members. The analysis indicates that these two factors when combined explain just over 50% (51.9%) of the variation in perceived levels of individual-to-organization communication. Based on the findings associated with hypotheses two, four and five, in the case of the inter-organizational network examined in this study increases in the frequency of communication and the number of people communicated with serves to increase perceived levels of individual-to-organization communication.

The regression equation examining which factors influence perceptions of organization-to-organization collaboration indicated that the factors examined in this study had a much smaller (though still acceptable for social science research) impact on explaining perceptions concerning organization-to-organization collaboration; the overall model including all of the variables explain just over 25% (26.1%) of the

variation in perceived levels of organization-to-organization collaboration. That being said, it is interesting to note that more of the factors provide to be significant indicators of perceived levels of organization-to-organization collaboration, with only one of the variables (channel richness) failing to achieve statistical significance. Based on the findings for the regression associated with perceived levels of organization-to-organization collaboration, lower position in the organizational hierarchy, combined with increases in the number of people from other organizations communicated with, frequency of communication activity, and increases in communication directionality all serve to bolster perceived levels of organization-to-organization collaboration among participants in the inter-organizational network being studied.

The responses to the open-ended questions of the survey instrument provide additional insight into participant's feelings regarding the organizational network's efforts to foster proximity as a means of collaboration as well as their perceptions concerning the effectiveness of those efforts. When asked how the co-location of the organizations in the network had impacted their personal levels of collaboration with other member organizations, the responses generated seem to be classifiable into four groups: those that perceived little to no impact on collaboration, those that perceived positive impacts from the co-location, those that perceived the co-location to have had negative impacts on collaboration, and those responses in which there was a mixture of positive and negative perceptions.

The positive responses would seem to support the arguments asserting the effectiveness of establishing proximity as a means of enhancing communication, and

many of the responses provided reflected a generally positive perception of the co-location's impact on collaboration between the individuals and the other organizations in the network. In contrast, there were also a large portion of the responses which indicated that collaboration between themselves and other organizations had been negatively impacted by the co-location process. The specific identified negative factors included a decrease in scheduled meetings, issues with security systems of the buildings, the lack of communal kitchens, washrooms, and coffee, and feelings that the new location had resulted in the organizations being "put in its own box or corner of the building". The final category of responses identified both positive and negative impacts on collaboration due to the co-location. Generally, these responses acknowledged the opportunities for increased communication with members from other organizations, but framed those interactions as potential or real disruptions to productivity. While acknowledging that there were inconveniences caused by the co-location in terms of productivity and time, most of the respondents in this category either expressed that the benefits to collaboration outweighed the inconveniences or indicated that they treated the delays or productivity losses as subject matter for humor.

Responses to the second open-ended question were similar to the responses to the first question in terms of basic themes and attitudinal representations; comments could be found in the neutral, positive, negative, and mixed varieties in relation to how co-location had impacted organization-to-organization collaboration. Most of the comments in response to the second open-ended question reflected a generally positive perception of the impact of co-location on organization-to-organization collaboration.

One of the primary identified benefits of co-location involved the transfer of knowledge between organizations and the accumulation of knowledge about other organizations. Several of the respondents indicated that the impact on actual collaboration had been negligible, though it was noted by this group that the co-location had increased the speed of communication.

Another fairly common theme in response to the second open-ended question concerned perceptions that co-location's impacts had been largely concentrated in the higher levels of the organizational hierarchies. Responses from those in lower status positions commonly reported that they either were not sure how organization-to-organization communication had been impacted, that they assumed communication between organizations had improved, or that they perceived it to be an administrative (i.e. upper-level management) issue. A final interesting response theme to the second open-ended question illustrated that even when collaborative conditions are created, individual factors relative to commitment and workload determine collaborative inclusion and success, including possible issues related to collaborative communication overload.

The third open-ended question asked participants to provide feedback as to what could be done to further improve collaboration in the inter-organizational network. Responses to this question can be categorized into four general themes: informal and formal communication opportunities, formal communication structures, addressing cultural difference issues, and improving organizational leadership.

While a few of the respondents shared opinions that there needed to be more formal channels of communication, a truly dominant theme was the desire for more opportunities for informal communication and socialization opportunities. Additionally, respondents indicated that they desired centralized kitchens, eating spaces and break areas, as well as informal meetings and informal seminars. These responses clearly indicate that one of the collaboration factors of perceived importance to individuals involves a concentration opportunities for informal, social interactions. Respondents also perceived that there was disconnect in collaboration between some of the organizations in the network due to cultural differences between the organizations. The final theme appears to offer possible paths for finding solutions to cultural differences. Specifically, respondents called for a focus on increased effectiveness of organizational leadership. It is interesting and perhaps significant that many of these critical comments concerning leadership focused on greater communication efforts in terms of disseminating inter-organizational information throughout the individual organizations and also in terms of sharing information about individual organizations throughout the inter-organizational network.

Implications

Before discussing the specific implications resulting from the analyses conducted, chaos theory is utilized in describing a classification of networks for which the findings of this study and the larger research program would potentially be especially applicable. The description of specific implications from the data testing phase of the project are then discussed, followed by a description of some general

implications which can be derived from various aspects of the study. These general implications include consideration of what specific types of networks could benefit from the study, how the results from the study could be used to decrease waste and inefficiency, implications concerning inter-organizational networking and inter-organizational collaboration, consideration of the implications of managerialism on inter-organizational networks and the ability to take action, issues related to network and organizational maneuverability, flexibility and size, and will offer some implications from the study in terms of preferred future courses of action for networks and organizations involved in collaborative inter-organizational networking. Finally, some implications for scholars and field professionals will be outlined before considering the implications for each of the study hypotheses, the research question, and the open-ended response analyses.

A general class of inter-organizational networks to which the results of the study and future research program could contribute can be established by examining chaos theory; the development of this project was partially founded in an interest as to how inter-organizational networks are representative of, respond to, and are influenced by chaotic factors. The study of chaos has been applied to the study of a wide variety of phenomena ranging from patterns of falling leaves to complex systems such as weather patterns (Lorenz, 1993), and has been found to be of high importance to developments in scientific thought (Gleick, 1987).

One definition of chaos that would potentially be of interest to scholarship derived from this study is that of system sensitivity to initial conditions (Hunt & Yorke,

1993; Williams, 1997). This definition of chaos states that chaotic systems are those in which small initial differences (including differences so small as to not be perceptible) can produce vastly different results over time. A second (but related) definition for a chaotic system introduces the concept of complexity. Williams (1997) incorporates the concept of complexity as an aspect of "dynamical systems", defining complexity as "[a] types of *dynamical* behavior in which many independent agents continually interact in novel ways, spontaneously organizing and reorganizing themselves into larger and more complicated patterns over time" (Williams, 1997, p. 449, emphasis in the original). In other words, complexity can be defined as a property of a system that "… is so intricate that a fairly realistic model would have to possess dozens, or more likely hundreds of variables" (Lorenz, 1993, p. 8).

Thus we have two conceptual definitions of chaos which can be used as potential parameters for describing a population of networks which may be directly concerned with the results from this study as well as potentially being of particular interest in future scholarship in the continuing research program. First, chaos involves systems that are complex and involve a large number of interacting and co-determining variables (i.e. each variable serves as potential independent and dependent variables to the other variables in the system). This complexity is present in (if not inherent to) inter-organizational networks; there are a vast variety of possible communication relationships factors impacting those relationships to be examined- it is illogical to assume that the current body of literature (including this study) has exhausted the possible areas of exploration in terms of the complex issues related to inter-

organizational networking and collaboration. Continued exploration of additional factors related to collaborative communication in inter-organizational networks is therefore a potentially rich area for future communication researchers to mine.

Second, chaotic systems are those in which small changes to the systems at any given point in time (or given initial state) can result in vastly different end states. In terms of dynamics, small differences in collaborative efforts may have a drastic impact on determining collaborative outcomes. The term "dynamics" used here does not refer to change, but rather the difference in outcomes that can be achieved from small differences in initial states. As such, the argument is that small differences in network structures can result in drastically different outcomes when it comes to response to chaos. Examples of changes in network structure could include changes in channels for communication, organizational levels (i.e. hierarchical levels) involved in the network communication, physical proximity of the organizations in the network, and other structural network factors.

It is easily imagined that small changes in an organization's structure or inter-organizational communication strategies would have a potentially drastically impact on overall efforts at inter-organizational collaboration. On the other side of the implications of chaos theory, the complexity of the interactions of the vast number of variables impacting efforts at inter-organizational collaboration would lead to the argument that the impacts of individual changes in inter-organizational collaboration efforts may be difficult if not impossible to measure since changes in one aspect may cause changes to the entire system of variables involved.

Having described these aspects of chaos as a mechanism for defining a general group of networks which could potentially benefit from the current research findings, the implications from the specific findings (data analysis) can be examined and briefly described. The findings associated with the first hypothesis posited in the study indicate that those employees who are in higher levels of their organizations hierarchy do maintain relationships with more organizations in an inter-organizational network. The networks of those in higher level positions were found to be more interconnected and to contain more reciprocal relationships than the communication linkage networks of those in lower level positions. The supported findings associated with H_1 indicate there is a managerial bias present in the inter-organizational communication linkage network. Further, the managerial bias also appears to have an impact on interconnectedness and relationship reciprocity in the network. The findings from H_1 imply that for those inter-organizational networks in which maintaining high levels of interconnectedness and/or reciprocal communication relationships is of importance, focus should be placed on increasing communication among lower-level employees from the network organizations.

The findings associated with the second hypothesis proposed in the study indicate that those employees who are in higher levels of their organizations hierarchy do maintain both more frequent levels of inter-organizational communication activity and inter-organizational relationships with greater numbers of people the networks of those in higher level positions; the networks of higher-level employees were also found to be more interconnected than the communication activity networks of those in lower

level positions in both of the communication activity (frequency or number of people) networks. There does appear to be partial support for the hypotheses related to tie strength in the communication frequency network and in terms of reciprocity in both of the communication activity networks.

The supported findings associated with H_2 indicate there is a managerial bias present in the inter-organizational communication activity network. Further, the managerial bias also appears to have an impact on network interconnectedness. This would imply that for those inter-organizational networks in which maintaining high levels of interconnectedness is of importance focus should be placed on increasing inter-organizational communication activity levels among lower-level employees from the network organizations. The partially supported findings associated with H_2 (if they can be more fully supported in future research) would extend the managerial impacts to potentially include network tie strength and/or relationship reciprocity in the communication activity network; the implications for inter-organizational networking would therefore expand accordingly.

The findings associated with the third hypothesis appear to indicate that those employees who are in higher levels of their organizations hierarchy do perceive higher levels of individual-to-organization collaboration than those employees in lower-level positions; contrary to the hypothesized relationship, it was found that higher positions in an organizational hierarchy generally resulted in a lower perceived level of organization-to-organization collaboration. The networks of higher-level employees were also found to be more interconnected than the networks of those in lower level

positions in both of the perceived collaboration level (individual-to-organization and organization-to-organization) networks. The technical/ administrative employee networks produced contrary results in the tie strength and relationship reciprocity sub-hypotheses in the individual-to-organization network as well as in the relationship reciprocity measure in the organization-to-organization network. In the organization-to-organization perceived collaboration level network the tie strength measure ran opposite to the hypothesized direction.

The supported findings associated with H_3 again indicate there is a managerial bias present in the inter-organizational network; this bias is demonstrated to impact both of the networks measuring perceptions of collaboration. The analysis indicates that those in higher-level positions perceive higher levels of individual-to-organization collaboration and lower levels of organization-to-organization collaboration than those in lower-level positions. Further, the managerial bias also appears to have an impact on network interconnectedness in both of the perceived collaboration level networks. This would imply that for those inter-organizational networks in which maintaining high levels of interconnectedness is of importance focus should be placed on increasing inter-organizational communication activity levels among lower-level employees from the network organizations. The partially supported findings associated with H_3 (if they can be more fully supported in future research) would extend the managerial impacts to potentially include network tie strength and/or relationship reciprocity in the communication activity network; the implications for inter-organizational networking would therefore expand accordingly.

Concerning the fourth hypothesis, the associated findings from this study indicate that there are very strong associations between inter-organizational communication activity and communication channel richness; contrary to the hypothesized relationship, it was found that increases in communication activity were associated with more rich communication channels. None of the network-based sub-hypotheses related to H_4 were supported; the e-mail channel of communication networks were anomalous in the interconnectedness and the relationship reciprocity hypotheses for both communication activity networks.

The supported findings associated with H_4 indicate how communication channel utilization impacts inter-organizational networking; as communication activity increases, it appears that this increase is also associated with the utilization of more rich channels of communication. This would imply that for those inter-organizational networks in which increasing levels of communication activity is of importance focus should be placed on increasing the richness levels of the channels utilized in the network. The partially supported findings associated with H_4 (if they can be more fully supported in future research) would extend these impacts to potentially include associations between communication activity, channel utilization and the network factors of interconnectedness and/or relationship reciprocity; the implications for inter-organizational networking would therefore expand accordingly.

The findings associated with the fifth hypothesis from this study indicate that there is a strong association between levels of communication activity and directionality of communication in inter-organizational relationships; contrary to the hypothesized

relationship, it was found that higher levels of communication activity were associated with increased directionality in the communication relationships. The networks of higher-directional communication were also found to be more interconnected and more reciprocal in both of the communication activity level networks. The data supported the existence of a relationship between communication directionality and tie strength in the communication frequency network, but the related sub-hypothesis was not supported in the network measuring the number of people communicated with. The data did not appear indicate a relationship between isolation level in relation to either of the communication activity networks and communication directionality.

The supported findings associated with H_5 indicate that increases in levels of inter-organizational network communication activity are associated with increases in the level of communication directionality; the network-based analyses conducted on both of the communication activity networks while measuring the impact of directionality demonstrates that increases in communication directionality in the communication activity networks impact levels of interconnectedness and relationship reciprocity; additionally the hypothesized relationship between tie strength in the communication activity and directionality network was supported in the communication frequency network, though it was not supported in the number of people communicated with network. This would imply that for those inter-organizational networks in which maintaining high levels of cybernetic communication relationships is of importance, focus should be placed on increasing inter-organizational communication activity levels; the supported network analyses would lead to the further implication that

increasing communication directionality in the network would also lead to increased levels of network interconnectedness and relationship reciprocity and may impact the strength of relationship ties.

The findings associated with H_6 indicate that more rich communication channels are associated with increased levels of perceived inter-organizational collaboration. The network-based analyses associated with H_6 were all unsupported; however, the e-mail communication channel was anomalous in the measurements of interconnectedness and relationship reciprocity in both of the collaboration perceptions networks.

The supported findings associated with H_6 indicate that for those inter-organizational networks in which maintaining high levels of perceived (or perhaps even actual) collaboration is of importance, focus should be placed on increasing the richness of the communication channels utilized for inter-organizational communication activity. The partially supported findings associated with H_6 (if they can be more fully supported in future research) would extend the impacts for increasing the richness level of inter-organizational communication channel utilization to potentially include network tie strength and/or relationship reciprocity in the network; the implications for inter-organizational networking would therefore expand accordingly.

The findings associated with the final hypothesis in this study suggest that increasing levels of directionality in inter-organizational communication relationships are associated with increased perceptions of inter-organizational network collaboration. It was also found that communication directionality impacted relationship reciprocity in the perceived collaboration level network. The hypothesized relationship between

communication directionality in the collaboration networks and network interconnectedness was supported in the individual-to-organization network, but only partially supported in the organization-to-organization collaboration network.

The supported findings associated with H_7 imply that for those inter-organizational networks in which maintaining high levels of perceived or actual collaboration is of importance, focus should be placed on increasing the directionality of communication relationships by working toward facilitating cybernetic communication relationships. The partially supported findings associated with H_7 (if they can be more fully supported in future research) would extend impacts of communication directionality on perceptions of collaboration to potentially include network interconnectedness in the network; the implications for inter-organizational networking would therefore expand accordingly.

In regard to the findings associated with the research question from this study, the findings appear to suggest that increasing perceived levels of individual-to-organization collaboration is largely a function of increasing both the frequency of communication activity and the number of people communicated with in inter-organizational network relationships. In terms of perceptions of organization-to-organization collaboration, it was found that hierarchical position, communication activity levels (both frequency and number of people communicated with) as well as the directional nature of the communication relationship serve important functions in determining perceived collaboration levels. The implications from this analysis are that by networks which are interested in improving network performance and collaboration

between network organizations should seek ways to increase communication activity throughout all levels of the participating organizations and seek to foster communicative relationships that are cybernetic in nature.

The open-ended questions data from this study has several implications, including the need for consideration of issues related to differences between hierarchical levels of employees in terms of collaboration perceptions (such as collaborative responsibilities and collaborative overload in managerial employees), the need to account for differences in perceptions between employee groups relative to the impacts of physical proximity, the need for collaborative networks to foster informal communication opportunities between inter-organizational employees, and the need for increased cross-organizational information sharing.

Specific to the organizational network which participated in this study, the qualitative data clearly demonstrates that come managerial employees feel overloaded by inter-organizational collaborative communication, while some lower-level employees express a belief that collaborative communication with other organizations in the network does not fall within their organizational duties. Likewise, members of the managerial classifications of employees generally perceived that collaboration had been enhanced by the creation of physical proximity between the organizations, while lower-level employees generally indicated that the creation of physical proximity had resulted in either negative or negligible impacts on their perceptions of collaboration in the network. Employees in this network also clearly expressed a desire for and belief that increased opportunities for informal interactions (including inter-organizational

events and physical space/resource sharing) would enhance collaboration. Finally, the qualitative data indicates that the members (especially the lower-level employees) of this network see a need for increased information sharing; this need included both the sharing of information about other organizations to raise awareness and the need for managers to increase the amount of information about either other organizations or the overall network with lower-level organizational employees.

As a final point of summarization in relation to the specific findings of this study, what appears to be clearly (though tentatively) supported by the overall findings of this research project is that even in inter-organizational networks which are committed to collaboration and which are physically proximate, actual efforts at inter-organizational communication are still highly constrained by forces related to management and bureaucratic structures in the individual organizations in the network. While increasing proximity may serve to enhance collaboration between some members of the organizations involved in the network, creating complete collaboration throughout all levels and layers of the inter-organizational network requires attention to the invisible forces of managerialism that Deetz (1992) argues are much more influential.

Based on the research findings of this project, in order to foster inter-organizational collaborative success, concerted effort needs to be made on the part of organizations and networks committed to inter-organizational collaboration to create opportunities for collaborative involvement throughout all levels of the organizations involved. These efforts need to be made while paying particular attention to how many

people an individual boundary spanner communicates with, how frequently inter-organizational collaborative communication takes place, and the directional nature of that collaborative communication. Additionally, future research may provide evidence that the one factor found to be insignificant in this study (communication channel richness) may in fact prove to be of much higher importance when studies of networks with other characteristics (especially physical proximity) than that network utilized in this study have been accounted for.

In addition to the specific implications of the research findings from the study relative to the specific network studied and the general network implications derived from the data testing, the aspects of system dynamics and complexity derived from chaos theory provide a foundation for arguing that the results produced in this study are potentially applicable to a variety of networks in modern society. Further, the ability of small changes in network structure to potentially drastically impact the achievement of desirable outcomes is of central concern in regard to the applicability and potential positive impacts of the research agenda; providing hope that even small changes made to structure and collaborative communication strategies may have significant positive implications for improving collaboration between those networks, perhaps most importantly those networks that provide various public and community services.

Some of the specific types of networks providing public and community services that could benefit from consideration of the results generated by this study include emergency management networks, disaster response networks, educational sector networks, and health care networks. To the extent that the success of these

networks in performing their various roles can be attributed to successful collaboration, the findings from this study imply that reducing the presence and effects of managerialism in inter-organizational communication while also facilitating opportunities and incentives for desired communication-based boundary spanner behaviors will serve to improve overall network performance. This would lead to the implication that these networks should explore ways to expand the collaborative communication between lower-level employees in participating organizations, improve opportunities for informal and face-to-face communication exchanges, and increase inter-organizational information-sharing both in terms of information about the overall network and information about the individual organizations in the network.

The implications of this study may also be applicable the performance of crisis management networks, knowledge management or information-sharing based networks, and various bureaucratic, jurisdictional or territorial networks. Reductions in managerial impacts and creating collaborative network structures in the networks of crisis-prone industries, sectors, and organizations could potentially serve these networks by reducing the potential for a crisis situation, increasing the timeliness and effectiveness of incident responses should a potential crisis occur, limiting the duration of a crisis, and enhancing the post-crisis recovery and learning processes.

In networks in which there is a reliance on knowledge management and/or information sharing, reducing the impacts of managerialism and enhancing collaborative communication networks could potentially increase the volume of inter-organizational communication. Another potential benefit to the knowledge/ information

based networks is a potential decrease in delays between information entering a network and appropriate action being taken with that information; depending on the shelf-life of the information and the rate of environmental change, eliminating delays due to hierarchical filtering between organizations may prove to be a critical factor in making successful decisions and taking appropriate action on unfolding or changing information.

Implications in regard to organizational networks that are highly bureaucratic, which contain highly bureaucratic organizations, or in which significant barriers exist in relation to organizational jurisdiction or territoriality, reducing the effects of managerialism and enhancing network communication and boundary spanner behaviors could lead to several positive outcomes. Adopting inter-organizational network structures which foster increased levels of collaboration could serve to speed up information processing in bureaucratic networks and organizations. In those networks in which a reduction in jurisdictional and territorial boundaries is desired, reducing managerialism and adopting collaborative structures could foster a sense of community and build inter-organizational trust.

By fostering collaboration and reducing the impacts of managerialism in inter-organizational relationships, there is potential to reduce waste in spending through resource-sharing, reduce the waste of information due to information processing-related delays leading to a lack of action-ability on the front lines of the organization or network. Reducing managerial control in inter-organizational networks and creating collaborative networks could potentially serve to increase information sharing and

speed in the various inter-organizational networks, thereby increasing organizational and network response effectiveness and the ability to quickly take front-line action in response to changing information and/or circumstances.

Another important general implication in regard to networks and collaboration is that the analysis demonstrates that proximity may not prove to be the main factor (as many assume) in fostering collaborative inter-organizational networks. While proximity was controlled for in this study, there appears to be significant evidence that a managerial bias in both communication practices and in network structures may be highly significant factors in determining perceptions of (and perhaps actual levels of) collaboration. The clear implications for collaborative communication practices and network performance are that inter-organizational networks should be less concerned with increasing inter-organizational proximity than with reducing managerial constraints on inter-organizational communication and fostering collaboration-enhancing communicative structures and practices in the inter-organizational network.

While many of the implications of this study address concerns related to managerialism and control of communication in inter-organizational networks and have focused on how managerial controls limiting collaborative sharing in inter-organizational networks, one implication in particular raises concerns relative to members of the managerial class and networking effectiveness. The analyses conducted in this study seem to indicate that members of the higher-level employee groups are potentially prone to experiencing collaborative communication overload. The impacts of collaborative overload could include decreased manager effectiveness in terms of

operations and decision-making in their respective organizations, inefficient processing of inter-organizational information throughout their own organization, and perhaps potential burn-out in terms of continuing to maintain collaborative inter-organizational relationships, to name a few possible outcomes. Some of the qualitative data collected from participants in higher-level positions appears to provide additional support for the existence of collaborative overload and also indicate some of these problematic issues. Therefore, creating collaborative network systems in which inter-organizational communication includes all classifications of employees more equitably could serve to alleviate the impacts of collaborative communication overload for the inter-organizational network, its member organizations, and individual employees in higher levels of their organization's hierarchies.

One major challenge to creating collaborative networks found in the qualitative data is the perception on the part of lower-level employees that collaborative inter-organizational communication is primarily the responsibility of the members of the managerial class. There are three possible tools available to address this challenge; used in conjunction with one another, they may prove to be powerful tools for reversing this trend in perceptions. First, it may prove beneficial to train employees; collaboration-based training programs could include addressing issues as to why collaboration is important to the network and its organizations, how employees at all levels can contribute to collaborative efforts, functions of the participating organizations and the individuals within them, and social networking skills. It stands to reason that if these training programs could be implemented in multi-organizational platforms (i.e.

classrooms in which members of multiple network organizations and perhaps job classifications were participating in the training together), additional network-building benefits could be facilitated in the training process.

Second, organizations and inter-organizational networks which are dedicated to collaboration could seek to find ways to empower and incentivize employees to cross-connect; empowerment could potentially be encouraged via the training programs, additional measures to increase empowerment and incentive to collaborate could include encouraging managerial class members to delegate inter-organizational communication responsibilities, providing monetary or other compensation incentives to lower-level employees for increasing one's inter-organizational communication, and/or by increasing the utilization of more inter-organizational, multi-employee-level teams to accomplish inter-organizational work objectives.

Third, networks with a vested interest in fostering improved collaboration should seek to provide increased opportunities for informal, face-to-face communication between lower-level employees from different network organizations. In the case of the physically proximate network utilized for this study, employee responses to questions of improving collaboration in the network clearly supported this argument; calls were made by the employees for the utilization and/or return of opportunities for informal communication opportunities such as sharing of leisure and non-work space (such as break rooms and kitchen facilities), social activities (i.e. the Sundae on Monday ice cream social), and informal opportunities for sharing knowledge (such as poster sessions, etc.). In either proximate or non-proximate networks, informal

communication opportunities could be fostered by creating inter-organizational sporting teams (i.e. inter-organizational softball teams, bowling leagues, etc.), creating opportunities for inter-organizational community involvement (i.e. working together on a Habitat for Humanity building project), or in the case of regionally/globally diverse networks technology could be utilized to build informal communication opportunities through online gaming tournaments, annual family or employee gatherings, etc. Creating these informal networks should serve to foster a sense of shared community, build trust in interpersonal interorganizational relationships, and thereby encourage continued collaborative communication once a bond between the relationship's participants is built.

Reducing the impacts of managerial biases in inter-organizational networks and fostering the creation and implementation of collaboration-enhancing communicative structures has a number of implications in regard to network and organizational maneuverability, flexibility, size, and the ability to respond to changes. Generally, making efforts to reduce negative managerial impacts on the networks and fostering collaborative communication structures in inter-organizational networks should serve to foster the development of increased fidelity, efficiency, and utilization of inter-organizational information and knowledge. This should in turn serve to foster the building of networks and organizations which are more efficient in gathering and processing environmental and internal changes, resulting in more efficient, flexible, and more maneuverable organizations and inter-organizational networks. Enhanced collaborative practices and structures could also prove to be a useful tool for

counteracting decreases in efficiency, flexibility, and maneuverability of networks which could result from increases in organizational or overall network size, thereby increasing the ability of networks and their participating organizations to take timely and optimum actions when necessary in response to changes in the network/organization or in the network/organizational environment.

The implications in regard to preferred directions for networks and organizations include the need to establish and attain desired collaboration levels including addressing areas such as collaboration assessment for both networks and their participating organizations, and developing methods for planning, implementing, and measuring organizational change and network development. The first step in creating successful collaboration-based networks may be to recognize that complete collaboration may not be either a realistic or desired goal for all inter-organizational networks. This being said, the implications are that inter-organizational networks should begin by determining a goal in terms of optimum desired collaboration levels relative to both the overall network levels and the various related sub-networks (organizational, hierarchical, etc.). One way of determining optimum collaboration and communication levels in inter-organizational networks would be to identify the extent to which a network and its participating organizations are reliant upon or susceptible to changes, then to determine optimum collaboration levels based upon what would be required to reach desired levels of maneuverability and efficiency based on the likelihood and rates of potential environmental changes. Of course, this would imply that more likely, potentially impactful (either positively or negatively), and rapid these changes are, the more

flexible, action-able, efficient, and generally collaborative a network and its participating organizations would need to be in order to maximize success.

Next, networks and their participating organizations would need to assess their current levels of collaboration (perhaps using enhanced versions of the instruments and methods utilized in this study). Once assessments are completed and analyzed, gaps between the desired collaboration levels and the actual collaboration levels as well as particular structural and behavioral weaknesses in the network could be identified. Networks could then proceed to designing and implementing structures and processes which facilitate achievement of the desired collaboration goals. Finally, organizations and networks should consider and implement means for maintaining and measuring the maintenance of collaboration and the health of the network's collaborative structures; followed (logically) by making adjustments as changes in the system or in environmental circumstances require.

The general implications in regard to implementing organizational changes lead to some general implications for both application and research. In terms of professional applications, a new professional specialization could potentially emerge based on a specialization in inter-organizational consultation and inter-organizational change management. It is highly likely that inter-organizational networks and their participating organizations would (if it was available) seek external sources to assist them in the assessment and change processes; among other advantages to seeking outside assistance, the assistance of an outside expert could serve to alleviate concerns relative

to lack of objectivity or ulterior motives that would perhaps be significant if the process were conducted internally.

Successfully guiding networks and their participating organizations through these processes would require a professional consultant to maintain expertise in a specialized set consisting of a number of skills including a working theoretical knowledge of organizational communication, conflict management, organizational leadership, organizational development, change management, networking theory, and organizational assessment techniques. Professionals working in this field also potentially need to be well versed in a variety of methodologies including survey design and participation, statistical analysis techniques, network mapping and analysis, as well as critical and/or qualitative methods. Finally, professionals in this area would also need to maintain a working knowledge of one or more specialized concerns such as emergency management systems, disaster response systems, chaotic systems, crisis communication, public administrative systems, or others.

The professional implications lead directly to several implications for scholarship. First, there is clearly a need for further research both to enhance and to expand on the findings from the study; programs of research could potentially be designed to both improve and expand the methodology and theoretical model presented in this study as well as to expand the findings to analyses of other inter-organizational (and perhaps other) network forms. Second, the development of a professional field related to inter-organizational network consultancy offers opportunities for expansion of educational programs, especially (though a rather obvious bias is admitted in this

assertion) in the area of organizational communication scholarship. These opportunities include offering specialized coursework, certification programs and perhaps degree programs designed to provide consultants with the knowledge and skills needed in the field. Third, since the knowledge and skills required cross traditional boundaries between educational units (i.e. colleges or departments in higher education institutions), creating consultancy-based curriculums could serve to foster increased collaboration between academic units; thereby strengthening community bonds in the educational institutions which implement the programs and additionally increasing knowledge-sharing between related academic fields.

A final set of implications for scholarship can be found in the methodology utilized in this study. First, scholarship and knowledge generation can perhaps be greatly enhanced by seeking opportunities for increasing the application of quantitative methodologies to test and expand theories derived from critical scholarship in the area of organizational communication; other scholars (as previously cited) have also recognized this need. Second, the increased use of complex and multi-method research and analysis designs can potentially expand the implication and practical applications which can be derived from individual research projects, leading to a deeper understanding of both phenomenon and complex variable interactions in organizational communication research. Finally, the weaknesses (addressed in the limitations section) associated with the survey design and data collection processes utilized this study lead to implications concerning the need to seek out better ways to gain access to more specific organizational information in regard to employee communicative practices

while still achieving a high level of participant confidentiality as well as a low level of participant exhaustion; this concern could perhaps be minimized by increased interactions between scholarship and professional field consultancy.

Limitations

The first set of limitations concern those related to the population of the network which participated in the study. The proximity of the population, while useful as a control for this exploratory study, may have resulted in a population that is unique in their communication behaviors. As this study was interested in exploring the impacts of organizational structures and communication strategies employed in inter-organizational communication, the commitment to collaboration and intentionally-created physical proximity of the organizations serves to lend further weight to the findings of this study. One would suspect that networks of organizations less committed to collaboration efforts and less proximate in their geography would be found to have lower levels of perceived collaboration and fewer opportunities for collaboration-building communication, etc. than the network utilized in this study. Future research could include measures of physical proximity between organizations and/or individual boundary spanners in addition to the measures of the instruments used in this study to further enhance knowledge on the effects of both proximity and the factors examined in this study on collaboration between organizations and their boundary spanners in inter-organizational networks.

The second limiting factor for this study presented by the population of interest involves its particular demographics. As previously noted, the network utilized in the

current study is comprised of organizations that have physical proximity, a shared area of interest and a shared commitment to collaboration. Other inter-organizational networks in which collaboration is important are perhaps likely to be more geographically dispersed, have conflicting or overlapping areas of interest, and in various other ways be different from the network used in this analysis. Clearly, further work needs to be done in studying the factors related to collaboration in a variety of inter-organizational networks and from a variety of sectors before generalized claims concerning the factors impacting inter-organizational collaboration in the broader population can be established.

The voluntary nature of the participation in this study must be addressed as an issue related to the population for this study. Since participation was voluntary, it cannot be accurately ascertained to what extent the participants in this study are representative of the broader population; of specific concern is the extent to which this participants are representative of their organizations and job functions in relation to perceptions of collaboration. One fairly safe assumption that can be made is that those who participated did so out of interest in the subject matter being studied (as no incentives for participation were offered); this would lead to the conclusion that the participants may have a higher vested interest in expressing views concerning the inter-organizational collaboration (either positively or negatively) than their non-participating counterparts. This limitation could potentially be overcome, perhaps by using different methodologies which would garner higher participation levels of representative sample populations rather than a voluntary participation technique.

Many of the limitations that are derived from the data collection methods used could be classified as being necessary; while other data collection methods (i.e. direct observations, interviews, stratified sampling, offering incentives, etc.) could be used in future research, these other methods lead to their own issues in terms of protecting population anonymity, obtaining access, and other ethical and practical concerns. While other methods for collecting data should be explored in future research in the area of inter-organizational networking, care must be taken to preserve the ethical conduct of research, the protection of participant identity, and gaining access to the data; these concerns may prove to make collecting the detailed data which would provide many additional insights less feasible than the method utilized in this study.

A second set of limitations to the study are derived from the methods utilized, most of which stem from the limitations posed by the survey instrument and data collection methods. Some of these limitations were due to concerns for protection of individuals and their identities and are inherent to studies in the social sciences which seek to maintain participant anonymity as was the case in this study. Specifically, this study did not seek to discover some potentially informative data in the effort to protect participants, including data concerning the specific job positions of participants or who specifically from other organizations they communicated with; though that information could certainly informed the analysis, it was also deemed possible that individual participants could potentially be identified if this information was collected, and so the decision was made to sacrifice a certain level of specificity in order to provide for the protection of the individual research subjects.

A second limiting issue related to the methods utilized in this study concerns the specifics of the communication behaviors, and may be more easily addressed in future developments of the instruments that those mentioned above. First, more specific data concerning specifics in terms of locations (both the physical locations of the participant's workspaces and the physical locations of the communication interactions) could prove to be useful in future research efforts if this could be accomplished while utilizing code-names for locations so as to still provide for the protection of participant identities. Second, the categories related to types of communication activities could be expanded in two ways- expansion of sub-categories in terms of types of meetings, communication exchanges, etc. could provide more detailed information, and asking participants to identify communication channels, directionality, and locations using some form of a percentage-based scale (as opposed to asking them simply to identify their primary forms) could provide more detailed information concerning the impacts of these variables on collaboration. Future research using these enhanced measures may demonstrate that secondary forms not recorded in this study serve to provide cumulative impacts superseding the primary forms indicated in this study. Finally, the issues concerning reliability should be addressed in future research if the goal is to produce generalizable findings with confidence; some form of test-retest procedure or the use of multi-item scales to measure the variables could be used to address this issue; a central concern (especially in larger inter-organizational networks) of using these enhanced procedures will be to balance procedural concerns with considerations for participant exhaustion.

Many of the limitations relative to the survey instruments utilized in this study also resulted from choices made in an effort to protect participant identities and maintain research ethics. That being said, there is opportunity to enhance the survey instrument by collecting specific data as to employee positions, locations, and particular information as to whom participants are communicating with if protection of participant identities are maintained. Additionally, the survey instruments could be enhanced by offering participants more options in detailing their responses. For example, instead of asking participants to identify their primary channels for inter-organizational communication, participants could instead be asked to assign percentages to the communication channels utilized thereby rendering more detailed information. This approach could also be taken with the questions relative to communication directionality and communication frequency. In short, the limitations to the survey instrument can largely be addressed in future research through consideration of ways to alter the scales in order to capture more detailed information about the inter-organizational relationships and participants if participant identity can be protected.

A third set of limitations in regard to methodology in the study is related indirectly to the issues stated in the previous paragraphs, but specifically concern those related to the quantitative analysis. First, many of the variables in this study were measured using ordinal-level scales; if the measurement level of these items could be enhanced (perhaps through collecting more specific data) to contain interval or ratio level data, more robust forms of statistical analysis and modeling could be utilized in future research. Secondly, the findings of the quantitative analysis in this study are

limited by the form of inter-organizational network utilized; this limitation can potentially be overcome through continued studies examining the bureaucratic and communication-based factors related to inter-organizational collaboration in a variety of networks from a variety of sectors which could then serve as points for comparison to this study.

The network analysis methods utilized in this study also present limitations to the research; three primary areas of limitation which should be considered and addressed in future research can be indentified in the network analysis. First, the implications of chaos theory described in previous sections illuminate one set of limitations; the data collected in this study does not account for changes in organizations or network structures over time, relying instead on data collected during one time period. Future research can address this limitation by either conducting multiple periodic examinations of a network over an extended period of time or by conducting continuous observations which capture and measure changes in the network relationships (and resulting changes in the relationships between the variables of interest) over time.

A second limiting factor in the network analysis conducted in this study concerns the limitations of the analysis conducted. Additional and more rigorous network analysis tests could have been conducted on the map-related data, such additional testing could serve to provide deeper insights into the network relationships and interactions between the network variables. In the exploratory analysis conducted in this research, indications of key network interaction factors was the primary emphasis;

future research can address this limitation by going beyond the network analysis methods utilized in this project and consider additional and more detailed network analysis methods in order to further develop insights related to the impacts of managerialism and communicative behaviors on inter-organizational networks.

The limitations in the data analysis can be primarily addressed by enhancements made to the data collected in the survey instrument. The remaining data analysis limitations (i.e. depth of network map analysis) can also be addressed in future research by expanding the analyses to include more sophisticated and robust forms, these expansions should be considered in regard to both the network map and qualitative analyses; in the case of the qualitative data, grounded theory could be used to systematically classify and analyze qualitative data collected in future network analyses.

In summary, this exploratory analysis contains a variety of limitations; many of these limitations are derived from the data collection and survey instrument design and were created through choices made by the researchers and participating organizations in order to protect participants by avoiding the collection of individually identifiable data. While future research in this area may seek to collect more specific data about individuals and their inter-organizational network relationships, these efforts need to continue to protect participant's identities in these processes. The remaining limitations in this study can be addressed in large part through adjustments to the scales used in the instruments (resulting in more specific relationship and behavioral data) or through adjusting the data analysis to include more in-depth and robust statistical tests. The

limitations due to population considerations concerning unique factors in the studied network (i.e. proximity) should be addressed in the future by conducting similar analyses in a variety of other inter-organizational networks, especially those networks in which chaos is a significant internal or environmental factor.

Future Research Directions

Ample opportunities for additional research can be derived from the foundation laid in this study. In this section, several of these future directions will be addressed including future uses for the data collected in this study, design and methodological improvements to be made in future research, future utilization of the research methods utilized in this study, and contexts for application and further study.

First, it should be recognized that this study presents one analysis of a part of the data collected in the research project; additional, separate analyses using the data utilized in this study are currently underway. As such, this study represents not a complete whole, but an important part of a larger research project that is ongoing. Once completed, it is planned that the findings from the other aspects of the research project will be combined with the findings of this study and incorporated into a larger whole. The project will then be utilized both for presentation to the network that participated in this study (along with recommendations for improving their inter-organizational collaboration) and for presenting findings to the broader research community.

Turning to the issue of future research based on this study, the first proposed step for future research based on this study consists of making adjustments to the survey instruments and methods utilized in order to address the limitations posed in the

previous section of this chapter to the extent possible, including specificity of the data collected, types of statistical analysis able to be performed on the data, and issues related to reliability. The revised instrument should then be administered to a variety of inter-organizational networks from a variety of sectors so as to provide points for comparison between the findings of this study and those which are to be conducted, specifically in the contexts described in the paragraphs below.

The data analysis methods utilized in this study present both a foundation for designing future inter-organizational network-based research projects and challenges which should be addressed in future research endeavors. Observations have already been made in this study as to the potential for combining critical theoretical arguments with quantitative testing of those arguments. Additionally, the triangulated data analysis approach (combining traditional statistical analysis, network-map analysis, and qualitative data analysis) is seen as being an important feature to this study which should be continued and further developed in future network-based inter-organizational research.

Combining these methods allows for a richness and depth of data analysis, allowing researchers to examine the phenomena of interest from a variety of perspectives; the flip side of the argument is that researchers in this area need to be versed in a variety of methodologies. As the proverb states, to the man equipped only with a hammer, every problem looks like a nail; multi-methodological approaches to research serve to reinforce the importance of carrying and being able to utilize a variety of tools. Future research in the area of interorganizational networks would perhaps do

well to continue developing and utilizing multiple-method approaches when examining the complex interactions that occur in order to enable a deeper understanding of the forces at play in network relationships.

Three distinct yet potentially inter-related areas of study present a potentially rich field for future research on the factors related to inter-organizational collaboration and application of the findings from this study. While these are certainly not the only possible areas for future research, interest in these areas served as a motivating force for the development of this study and combine to form a general area of research interest that is intended to follow this study and form a program of research based in part on its results. These three areas include the application of chaos theory to developing increased understanding of the relationships involved in inter-organizational collaboration, an application of both the findings of this study and chaos theory in the area of crisis communication and management, and further study into collaboration between organizations in the context of emergency planning and management. Each of these potential areas for future research is described below.

One possible future direction for future research which this study could contribute to would be to examine inter-organizational collaboration efforts in relation to the implications of chaos theory. This call for continued exploration of the implication of chaos on inter-organizational networking is firmly grounded in existing research. Extant scholarship concerning the effects of chaos on inter-organizational collaboration includes the exploration of various sub-themes. First, scholars have examined the complex nature of inter-organizational network structures due to both

ambiguity and changes in network membership over time (Huxham, 2000; Dodgson, 1993) and how network structures change in response to chaotic environments (Gulati & Higgins, 2003). Second, the use of information technologies by inter-organizational networks for knowledge management in complex and dynamic situations has been addressed (Markus, Majchrzak, & Gasser, 2002). A third sub-theme examines the use of knowledge from network partners in managing the uncertainties associated with organizational expansion into new markets (Henisz & Delios, 2001), and the need for strong relationships with extra-organizational stakeholders in attaining knowledge about complex and dynamic environments (Anand, Glick, & Manz, 2002). Finally, researchers have explored how complexity and uncertainty in inter-organizational environments and networks can lead to enhanced creativity (Drazin, Glynn, & Kazanjian, 1999).

As can be seen, there is a strong tie between chaos and inter-organizational networking that has been recognized in previous scholarship. Further, existing research supports the descriptions of chaos and the applications of chaos theory that have been asserted to be relevant. Future studies utilizing the concepts from this study could enhance the body of research by addressing how chaotic networks are impacted by the structures of the networks themselves as well as how the communication behaviors and hierarchical locations of individuals are of central importance in managing the complex and dynamic structures and information that are inherent in inter-organizational networking, an area which does not appear to have been previously explored. Chaos theory could be applied as a means of expanding upon this study in two primary ways.

First, chaos theory should direct future research efforts toward identifying and understanding all of the complex factors that impact inter-organizational collaboration and fully examining the relationships between all of the factors. Second, the concept of dynamics should serve to guide future research efforts in the area of inter-organizational collaboration to utilize research designs that allow for studying efforts at collaboration over time; in metaphorical terms, accounting for and understanding the dynamics of chaos requires the capture of video, not photographs.

A second potentially rich area for future research endeavors based in part on this study includes examining the collaborative efforts of inter-organizational networks operating within the contexts of crisis. Once again, the call to research related to inter-organizational collaboration and networking is not a new one. Though this body of literature is less developed than other themes in the collaboration literature, several scholars have addressed issues related to inter-organizational collaboration and crisis management. Scholars have drawn connections between disaster/ crisis management and inter-organizational collaboration and have called for further research in this important area (Adkins, 2010; Sellnow, Veil, & Streifel, 2010; Dayton, et al. 2004). Sellnow, et al. (2010) note that "little research has explored the role of interorganizational communication in issues management and crisis communication" (p. 657); clearly representing a call for more research into the relationship between inter-organizational communication effectiveness and crisis mitigation.

The positive outcomes related to successful collaboration between organizations in the face of extenuating circumstances is perhaps best highlighted in the now-classic

crisis communication case of the Tylenol cyanide poisonings in which the company was widely praised for their collaborative efforts with the media and medical practitioners, among others while navigating through the crisis as it unfolded (Foster, 2002; Gourney, 2002; Benoit, 1987). Examples of failures in collaboration provide the most dramatic exemplars to support the importance of inter-organizational collaboration. Cases that illustrate these failures and the negative consequences related to them include various crises such as the failures of government agencies in responding to the hurricane Katrina disaster in 2005 in which the disaster was elevated from being a natural disaster to being a crisis in part due to failures in collaboration among the government agencies tasked with protecting the population of New Orleans (Gouran & Seeger, 2007; Adkins, 2010), failures in communication between organizations that lead to the NASA space shuttle *Challenger* accident causing the loss of seven lives and serious threat to the continued existence of the space shuttle program (Vaughan, 1990; Winsor, 1988; Tompkins & Tompkins, 2005), and fall-outs between previously collaborative partners such as Ford/Firestone in which a long-standing partnership between companies and the families who ran them was destroyed (O'Rourke, 2001; Ulmer, Sellnow, & Seeger, 2007). Each of these cases serves to demonstrate the various disastrous results that can occur when organizations fail to work collaboratively when tasked with evading or mitigating crisis circumstances.

In addition to the need for further research in terms of inter-organizational collaboration on successful crisis management, there is also the potential to draw ties between studies in crisis management and studies utilizing chaos theory in

investigations of collaboration. The current research on inter-organizational collaboration in disaster and crisis management does not appear to draw heavily on utilization of chaos theory as a means of describing a broad typology of networks as a means of asserting relationships between various networks involved in disaster and crisis management. This lack of recognition of a potential lynchpin thereby limits the cross-applicability of research findings from one study in terms of being perceived as applicable to others of the same general type. The current research (and the research program it is a part of) seeks to remedy this limitation; though issues related to disaster that the findings produced in it will prove to be applicable to these contexts.

The findings of the current study and the instruments used in it could be readily applied to and adopted for the study of inter-organizational collaboration in crises, potentially providing enhanced practical and theoretical tools for increasing crisis evasion and response effectiveness. Increasing understandings of how organizations can work with other organizations in preparing for and mitigating potential crises may prove to be an important key to preventing them in the first place or at least to minimizing their negative impacts on organizations and the larger societies in which they operate.

A third primary area for future research based in part on the findings of this study would address inter-organizational collaboration issues in relation to emergency planning and response. As with the previous areas explored in terms of future research possibilities, this of research is an active one, and the call for additional research is not a new one. Extant work by highly-recognized scholars in the area of crisis communication have noted the importance of inter-organizational communication and

cooperation in managing events such as natural disasters (Sellnow, Seeger, & Ulmer, 2001; Adkins, 2010; Adkins, Blake, and Thornton, 2009).

Extant literature in the area of inter-organizational networking within emergency response communities has examined the effectiveness of collaboration efforts during emergency response exercises (Berlin & Carlstrom, 2008), and the use of physical proximity to enhance collaboration between emergency response agencies (Soeparman, et al., 2008). Scholars have also examined collaboration efforts between government agencies and NGOs for the protection of vulnerable populations during disasters and crises (Rosenberg, 2008; Gajda, 2006), and have asserted the need for the development of adaptive systems and inter-agency networks for responses to terrorism and other extreme events (Comfort, 2002; Rosenthal & Kouzmin, 1997; O'Hair, et al., 2008). The work of Berlin and Carlstrom (2008) indicates that collaboration during simulated extensive accidents between medical, police and fire departments was very limited. Clearly, one particular area of interest in relation to inter-organizational communication and emergency management has to do with planning for evacuations in response to natural or man-made disasters; the potential practical applications for increasing the effectiveness of inter-organizational collaboration are practically implied when one considers the number of agencies and organizations that must be coordinated in these efforts.

Currently, several research projects utilizing the tools and results from the study are being designed within the context of emergency management in the area of evacuation planning; specifically, the next phase of the research program to be pursued

involves the examination of inter-organizational and community-wide collaboration in planning for and responding to a potential evacuation due to an industrial accident.

Finally, there are some interesting questions raised by the findings and methods of this project which are in clear need of further investigation in future research endeavors. This study provides evidence of a managerial bias in inter-organizational networks; however, more research needs to be done as to the extent of this bias. For example, the managerial bias could be found to be even more pervasive in inter-organizational networks if future research were to find that both managers and lower-level employees from one organization communicated primarily with members of a particular class of employees (i.e. managers) in their communications with other organizations.

Another area for further investigation which stems directly from the findings of this study involves the results found in relation to communication channel selection. For example, this project found evidence that both face-to-face/ informal communication and e-mail based communication channels seem to be highly effective as well as structurally strong channels for inter-organizational collaboration; an interesting question that arises from this finding is the extent to which these channels are more effective as mechanisms to foster the creation of collaborative networks versus being effective mechanisms for maintaining established collaborative relationships. It would not be surprising if future research endeavors were to find significant differences between the channels in relation to these functions; for example, it may be that face-to-face/ informal channels for communication are more effective means for encouraging

new relationships, but once the relationships are established e-mail is a more effective means for maintaining them.

Though this brief discussion of some of the potential areas for future research derived from this project is not exhaustive, there is clearly a significant opportunity for development of further research relative to this study and its findings. While this study provides a solid foundation for the development of a future model, there is ample opportunity for continued enhancement of tools and methods, applications to a variety of contextual areas, additional and more in-depth analysis of the inter-organizational collaborative factors, studies of new questions, and verification of the findings to be undertaken in the process. In the end, perhaps this is the most important finding that any research project can attain- fertile ground into which the seeds for growing future knowledge can be planted.

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Appendix A

Sample Survey Instruments

Survey Instrument I: Organization Names and Survey Links for [HQ] Inter-organizational Networking Study (posted at www.ou.edu/crcm/Consent.html)

Page # 1: Informed consent

INFORMATION SHEET FOR CONSENT

TO PARTICIPATE IN A RESEARCH STUDY

My name is [primary researcher name], and I am a professor in [department and university name]. I am requesting that you volunteer to participate in a research study titled [research study name]. You were selected as a possible participant because you work at either [HQ building 1 name] or [HQ building 2 name]. Please read this information sheet and contact me to ask any questions that you may have before agreeing to take part in this study.

Purpose of the Research Study: The purpose of this study is: To examine the relationships among [network affiliation name] located at [HQ]. The study will also examine the relationships of these organizations to other [network affiliation name] organizations.

Procedures: If you agree to participate in this study you will be asked to complete an online survey about your interaction and communication patterns with local [network affiliation name] organizations.

Risks and Benefits of Being in the Study: Although there will be no information included that will make it possible to identify you individually with your responses; there are slight risks related to revealing employment information, and personal

information such as gender and amount of professional experience will be sought as part of the demographic data collected in the study. The benefits to participation are: Individuals will potentially benefit from a better understanding of their organization's level of interaction with other organizations in the network. Additional benefits potentially include increased knowledge through enhanced organizational networking and expansion of professional and social relationships with other professionals in their area of interest.

Compensation: You will not be compensated for your time and participation in this study.

Voluntary Nature of the Study: Participation in this study is voluntary. Your decision whether or not to participate will not result in penalty or loss of benefits to which you are otherwise entitled. If you decide to participate, you are free not to answer any question or discontinue participation at any time.

Length of Participation: Approximately 30-45 minutes

Confidentiality: The records of this study will be kept private and your supervisor will not have access to your responses. In published reports, there will be no information included that will make it possible to identify you as a research participant. Research records will be stored securely. Data will be kept in electronic format only. Only the PI and Co-Investigators will have access to this data, which will consist of an SPSS data file. Any raw data collected (i.e. Excel datasheets) will be destroyed once the data has been transferred into the SPSS file. Any paper copies made of the data during the data

analysis process will be destroyed once the analysis for which the paper copy was needed has been concluded. The SPSS file will be kept on one password-protected computer until the data analysis phase of the study is completed. Once the study has been completed, the SPSS file will be transferred to a password-protected disk which will then be secured in a locked file by the P.I.; the data file on the password-protected computer will them be erased so that only the disk-saved copy remains. Only approved researchers will have access to the records.

Contacts and Questions: If you have concerns or complaints about the research, the researcher [primary researcher name] conducting this study can be contacted at: e-mail to [primary researcher e-mail address] or contact via phone at [primary researcher phone number]. In the event of a research-related injury, contact the researcher(s). You are encouraged to contact the researcher(s) if you have any questions. If you have any questions, concerns, or complaints about the research and wish to talk to someone other than the individuals on the research team, or if you cannot reach the research team, you may contact the [university institutional review board name and abbreviation] at [IRB phone number] or [IRB e-mail address].

By clicking on the "CONTINUE" button at the bottom of this page, I am agreeing to participate in this study.

- ○ Continue

Page #2: Participant Organization

For the purposes of this study, please choose the organization which you spend the majority of your time working for as being your organization. If you are a member of multiple organizations involved with this study, please fill out the information for your non-primary organizations in the same manner as for the organizations with which you have no affiliation.

Which [network affiliation name] related organization are you a member of? Click on the link below to be directed to the corresponding organizational survey.

[Organization A]

[Organization B]

[Organization C]

[Organization D]

[Organization E]

[Organization F]

[Organization G]

[Organization H]

[Organization I]

[Organization J]

[Organization K]

[Organization L]

[Organization M]

[Organization N]

[Organization O]

[Organization P]

[Organization Q]

[Organization R]

[Organization S]

Survey Instrument II: Primary Survey Instrument

Page # 1:

1. Demographic Information: Please tell us a little bit about yourself.

1. Which of the following best describes your primary function in your organization?

- Executive
- Administrative
- Management/ Supervisory
- Professional Researcher
- Student Researcher
- Technical
- Other

2. Where is your primary office/ workspace located?

- [HQ building 1] floor 1
- [HQ building 1] floor 2
- [HQ building 2] floor 1
- [HQ building 2] floor 2
- [HQ building 2] floor 3
- [HQ building 3] floor 1
- [HQ building 3] floor 2
- [HQ building 3] floor 3
- [HQ building 3] floor 4

- [HQ building 3] floor 5
- None of the above

Page # 2:

2. Please tell us about your personal networking with other organizations in the [network affiliation name] community: Information about personal networking in the [network affiliation name] community

1. Do you have contact with people from [organization name]?
    - Yes
    - No

Page # 3: (Included if the response on page # 2 was "Yes")

3. Please tell us more about your networking with [organization name]: Additional personal networking information

1. How many people at [organization name] do you have contact with?
    - 1-2
    - 3-4
    - 5-7
    - 8-10
    - 10+
2. How often do you have contact with someone from [organization name]?
    - Almost daily
    - 2-3 times per week
    - About once a week

- Several times per month
- About once a month
- Less than once per month

3. What is your primary form of contact with people from [organization name]?

- Face-to-face conversations
- E-mail
- Phone calls
- Group meetings
- Informal conversations (hallway, watercooler, etc.)
- None of the above

4. How would you characterize the flow of information between yourself and the people from [organization name]?

- From me to them
- From them to me
- Equally both ways
- We don't really exchange work-related information
- I can't tell, it varies a lot.

5. How would you characterize the relationship between yourself and [organization name]?

- Networking (loosely defined roles, little communication, no shared decision-making)

- Cooperation (somewhat defined roles, formal communication, provide information to each other, no shared decision-making)
- Coordination (defined roles, frequent communication, share information and resources, some shared decision-making)
- Coalition (share ideas and resources, frequent and prioritized communication, everyone has a say in decision-making)
- Collaboration (belong to one system, frequent communication with mutual trust, consensus is reached on all decisions)

6. How would you characterize the relationship between your organization and [organization name]?

- Networking (loosely defined roles, little communication, no shared decision-making)
- Cooperation (somewhat defined roles, formal communication, provide information to each other, no shared decision-making)
- Coordination (defined roles, frequent communication, share information and resources, some shared decision-making)
- Coalition (share ideas and resources, frequent and prioritized communication, everyone has a say in decision-making)
- Collaboration (belong to one system, frequent communication with mutual trust, consensus is reached on all decisions)

Page # 32:

32: Open-ended questions

1. Please tell us to what extent moving to [HQ] has affected your communication/ networking with the other organizations in the [network affiliation name] community:
2. Please tell us to what extent moving to the [HQ] has affected your organization's communication/ networking with the other organizations in the [network affiliation name] community:
3. Please tell us what you think could be done to further improve communication/ networking between the people and organizations in the [network affiliation name] community located at [HQ]:

Page # 33:

33. End of Survey: This is the final page of the survey instrument.

Thank You!

By clicking the button at the bottom of this page you will complete and exit the survey. Your results will be sent to the research team for aggregate data analysis; you cannot be individually identified in this process.

All data used in this study will be reported to the sponsoring organizations and for publication only in aggregate form.

Again, thank you for your time and participation.

Appendix B

Codebook, Coding Sheets, Tally Sheets, and Correlation Matrices

Survey Codebook

Part I: Demographic Data

1. Respondent ID#
    a. Assigned as entered, 3 digit code starting at 001
2. Respondent's Organization
    a. Adam=1, Becky=2, Charlie=3, Diana=4, Eugene=5, Francis=6, George=7, Hannah=8, Irma=9, Jerry=10, Karl=11, Leah=12, Mark=13, Nancy=14, Olivia=15, Paul=16
3. Primary Function
    a. Executive=7, Administrative=6, Management/Supervisory=5, Professional Researcher=4, Technical=3, Student Researcher=2, Other=1, Missing=99
    b. **Recode for analysis:** Management/Supervisory/Executive (5, 7)=4, Professional Researcher (4)=3, Technical/Administrative (3, 6)=2, Student Researcher (2)=1, Missing/Other=99
4. Primary Office/Workspace
    a. Bldg. 1 floor 1=1, Bldg. 1 floor 2=2, Bldg. 2 floor 1=3, Bldg. 2 floor 2=4,
    Bldg. 2 floor 3=5, Bldg. 3 floor 1=6, Bldg. 3 floor 2=7, Bldg. 3 floor 3=8,
    Bldg. 3 floor 4=9, Bldg. 3 floor 5=10, None of the Above=11, Missing=99

Part II: Relationship Data

1. Response Organization
    a. Adam=1, Becky=2, Charlie=3, Diana=4, Eugene=5, Francis=6, George=7, Hannah=8, Irma=9, Jerry=10, Karl=11, Leah=12, Mark=13, Nancy=14, Olivia=15, Paul=16
2. Do you have contact with?
    a. No=0, Yes=1, Missing=99
3. Number of people
    a. 0=0, 1-2=1, 3-4=2, 5-7=3, 8-10=4, 10+=5, Missing=99
4. Frequency of contact
    a. No contact=0, < 1/mo.=1, Approx. 1/mo=2, several/mo=3, Approx. 1/wk.=4, 2-3/wk=5, Almost Daily=6, Missing=99
5. Form of contact
    a. No contact=0, E-mail=1, Phone=2, Meetings=3, FtF Conversations=4, Informal Conversations=5, None of the Above=9, Missing=99
    b. **Recode for analysis:** No contact=0, E-mail=1, Phone=2, Meetings=3, FtF/Informal Conversations (4,5)=4, None of the Above=9, Missing=99
6. Direction of contact
    a. No contact=0, Don't really exchange=1, Them to me=2, Me to them=3, It varies a lot=4, Equally both ways=5, Missing=99
    b. **Recode for analysis:** No contact=0, Don't really exchange=1, Unidirectional (2,3)=2, Cybernetic (4,5)=3, Missing=99

7. Self to Org. Collaboration
    a. No contact=0, Networking=1, Cooperation=2, Coordination=3, Coalition=4, Collaboration=5, Missing=99
8. Org. to Org. Collaboration
    a. No contact=0, Networking=1, Cooperation=2, Coordination=3, Coalition=4, Collaboration=5, Missing=99

Sample Survey Code Sheet

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Sample Network Maps Tally Sheets

Tally Sheet: _____

Respondent Org: Adam

B	C	D	E	F	G	H	I	J	K	L	M	N	O	P

Sample Network Maps Tally Sheets

Tally Sheet: _____

Respondent Org: Becky

A	C	D	E	F	G	H	I	J	K	L	M	N	O	P

Sample Network Maps Tally Sheets

Tally Sheet: _____

Respondent Org: Charlie

A	B	D	E	F	G	H	I	J	K	L	M	N	O	P

Sample Network Maps Tally Sheets

Tally Sheet: _____

Respondent Org: Diana

A	B	C	E	F	G	H	I	J	K	L	M	N	O	P

Sample Network Maps Tally Sheets

Tally Sheet: _____

Respondent Org: Eugene

A	B	C	D	F	G	H	I	J	K	L	M	N	O	P

Sample Network Maps Tally Sheets

Tally Sheet: _____

Respondent Org: Francis

A	B	C	D	E	G	H	I	J	K	L	M	N	O	P

Sample Network Maps Tally Sheets

Tally Sheet: _____

Respondent Org: George

A	B	C	D	E	F	H	I	J	K	L	M	N	O	P

Sample Network Maps Tally Sheets

Tally Sheet: _____

Respondent Org: Hannah

A	B	C	D	E	F	G	I	J	K	L	M	N	O	P

Sample Network Maps Tally Sheets

Tally Sheet: _____

Respondent Org: Irma

A	B	C	D	E	F	G	H	J	K	L	M	N	O	P

Sample Network Maps Tally Sheets

Tally Sheet: _____

Respondent Org: Jerry

A	B	C	D	E	F	G	H	I	K	L	M	N	O	P

Sample Network Maps Tally Sheets

Tally Sheet: _____

Respondent Org: Karl

A	B	C	D	E	F	G	H	I	J	L	M	N	O	P

Sample Network Maps Tally Sheets

Tally Sheet: _____

Respondent Org: Leah

A	B	C	D	E	F	G	H	I	J	K	M	N	O	P

Sample Network Maps Tally Sheets

Tally Sheet: _____

Respondent Org: Mark

A	B	C	D	E	F	G	H	I	J	K	L	N	O	P

Sample Network Maps Tally Sheets

Tally Sheet: _____

Respondent Org: Nancy

A	B	C	D	E	F	G	H	I	J	K	L	M	O	P

Sample Network Maps Tally Sheets

Tally Sheet: _____

Respondent Org: Olivia

A	B	C	D	E	F	G	H	I	J	K	L	M	N	P

Sample Network Maps Tally Sheets

Tally Sheet: _____

Respondent Org: Paul

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O

Sample Sheet: Correlation Matrix for Network Mapping Analysis

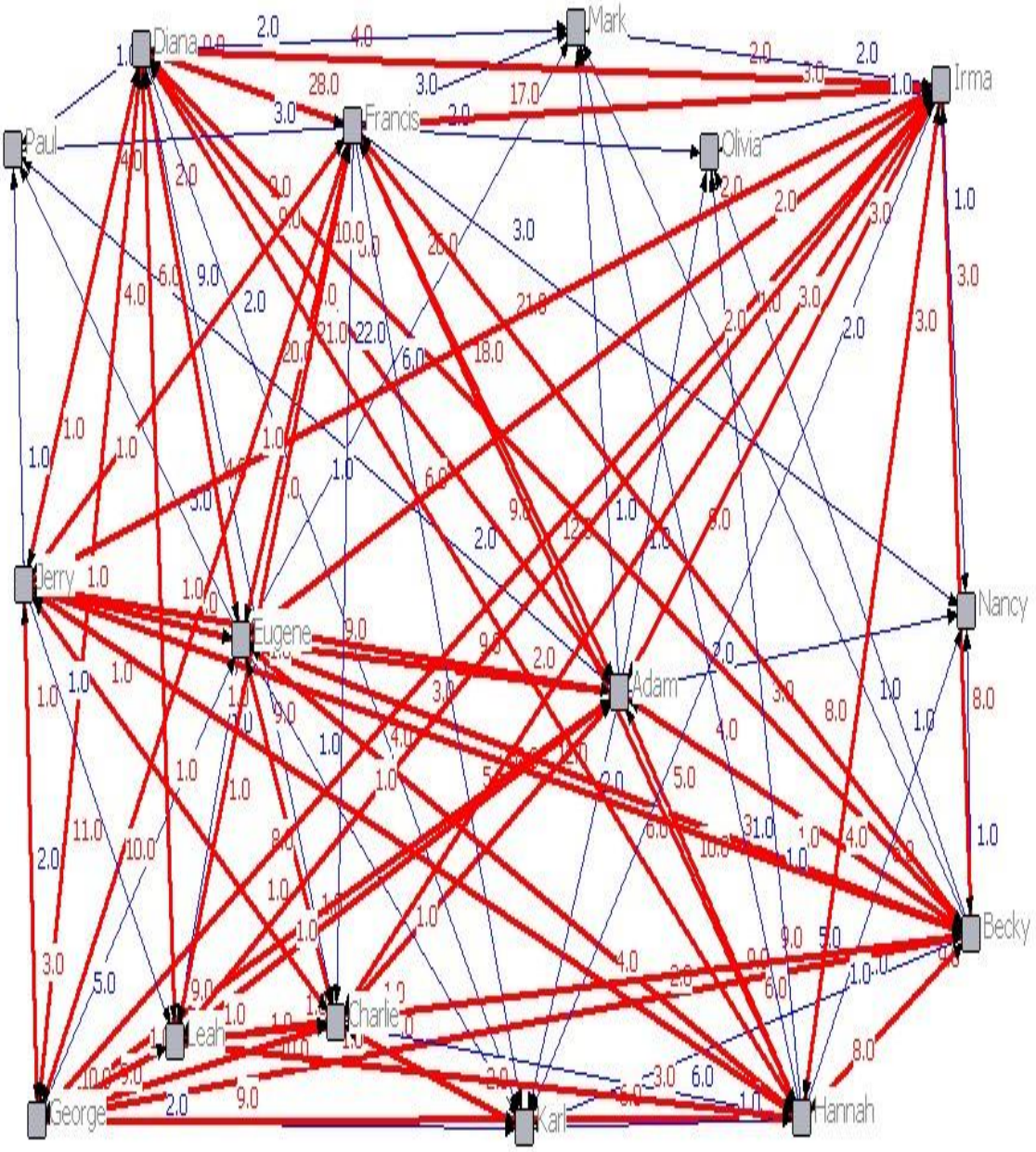
Network Map: _____

Resp. Org. ↓	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**	**P**
Adam	\															
Becky		\														
Charlie			\													
Diana				\												
Eugene					\											
Francis						\										
George							\									
Hannah								\								
Irma									\							
Jerry										\						
Karl											\					
Leah												\				
Mark													\			
Nancy														\		
Olivia															\	
Paul																\

Appendix C

Inter-organizational Network Relationship Reciprocity Maps

Figure C1: Total Contacts between Organizations- Reciprocity

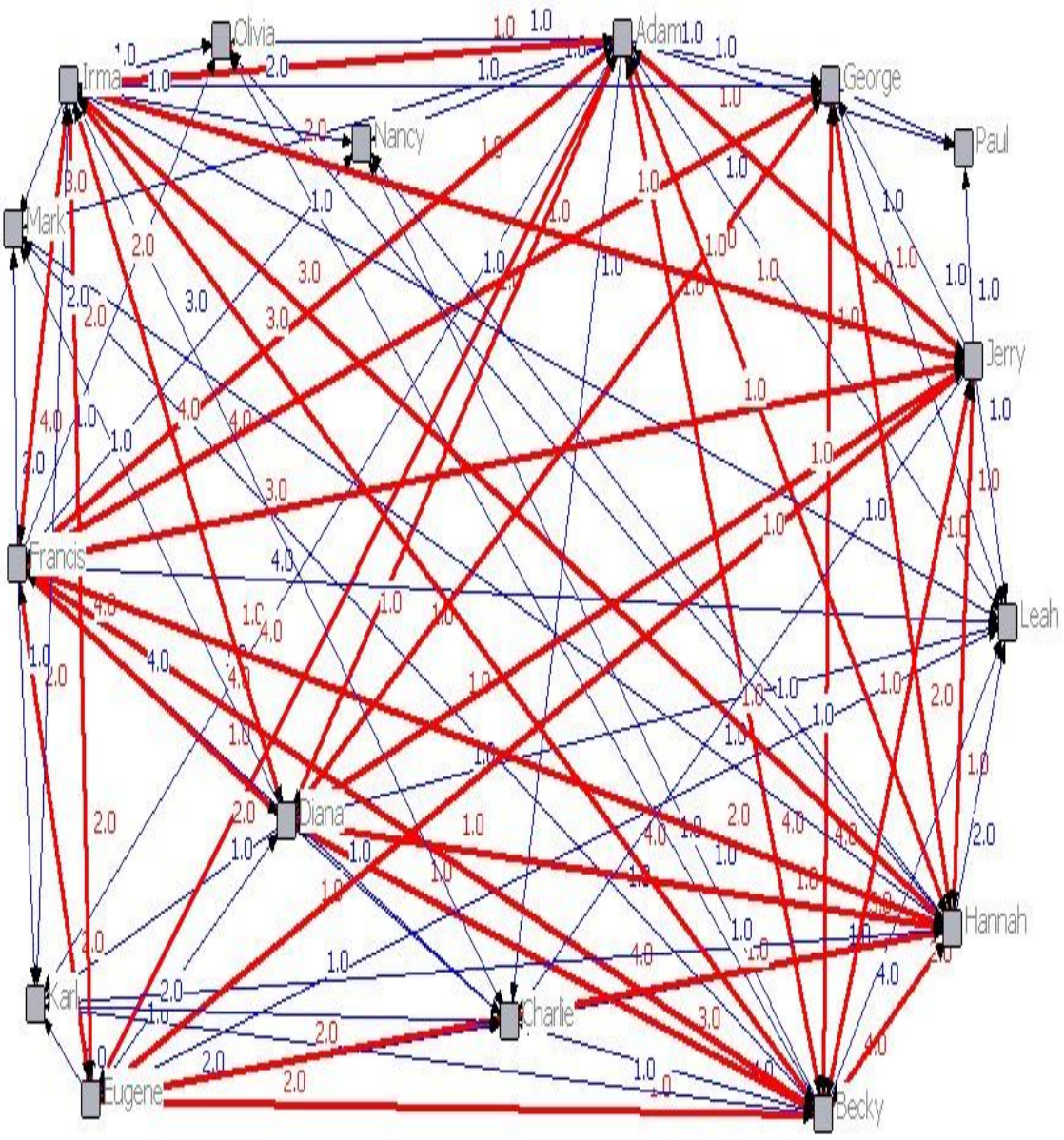


Legend:

Red= Reciprocal Tie

Blue= Non-reciprocal Tie

Figure C2: Management/Supervisory/Executive Organizational Contacts- Reciprocity

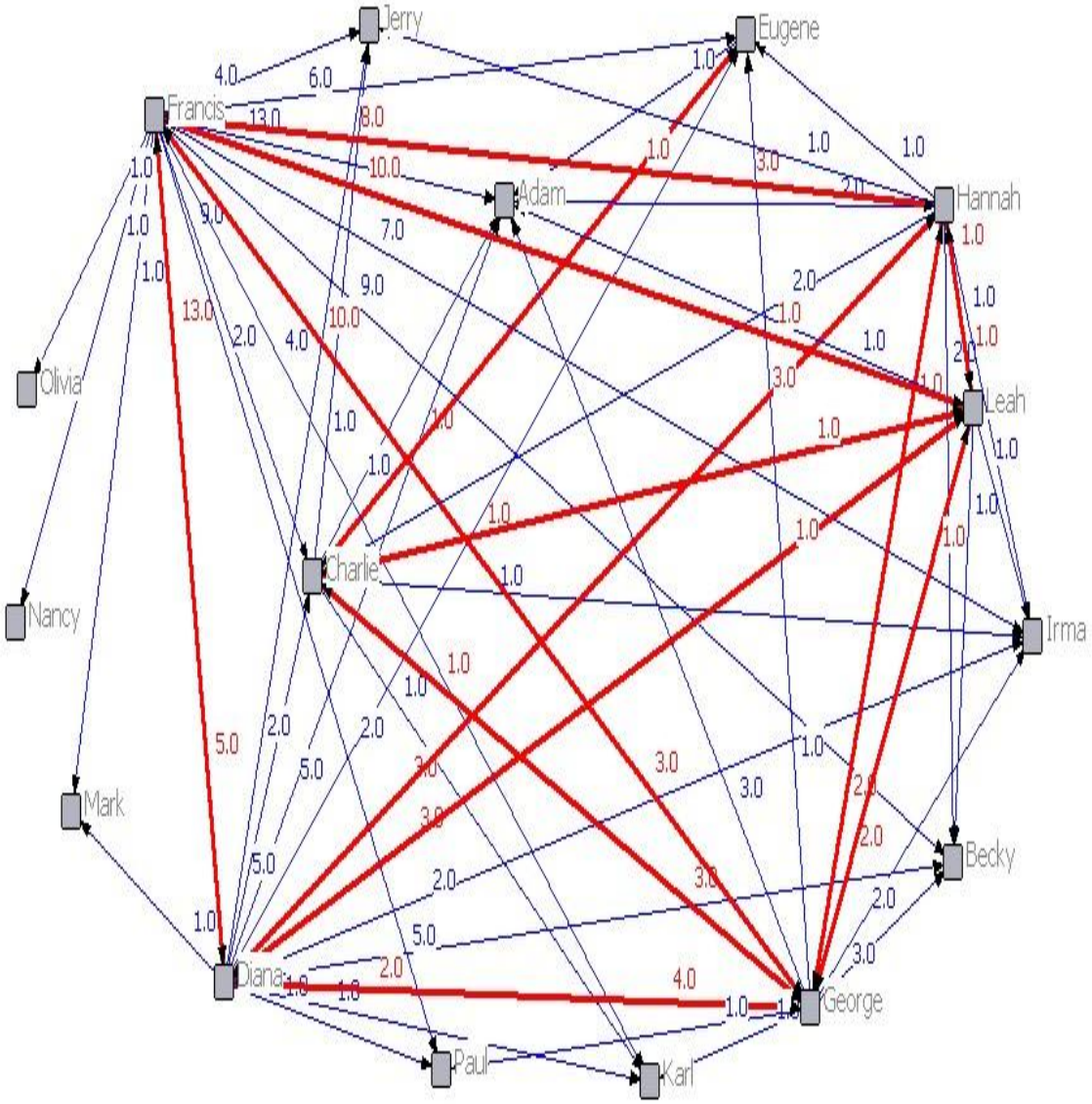


Legend:

Red= Reciprocal Tie

Blue= Non-reciprocal Tie

Figure C3: Professional Researcher Contacts between Organizations- Reciprocity

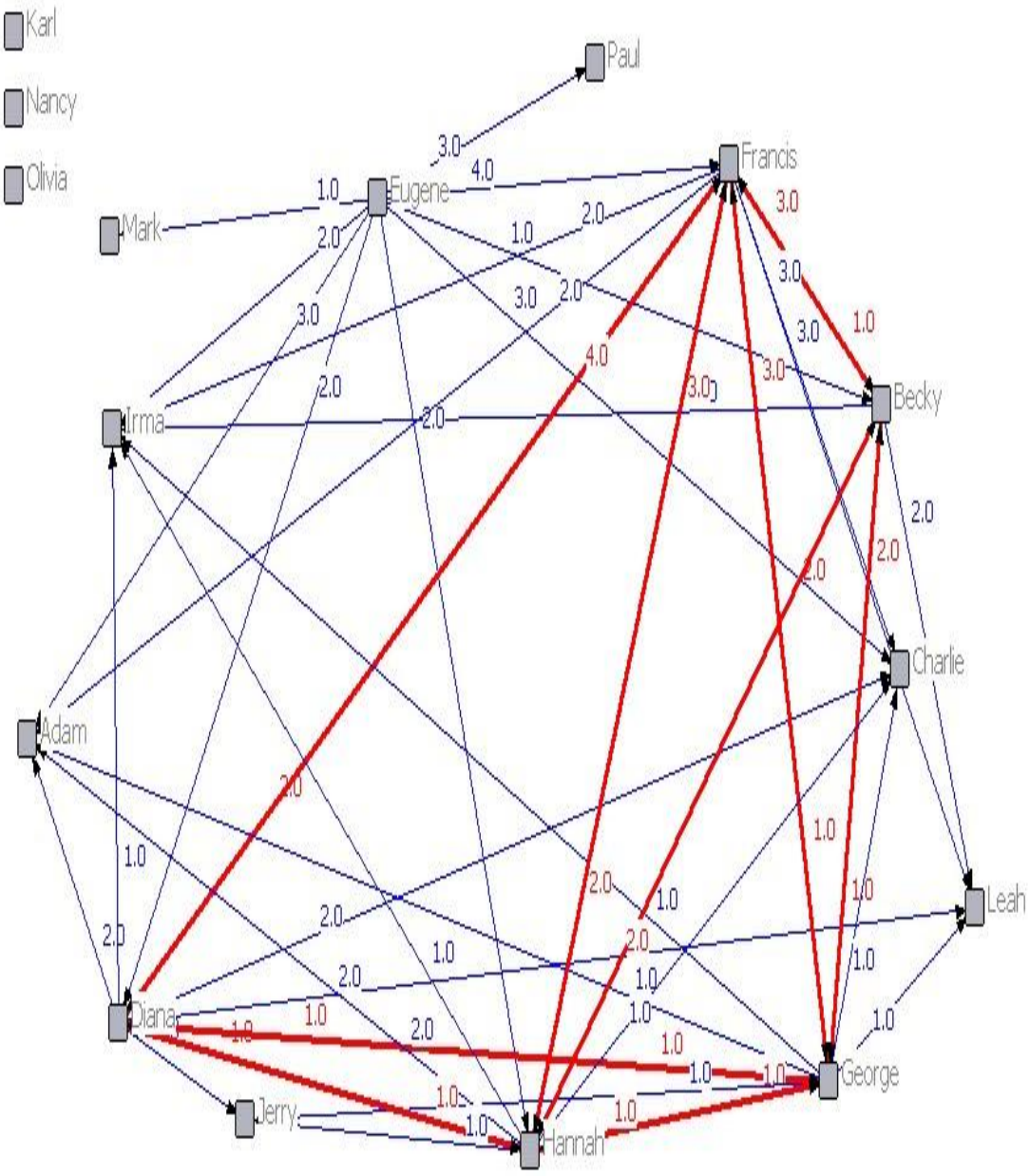


Legend:

Red= Reciprocal Tie

Blue= Non-reciprocal Tie

Figure C4: Technical/Administrative Contacts between Organizations- Reciprocity

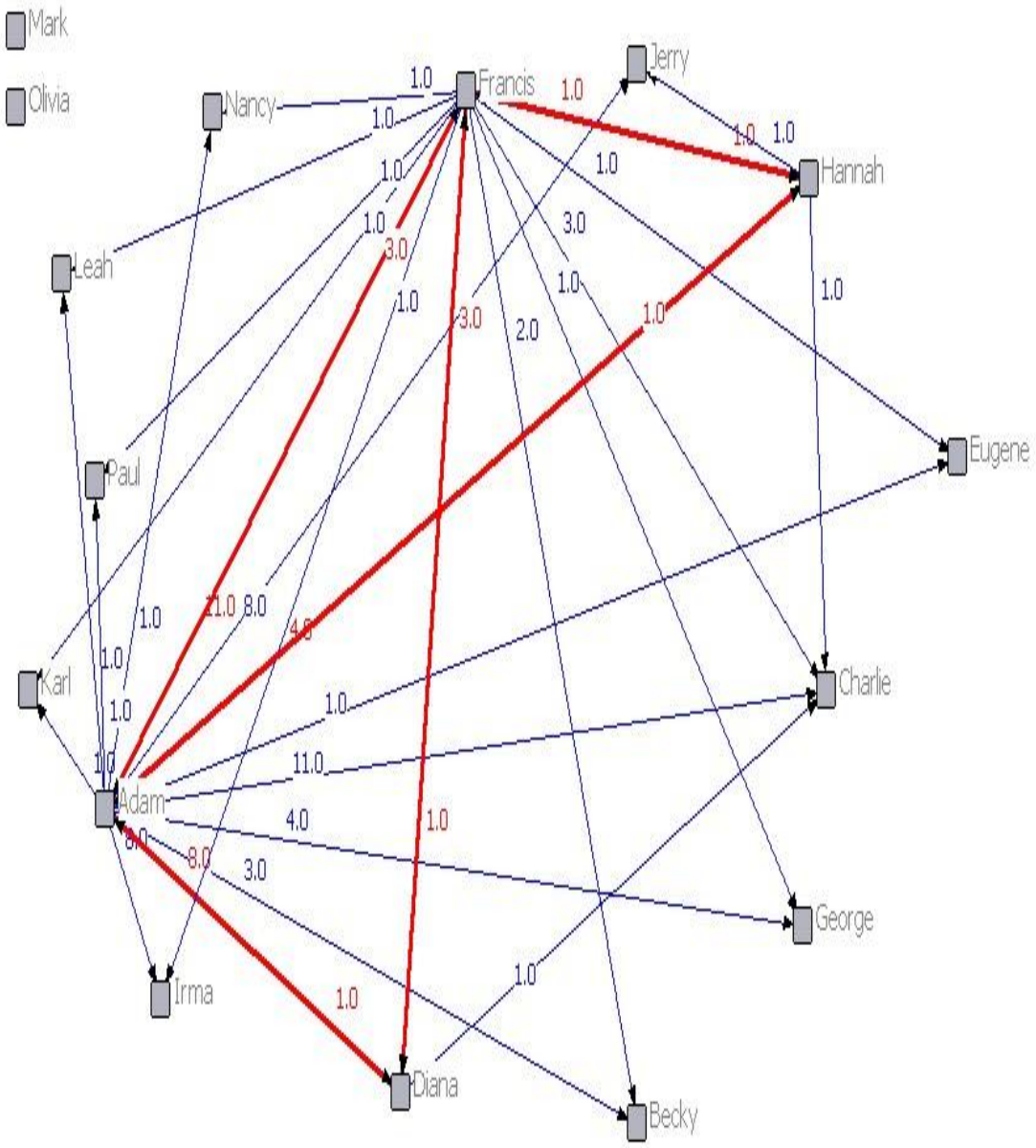


Legend:

Red= Reciprocal Tie

Blue= Non-reciprocal Tie

Figure C5: Student Researcher Contacts between Organizations- Reciprocity

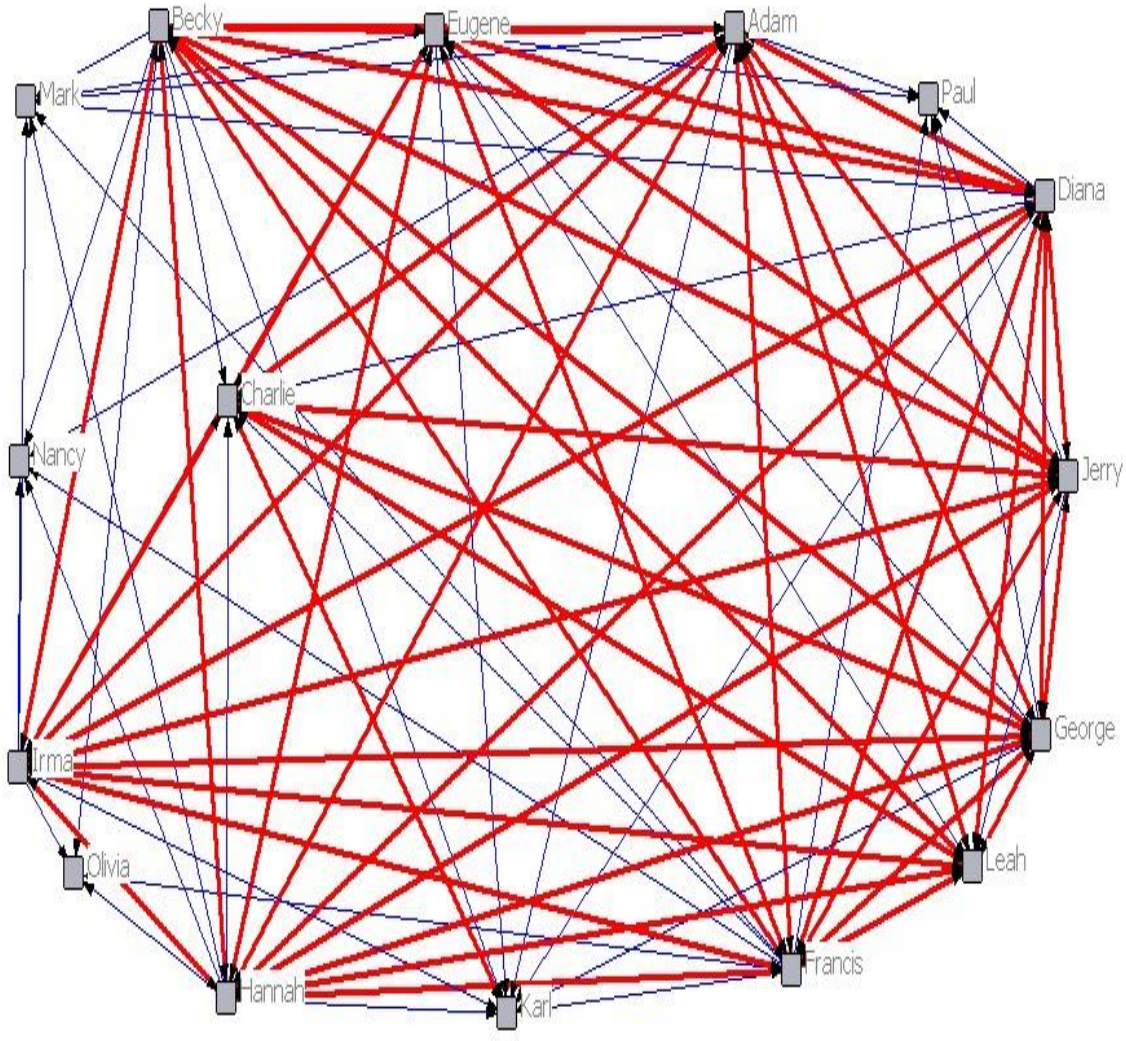


Legend:

Red= Reciprocal Tie

Blue= Non-reciprocal Tie

Figure C6: Total Contact Frequency between Organizations- Reciprocity

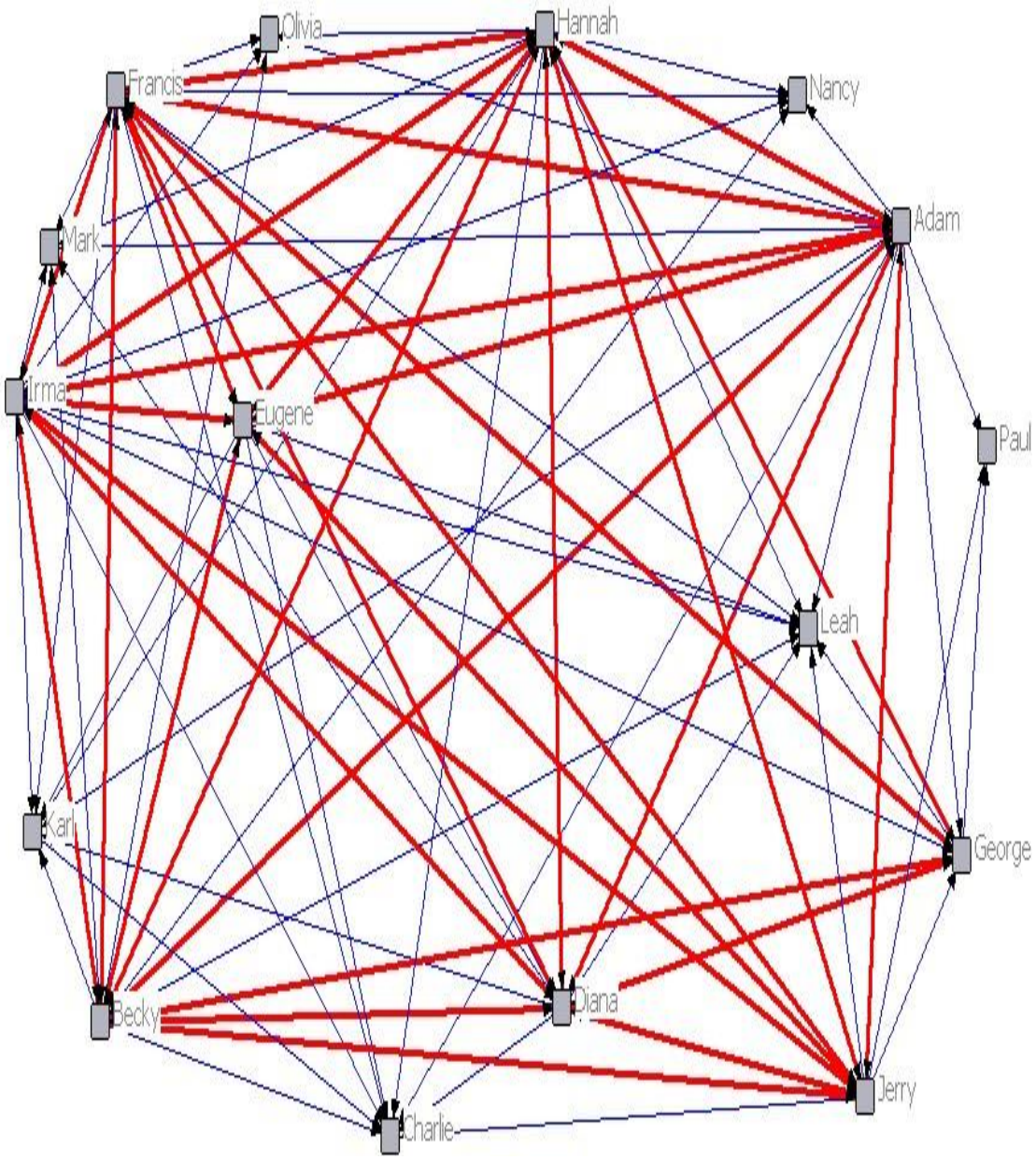


Legend:

Red= Reciprocal Tie

Blue= Non-reciprocal Tie

Figure C7: Management/Supervisory/Executive Contact Frequency- Reciprocity

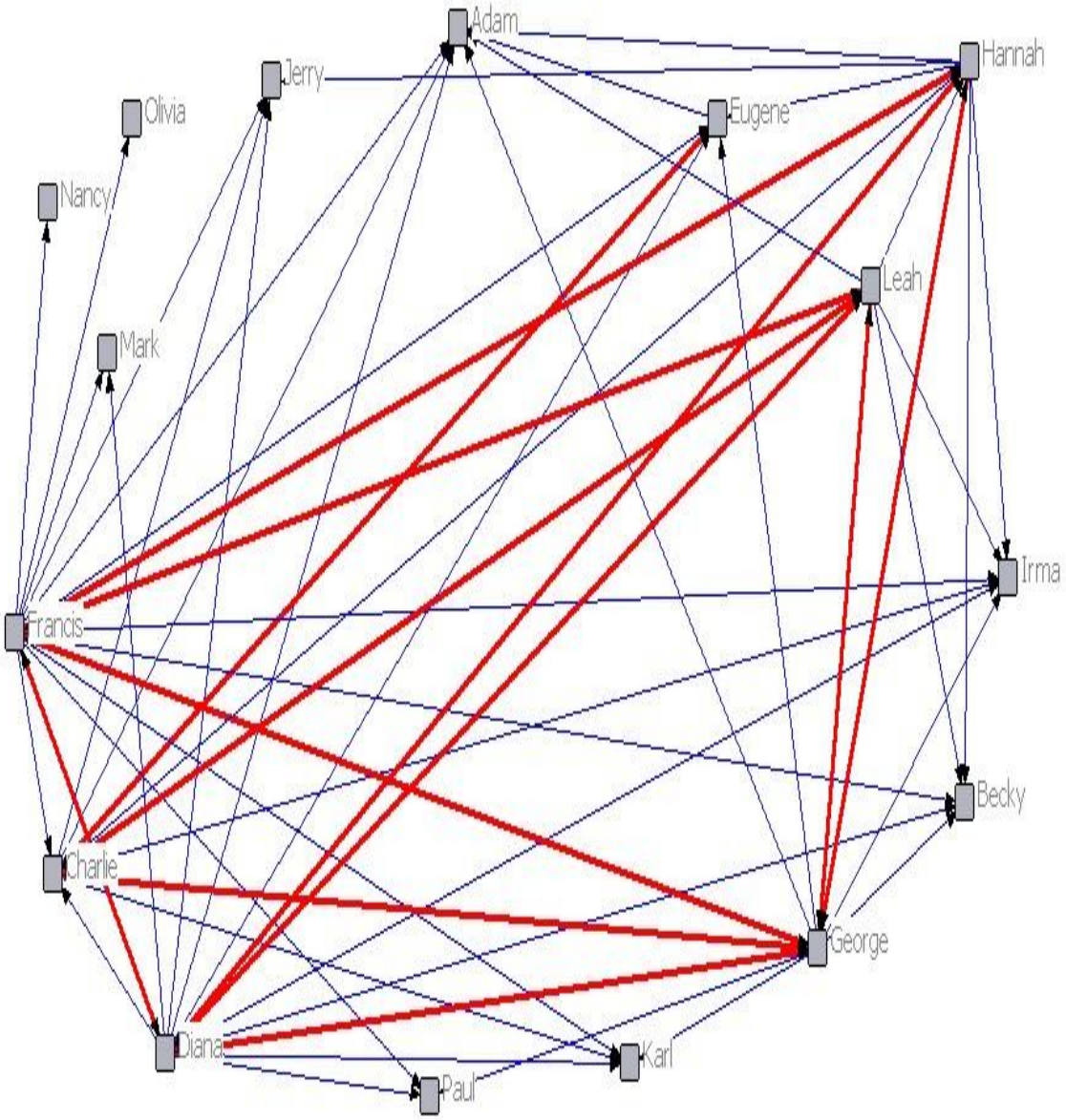


Legend:

Red= Reciprocal Tie

Blue= Non-reciprocal Tie

Figure C8: Professional Researcher Contact Frequency- Reciprocity

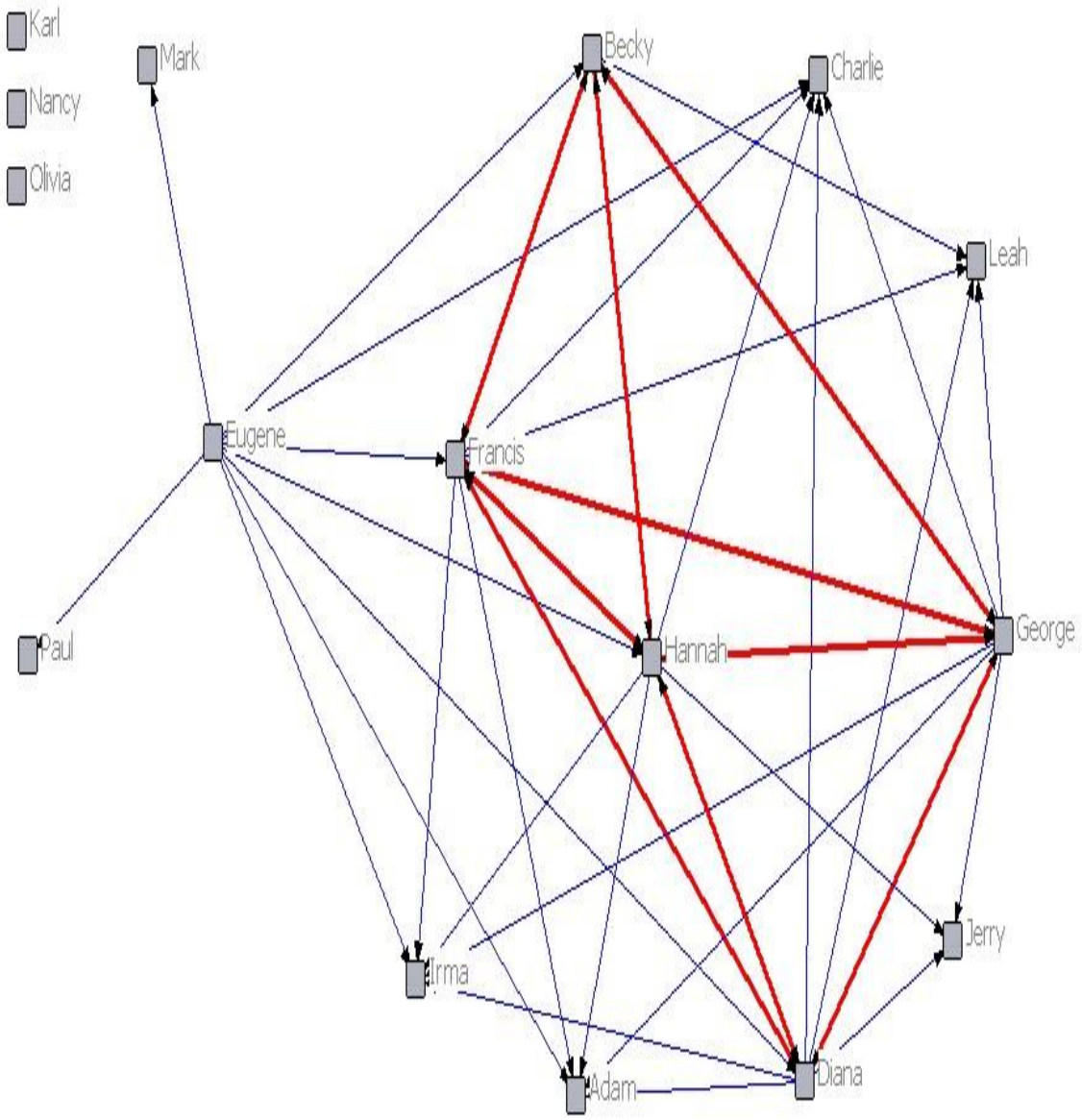


Legend:

Red= Reciprocal Tie

Blue= Non-reciprocal Tie

Figure C9: Technical/Administrative Contact Frequency- Reciprocity

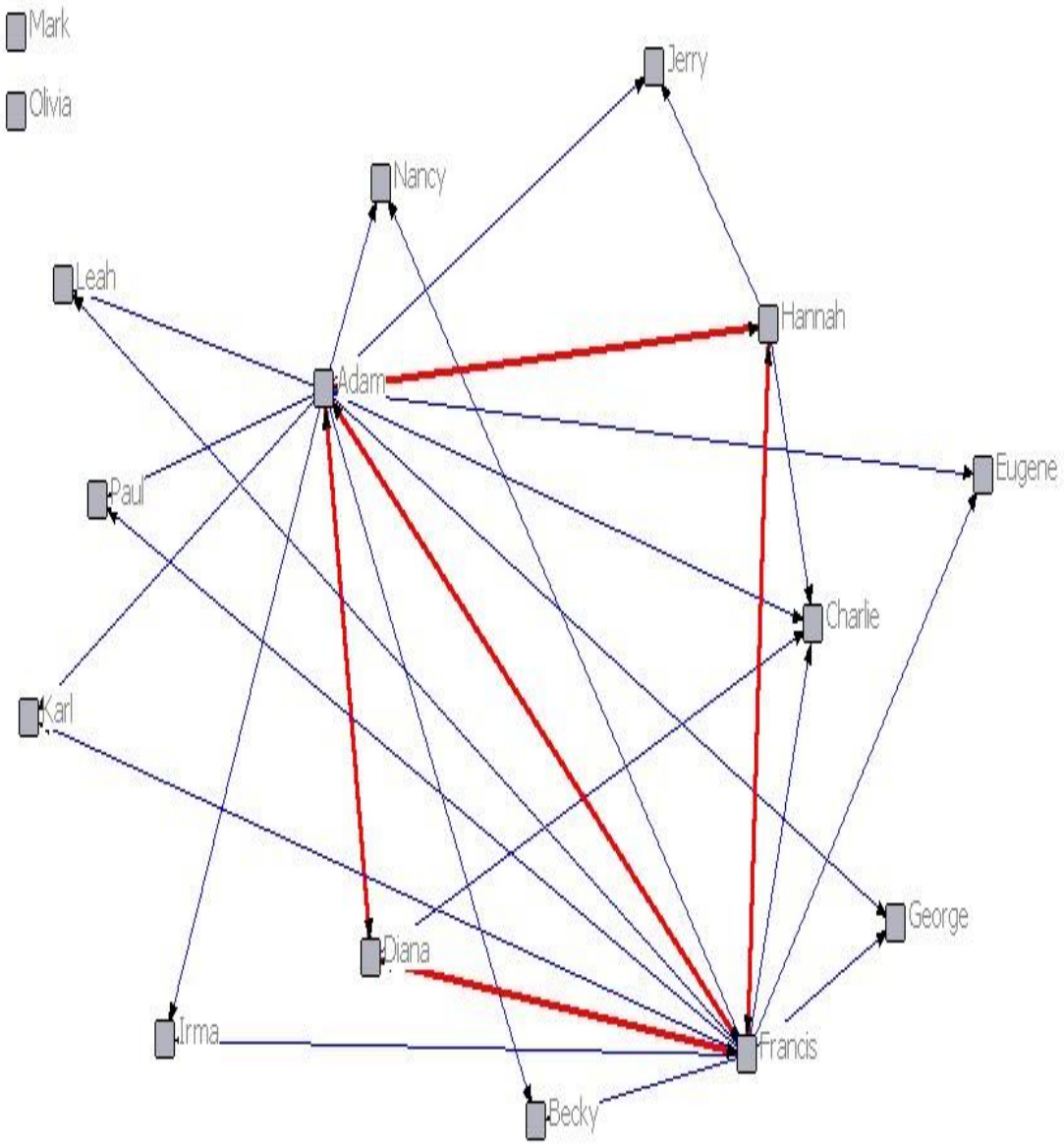


Legend:

Red= Reciprocal Tie

Blue= Non-reciprocal Tie

Figure C10: Student Researcher Contact Frequency- Reciprocity

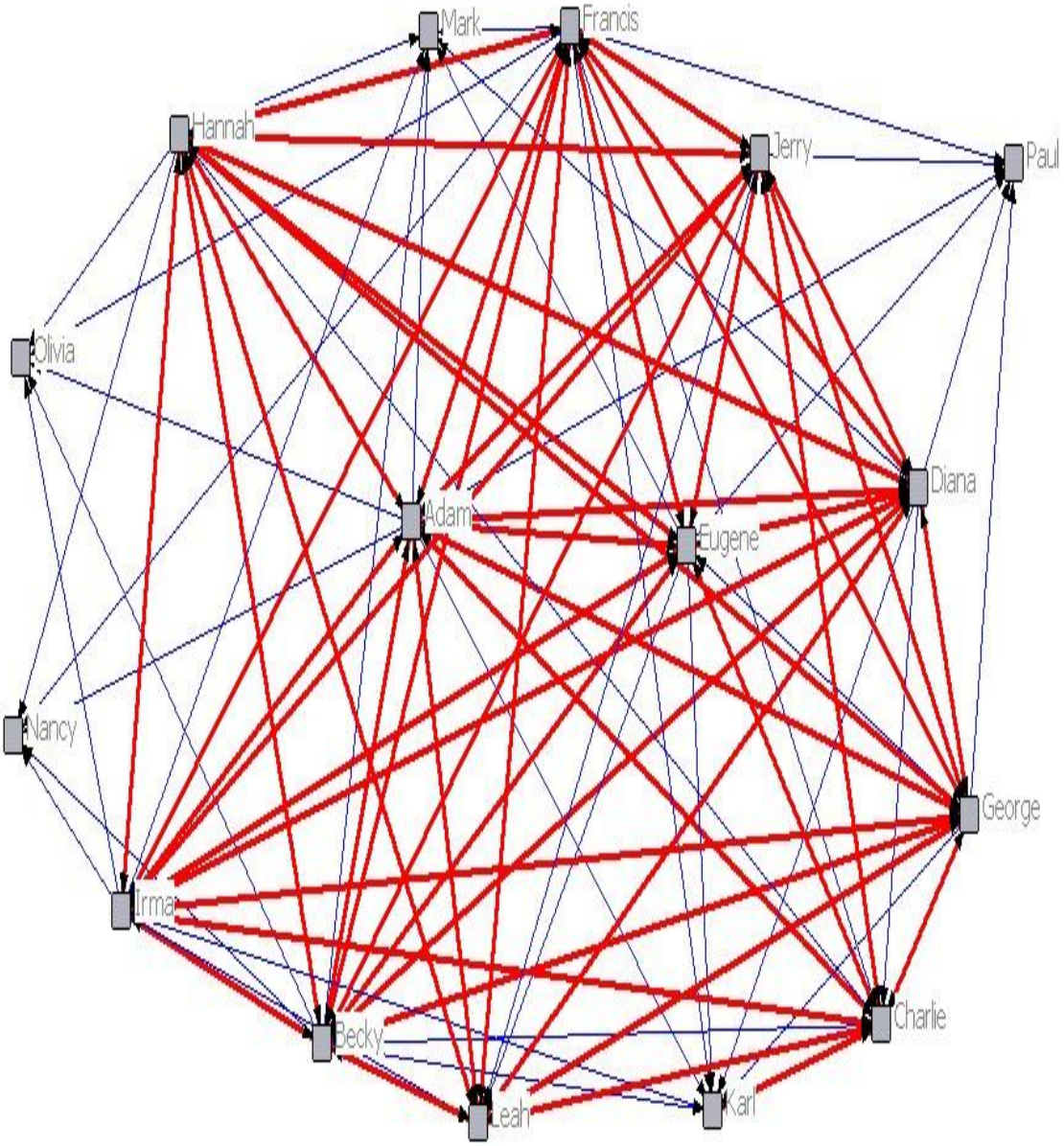


Legend:

Red= Reciprocal Tie

Blue= Non-reciprocal Tie

Figure C11: Total Number of People in Contacts between Organizations- Reciprocity

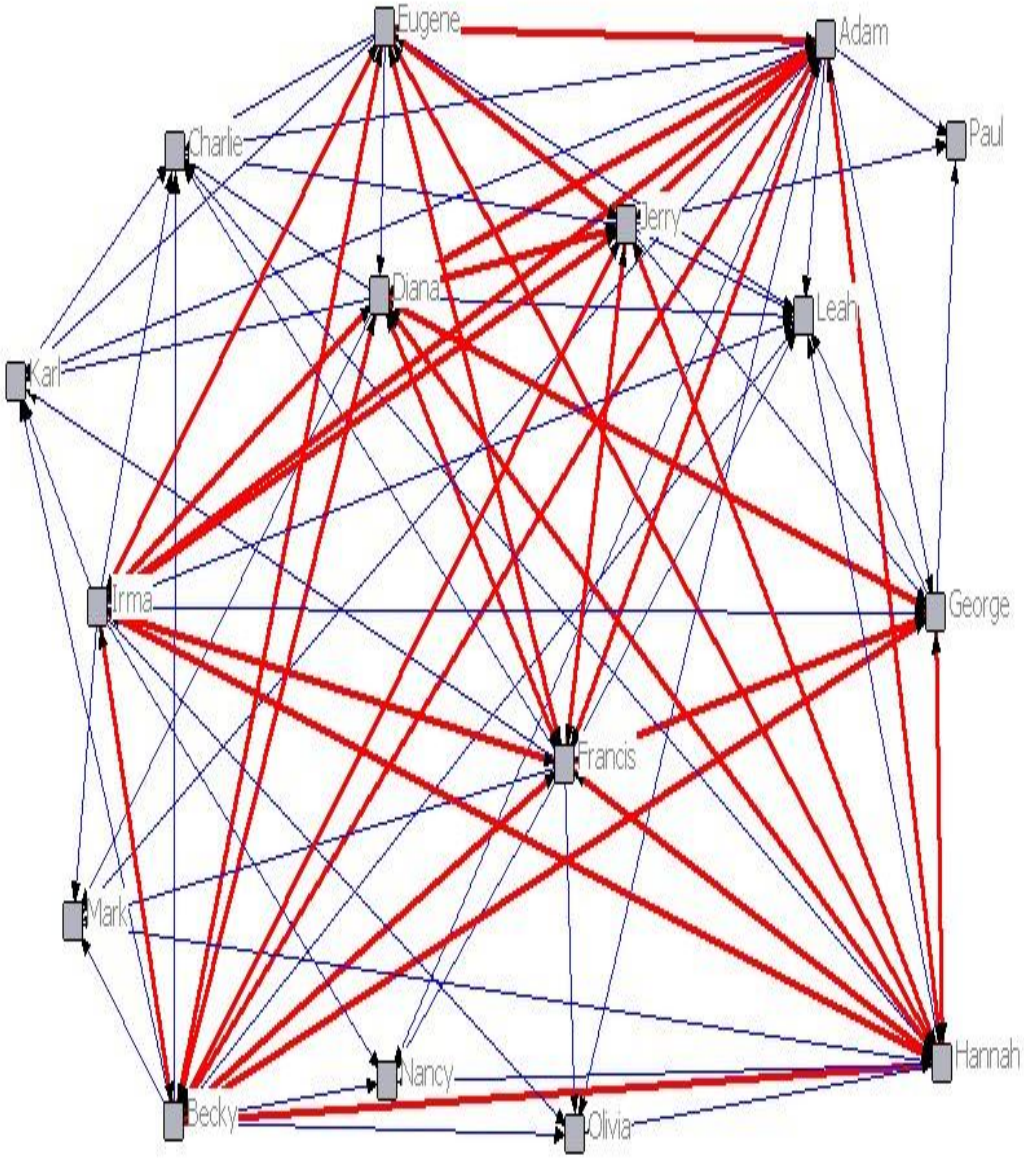


Legend:

Red= Reciprocal Tie

Blue= Non-reciprocal Tie

Figure C12: Management/Supervisory/Executive Number of People- Reciprocity

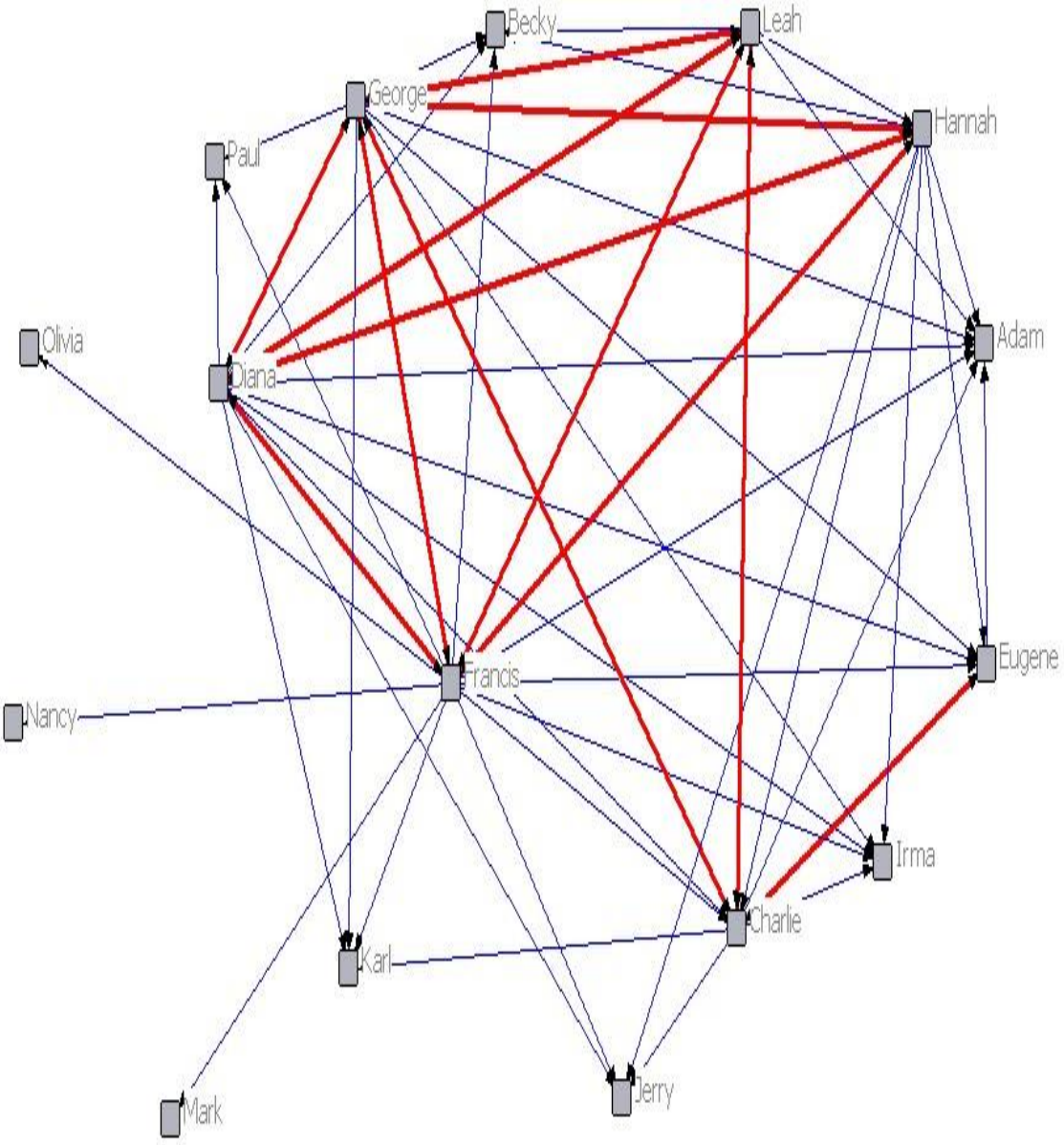


Legend:

Red= Reciprocal Tie

Blue= Non-reciprocal Tie

Figure C13: Professional Researcher Number of People in Contacts- Reciprocity

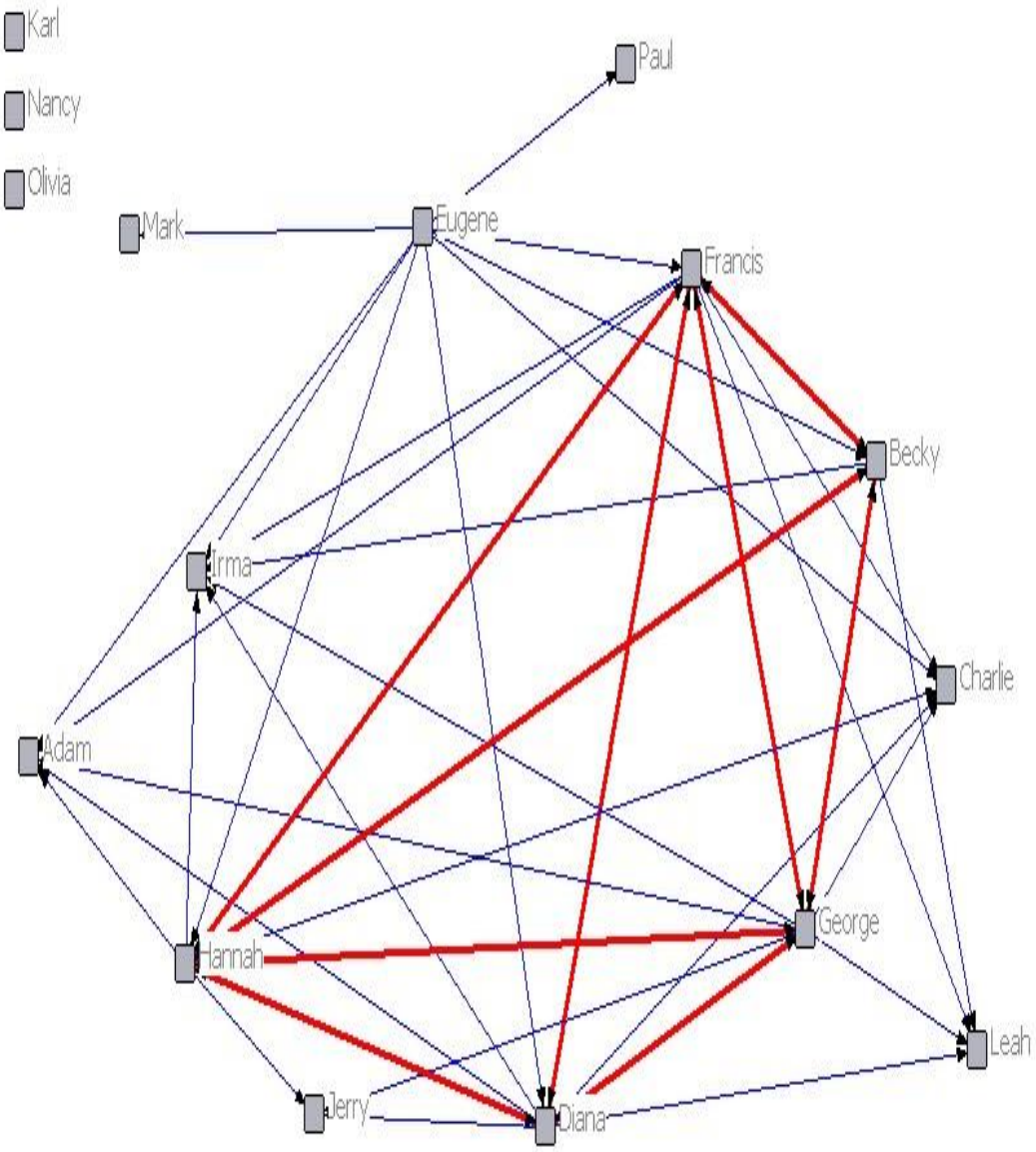


Legend:

Red= Reciprocal Tie

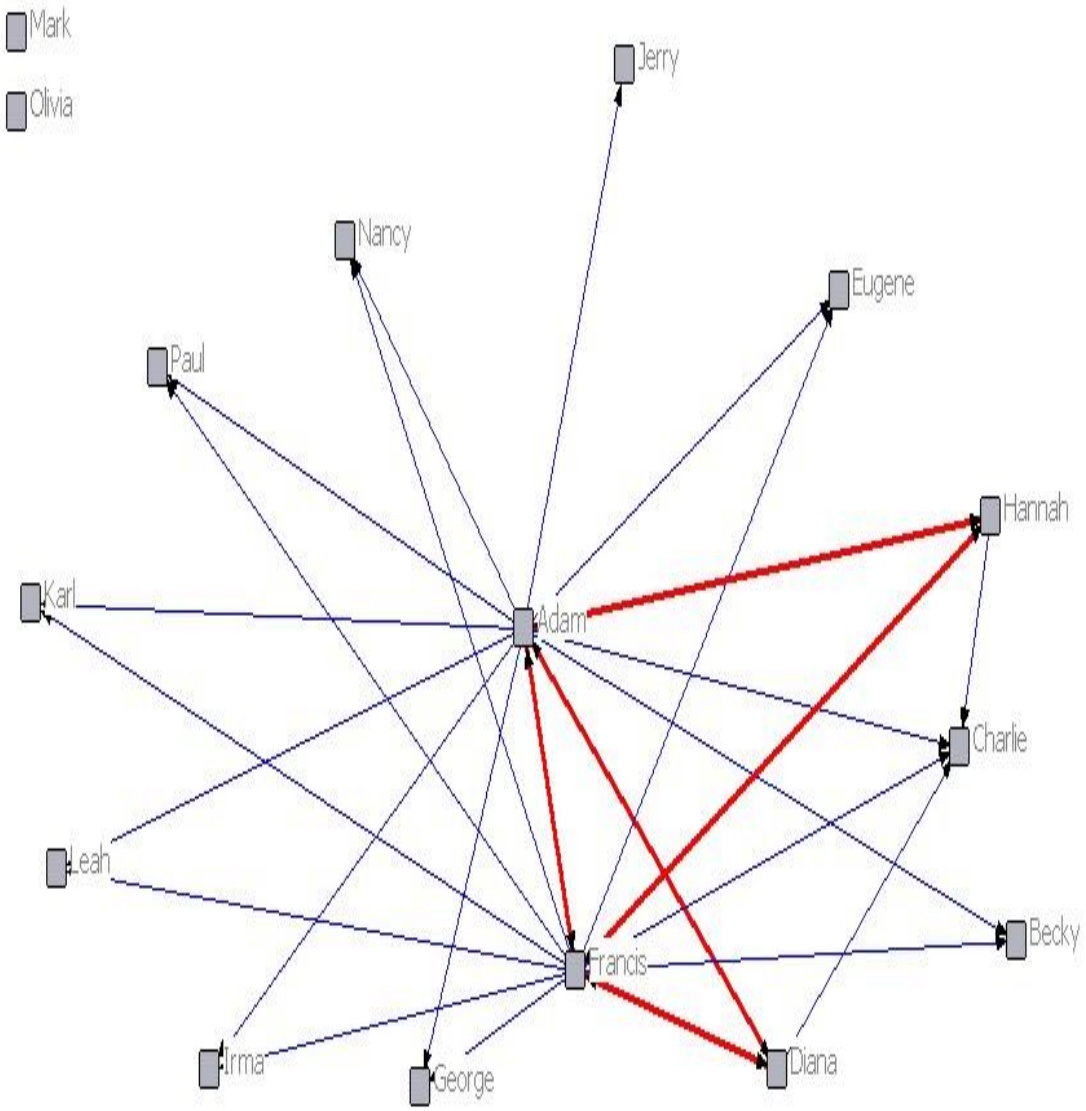
Blue= Non-reciprocal Tie

Figure C14: Technical/Administrative Number of People in Contacts- Reciprocity



Legend:
Red= Reciprocal Tie
Blue= Non-reciprocal Tie

Figure C15: Student Researcher Number of People in Contacts- Reciprocity

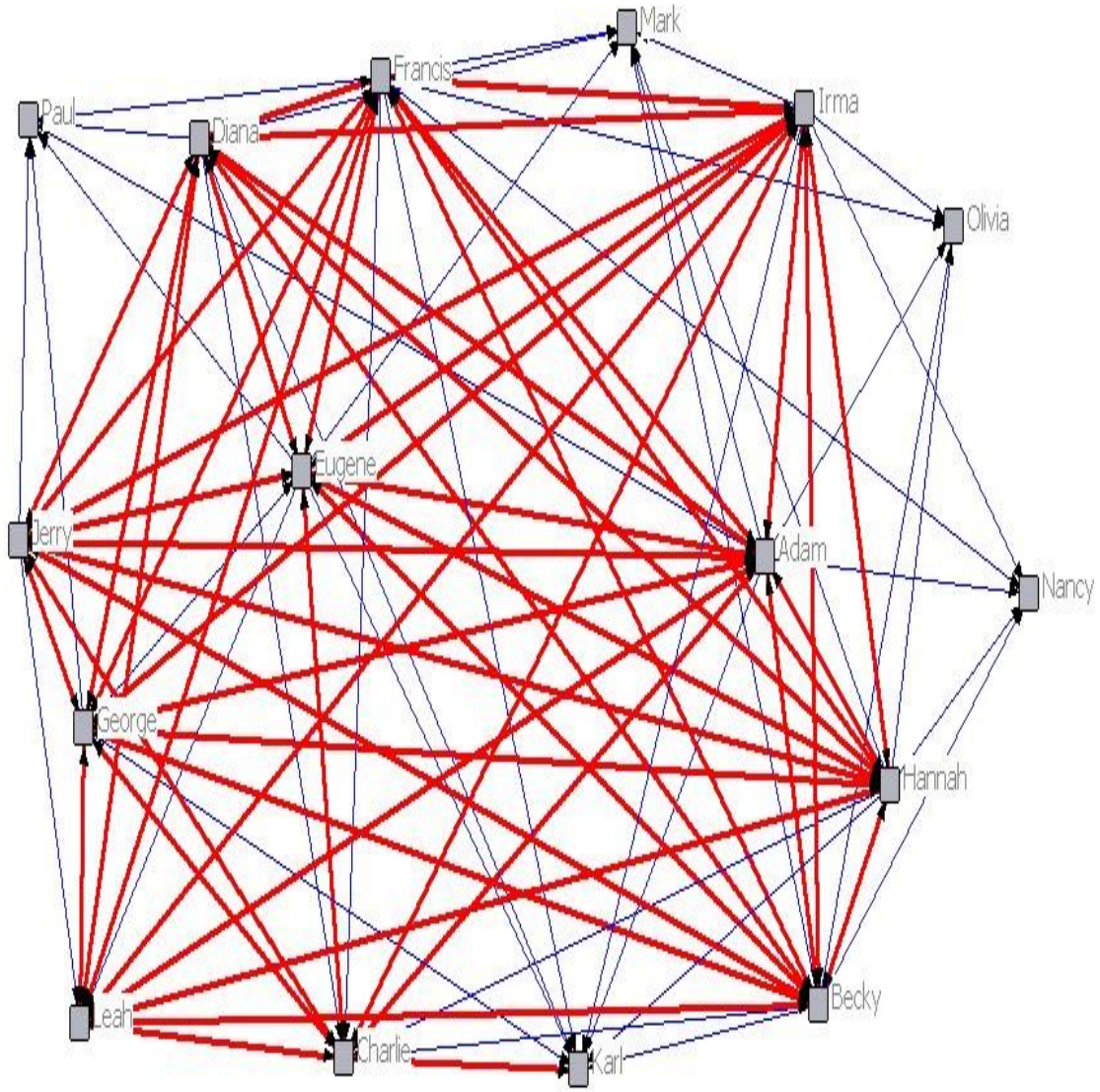


Legend:

Red= Reciprocal Tie

Blue= Non-reciprocal Tie

Figure C16: All Levels Individual-to-Organization Collaboration- Reciprocity

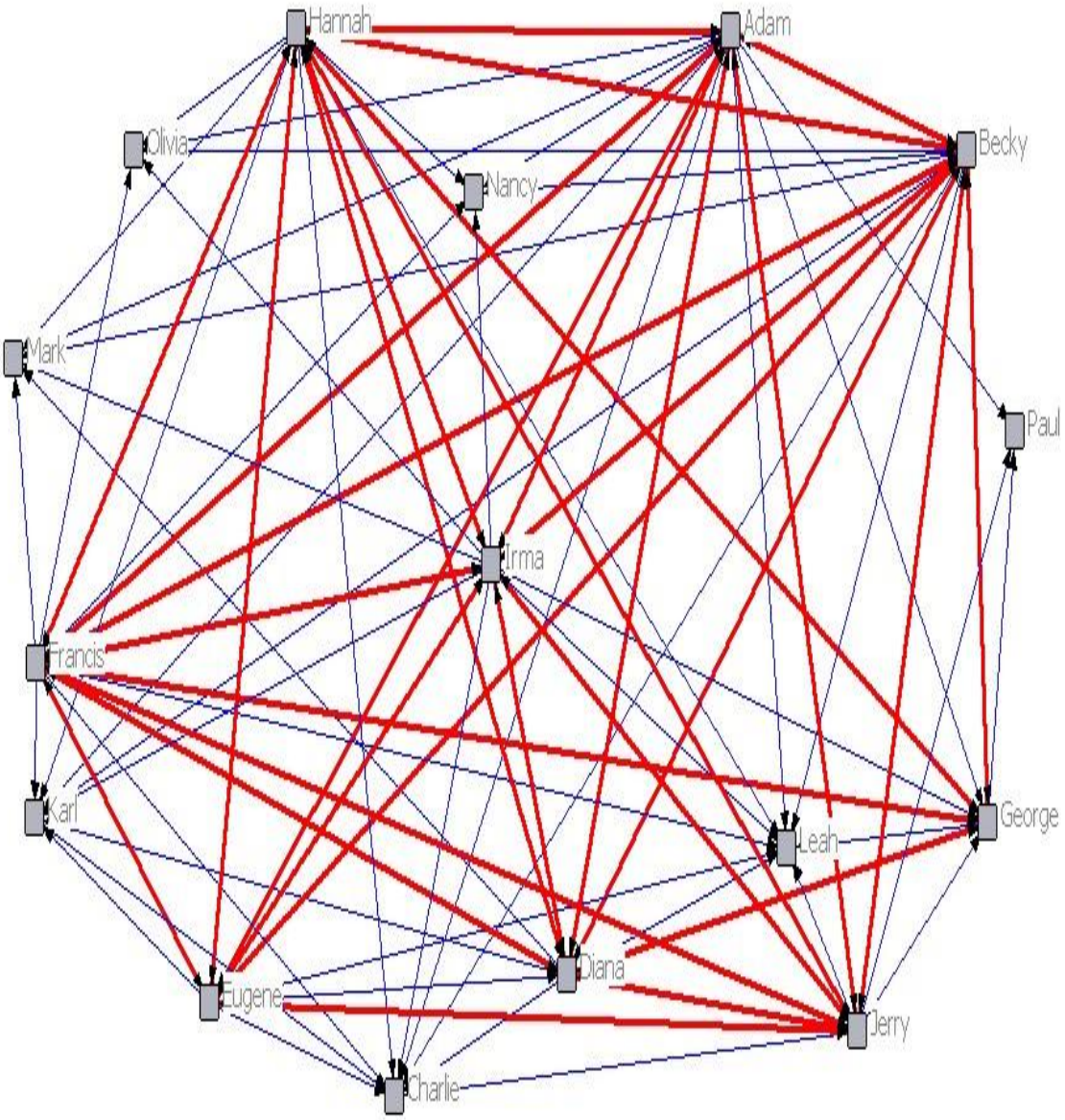


Legend:

Red= Reciprocal Tie

Blue= Non-reciprocal Tie

Figure C17: Management/Supervisory/Executive Individual-to-Organization Collaboration- Reciprocity

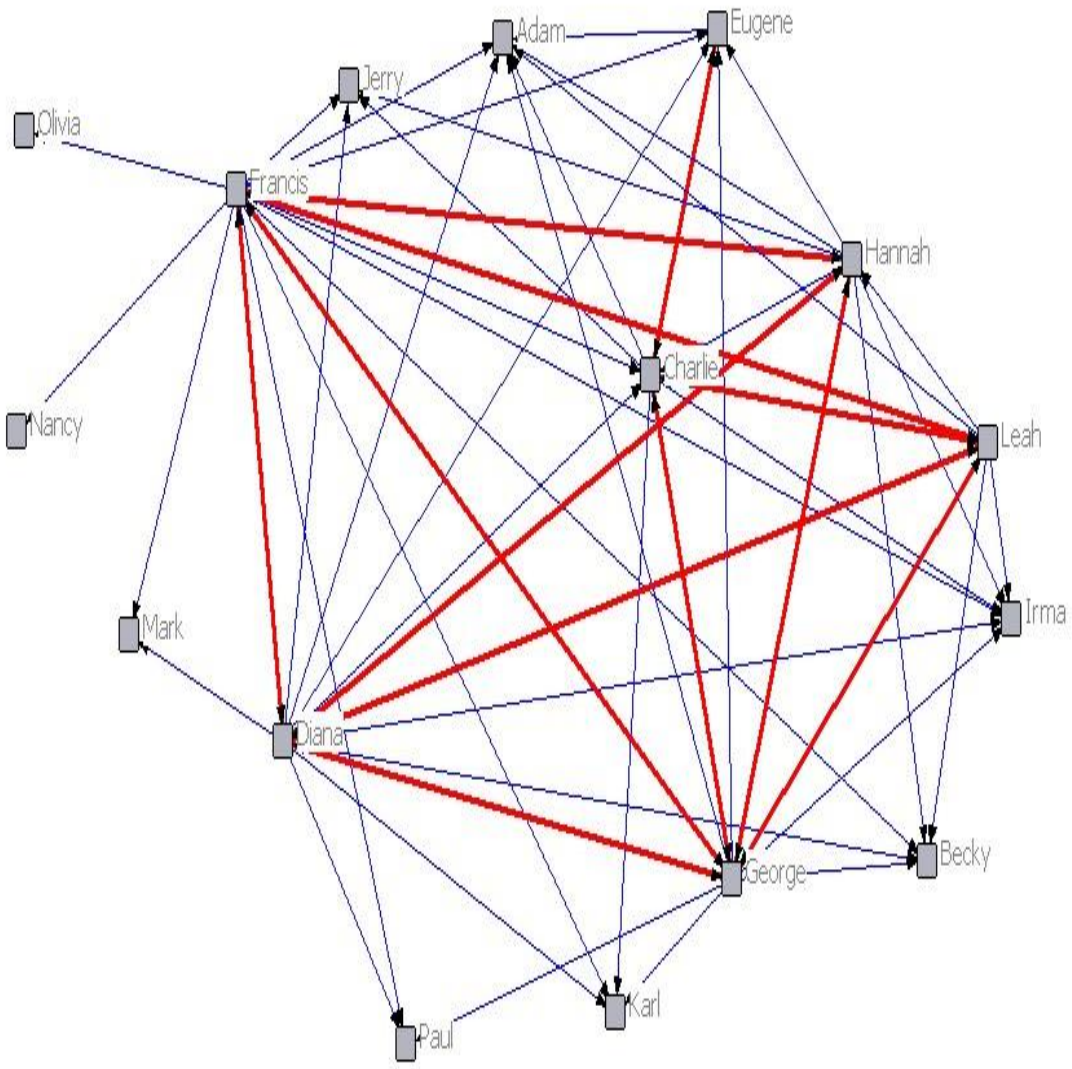


Legend:

Red= Reciprocal Tie

Blue= Non-reciprocal Tie

Figure C18: Professional Researcher Individual-to-Organization Collaboration-Reciprocity

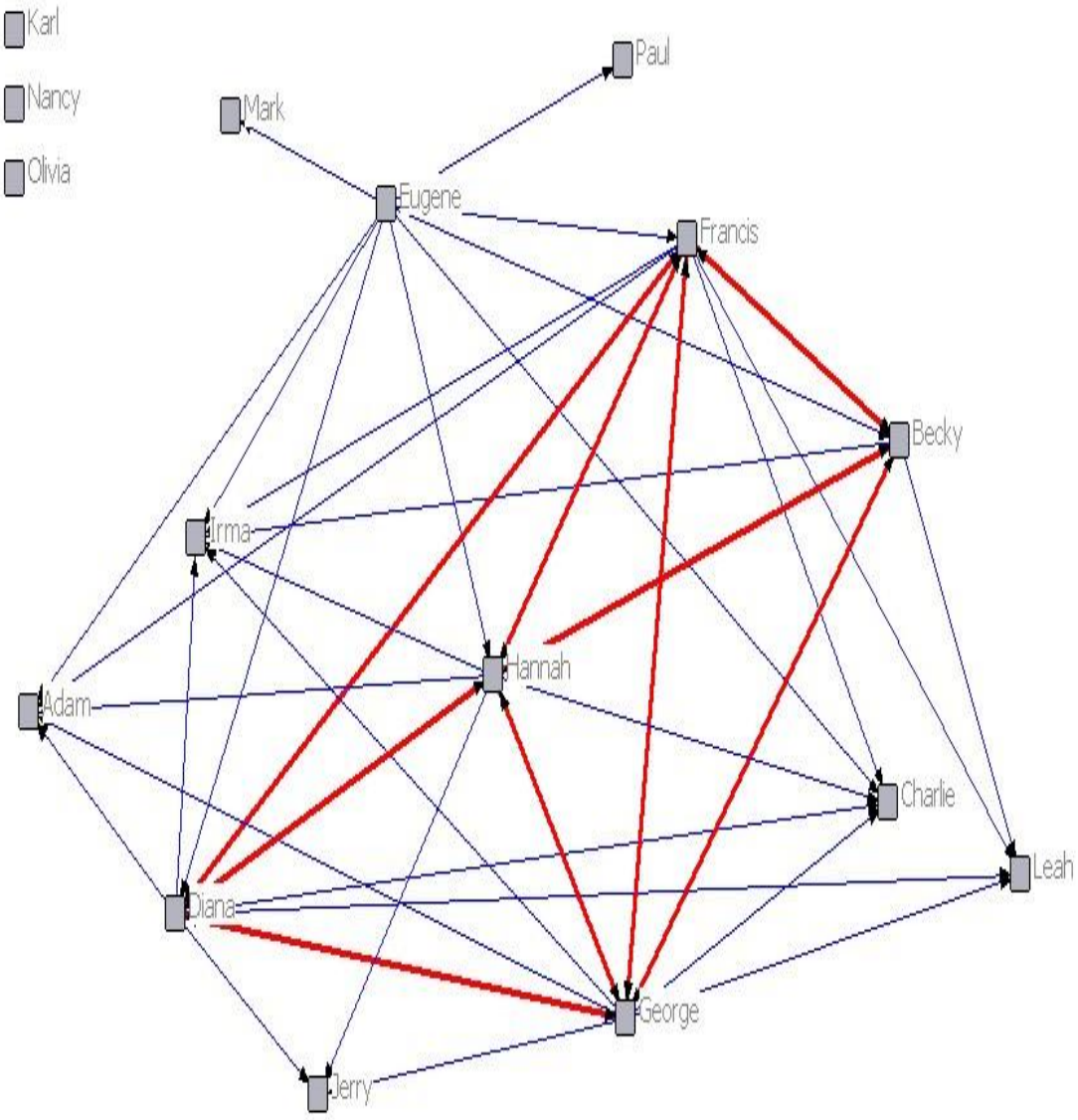


Legend:

Red= Reciprocal Tie

Blue= Non-reciprocal Tie

Figure C19: Technical/Administrative Individual-to-Organization Collaboration-Reciprocity

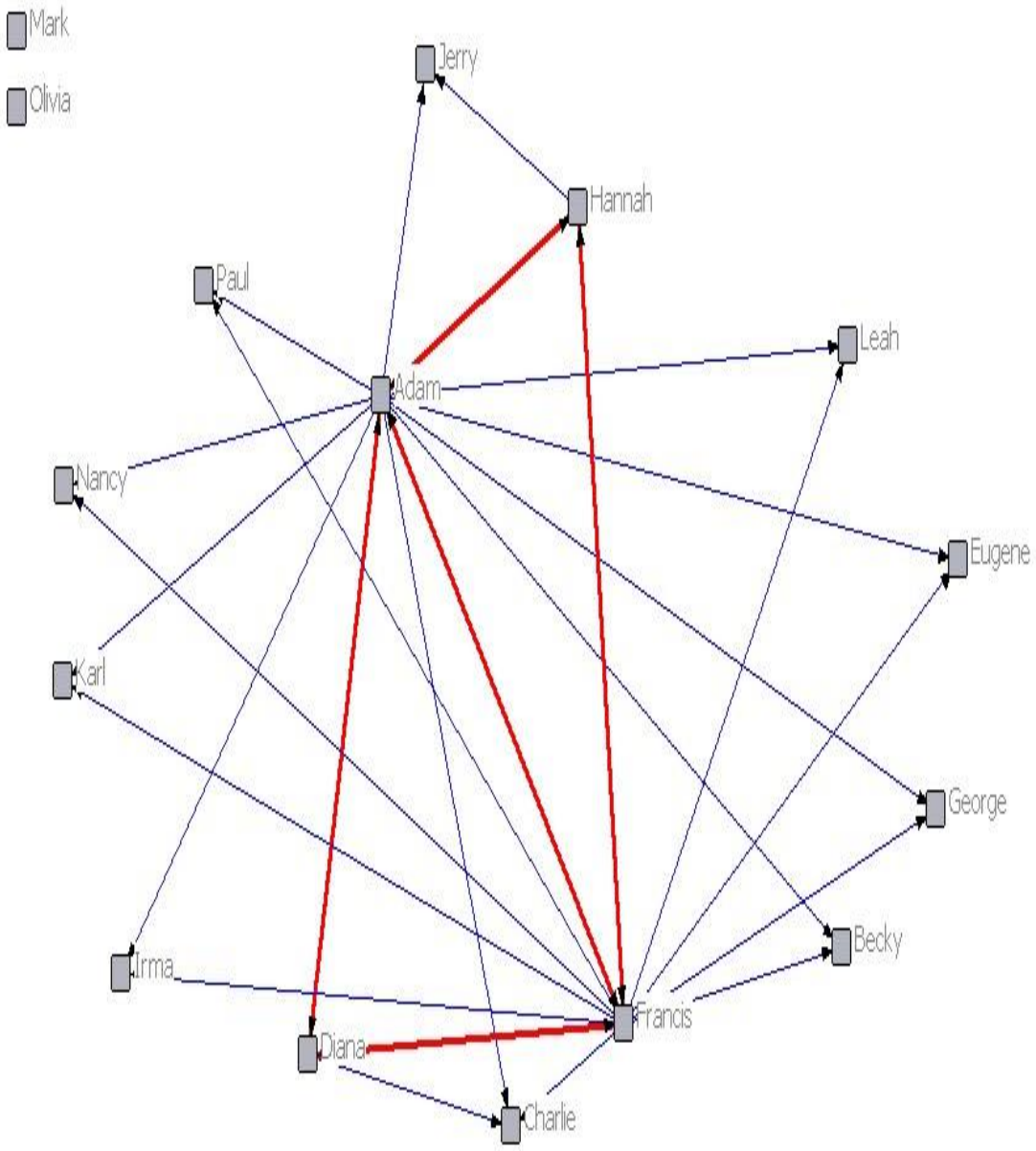


Legend:

Red= Reciprocal Tie

Blue= Non-reciprocal Tie

Figure C20: Student Researcher Individual-to-Organization Collaboration- Reciprocity

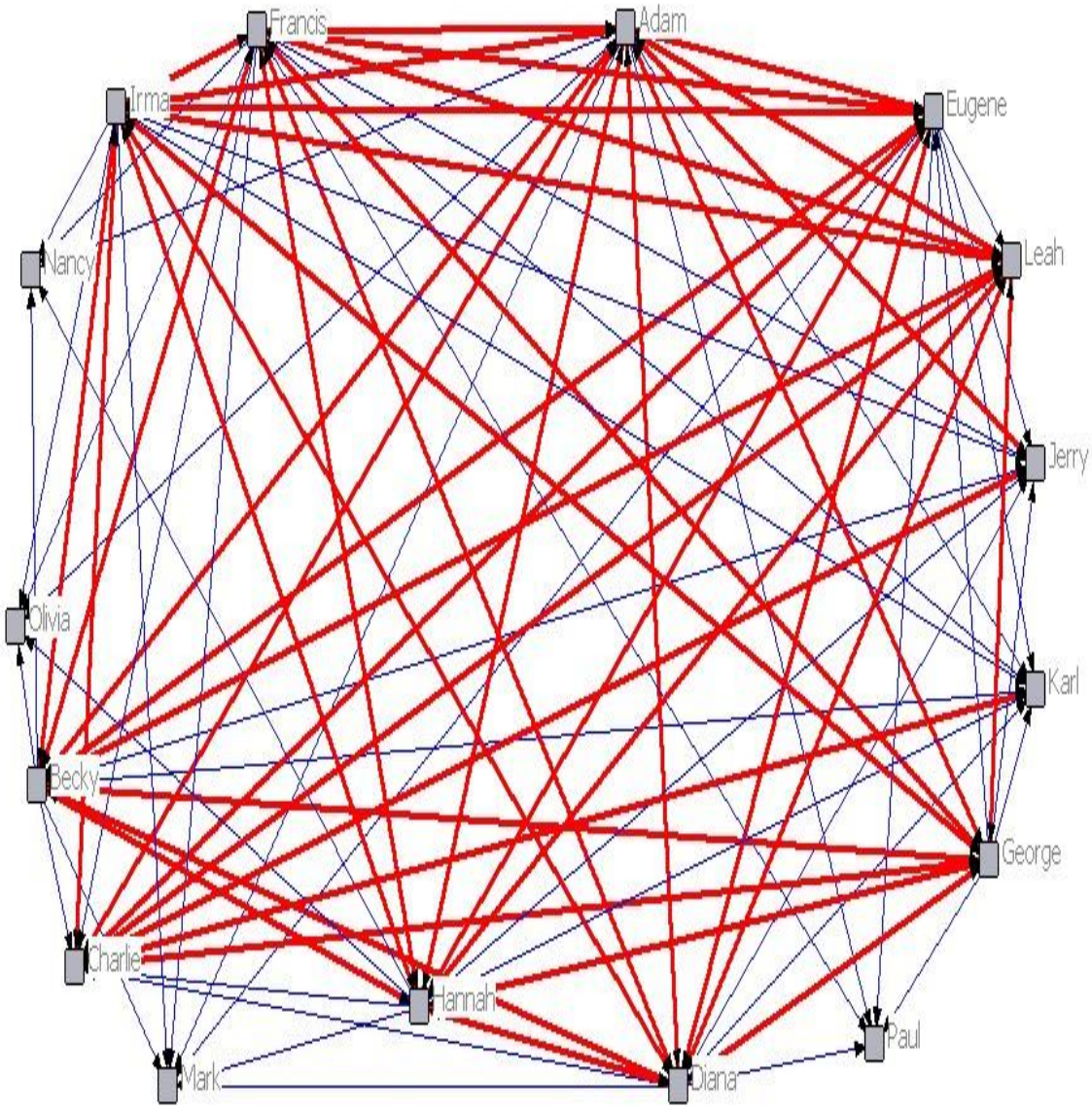


Legend:

Red= Reciprocal Tie

Blue= Non-reciprocal Tie

Figure C21: All Levels Organization-to-Organization Collaboration- Reciprocity

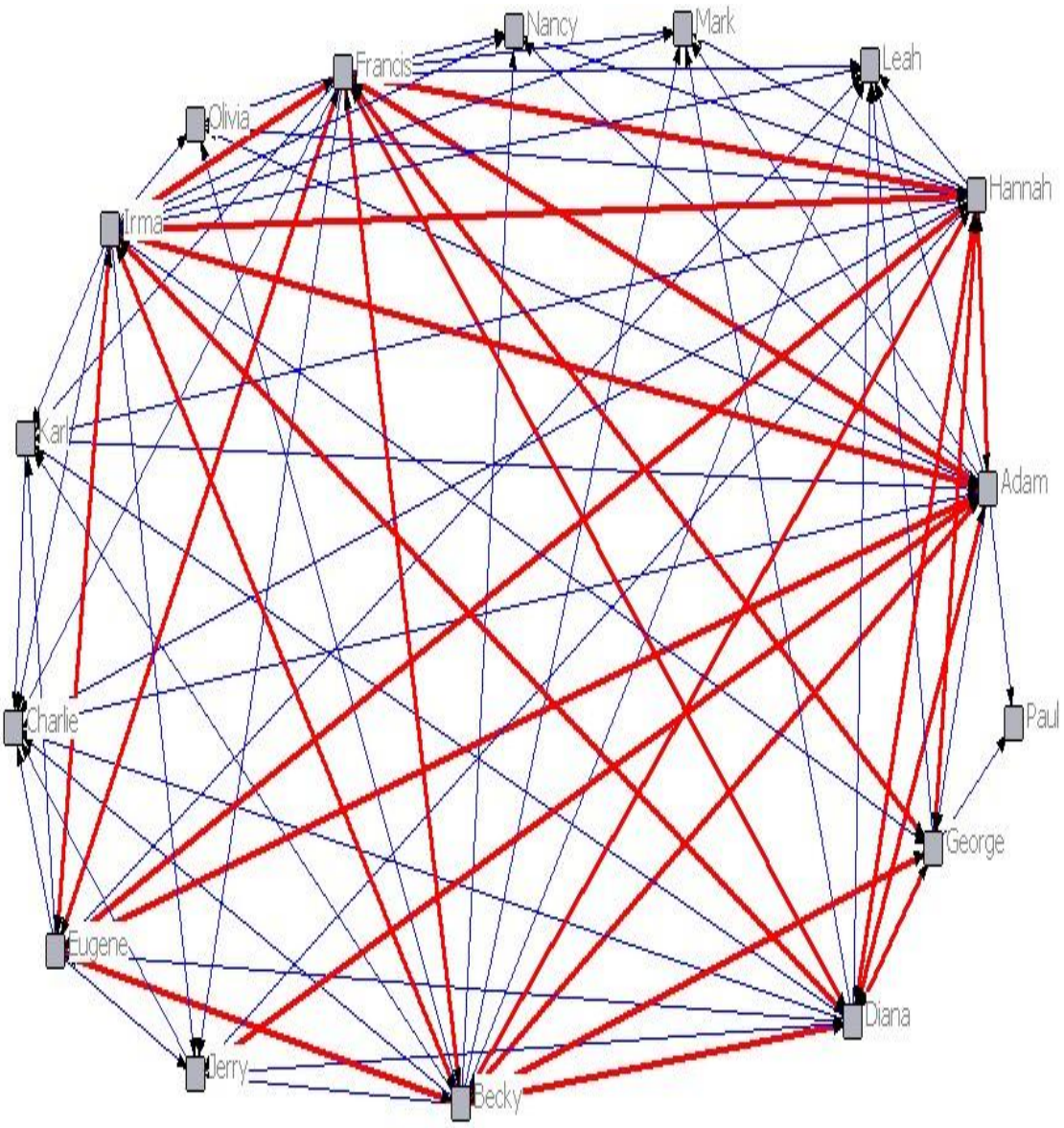


Legend:

Red= Reciprocal Tie

Blue= Non-reciprocal Tie

Figure C22: Management/Supervisory/Executive Organization-to-Organization Collaboration- Reciprocity

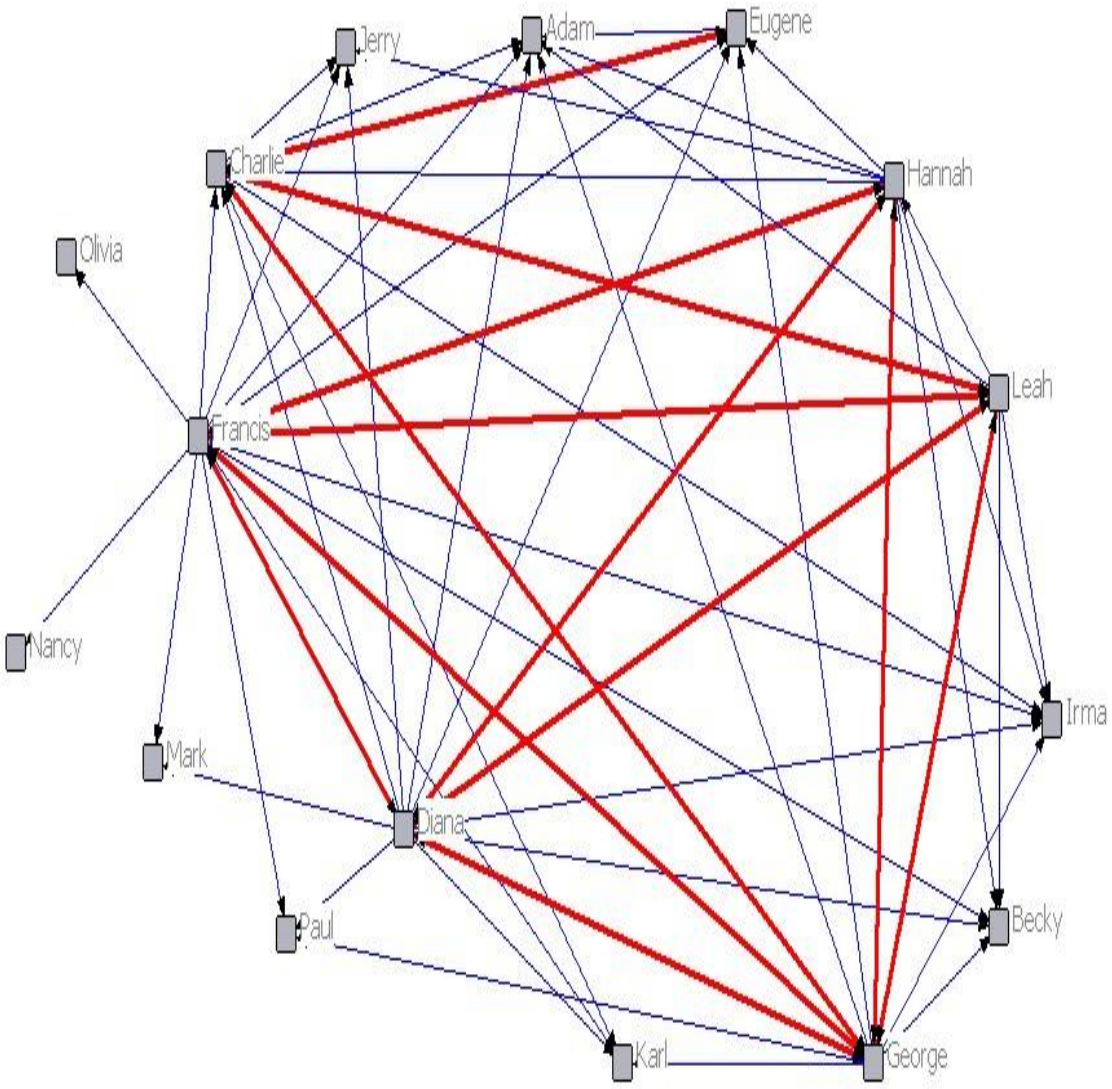


Legend:

Red= Reciprocal Tie

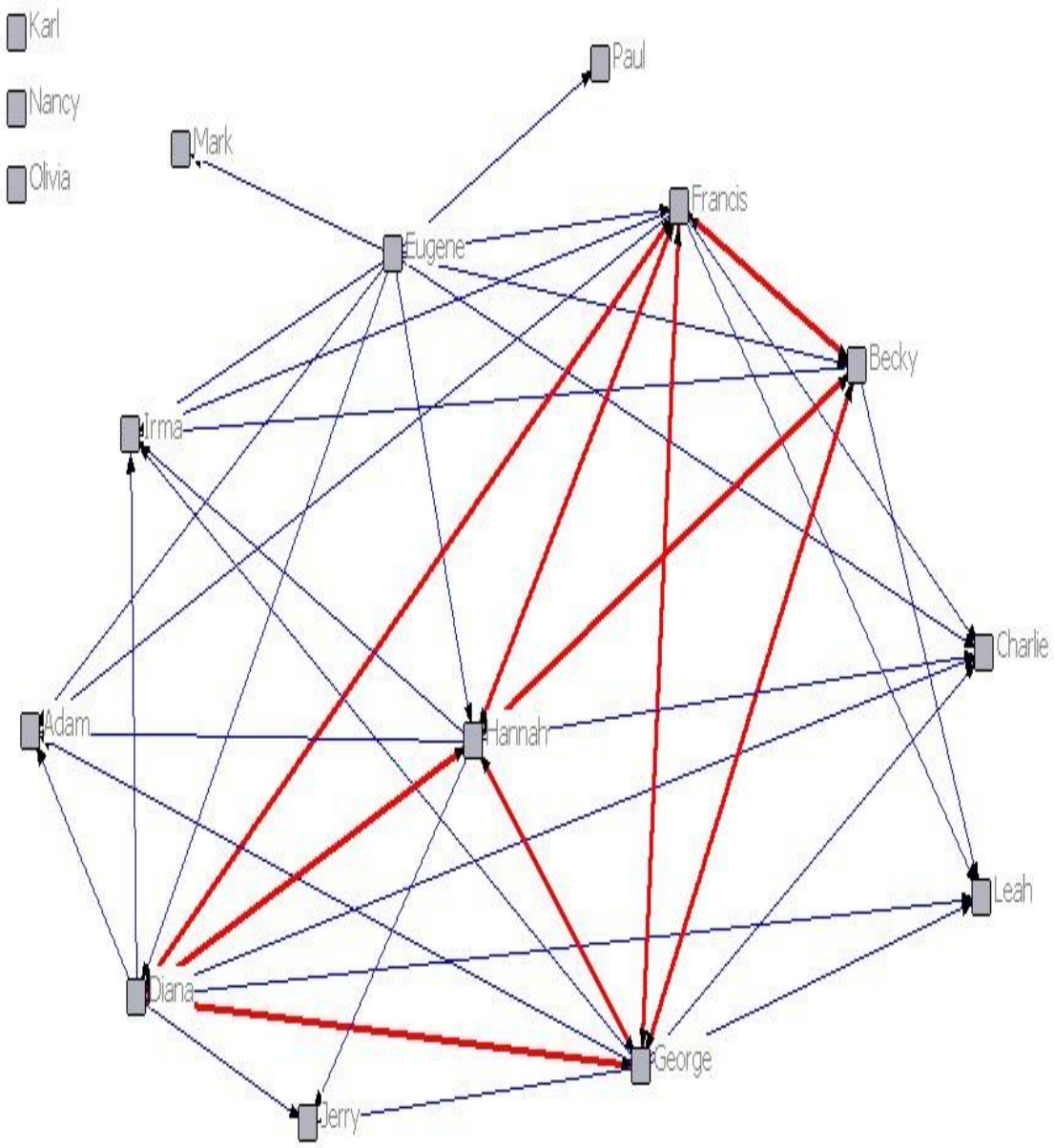
Blue= Non-reciprocal Tie

Figure C23: Professional Researcher Organization-to-Organization Collaboration-Reciprocity



Legend:
Red= Reciprocal Tie
Blue= Non-reciprocal Tie

Figure C24: Technical/Administrative Organization-to-Organization Collaboration-Reciprocity

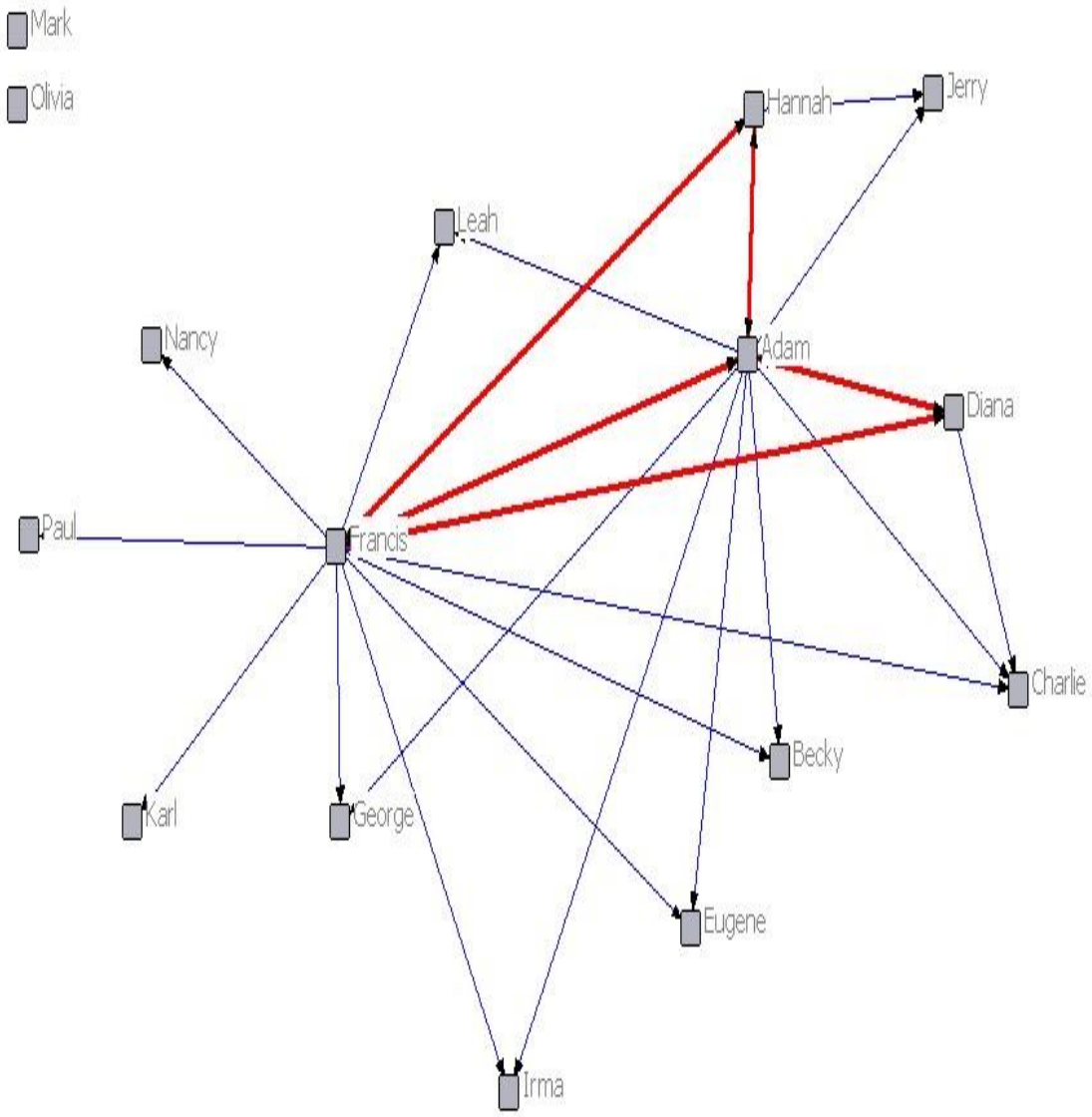


Legend:

Red= Reciprocal Tie

Blue= Non-reciprocal Tie

Figure C25: Student Researcher Organization-to-Organization Collaboration-Reciprocity

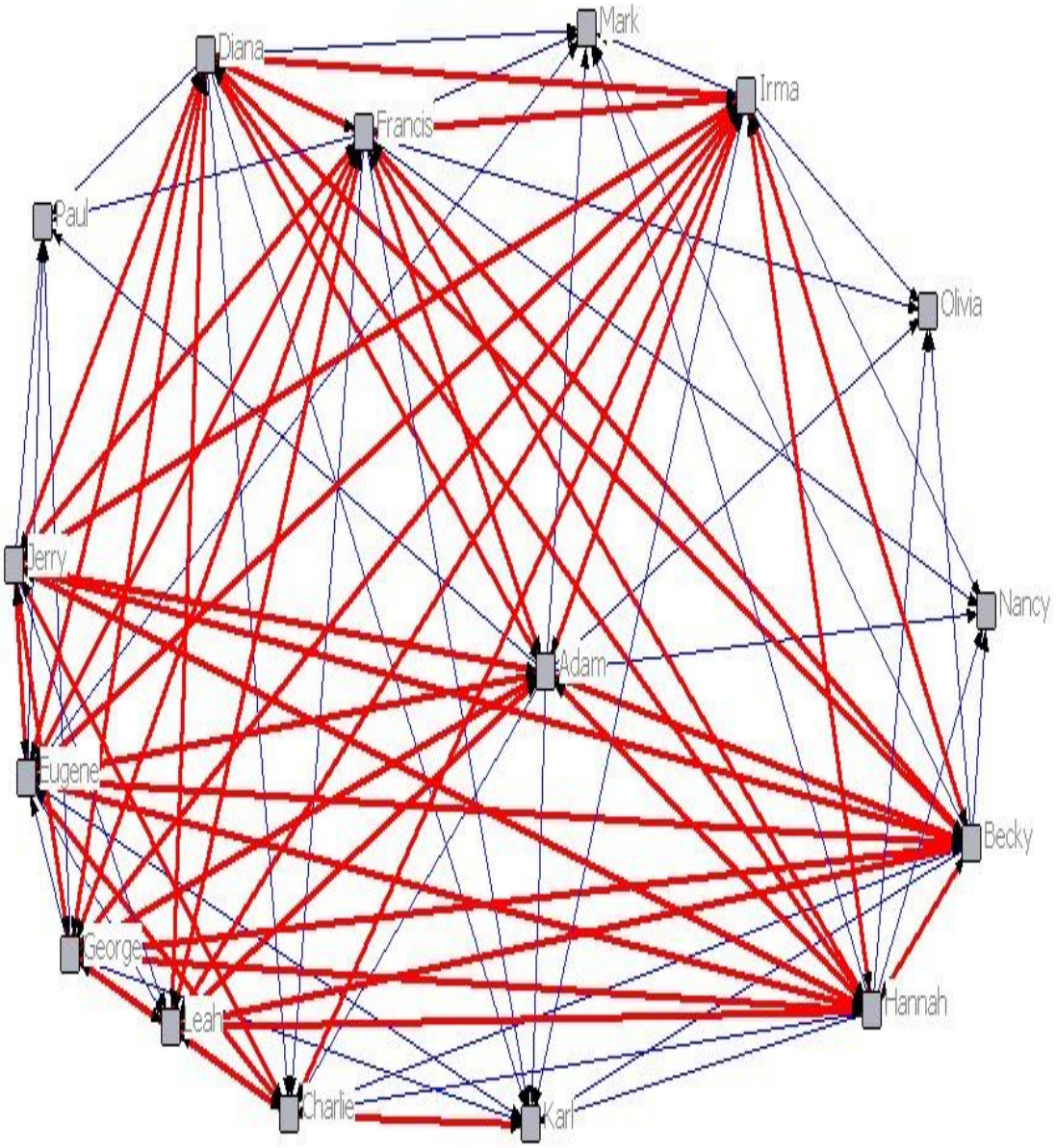


Legend:

Red= Reciprocal Tie

Blue= Non-reciprocal Tie

Figure C26: All Channels Contact Frequency between Organizations- Reciprocity

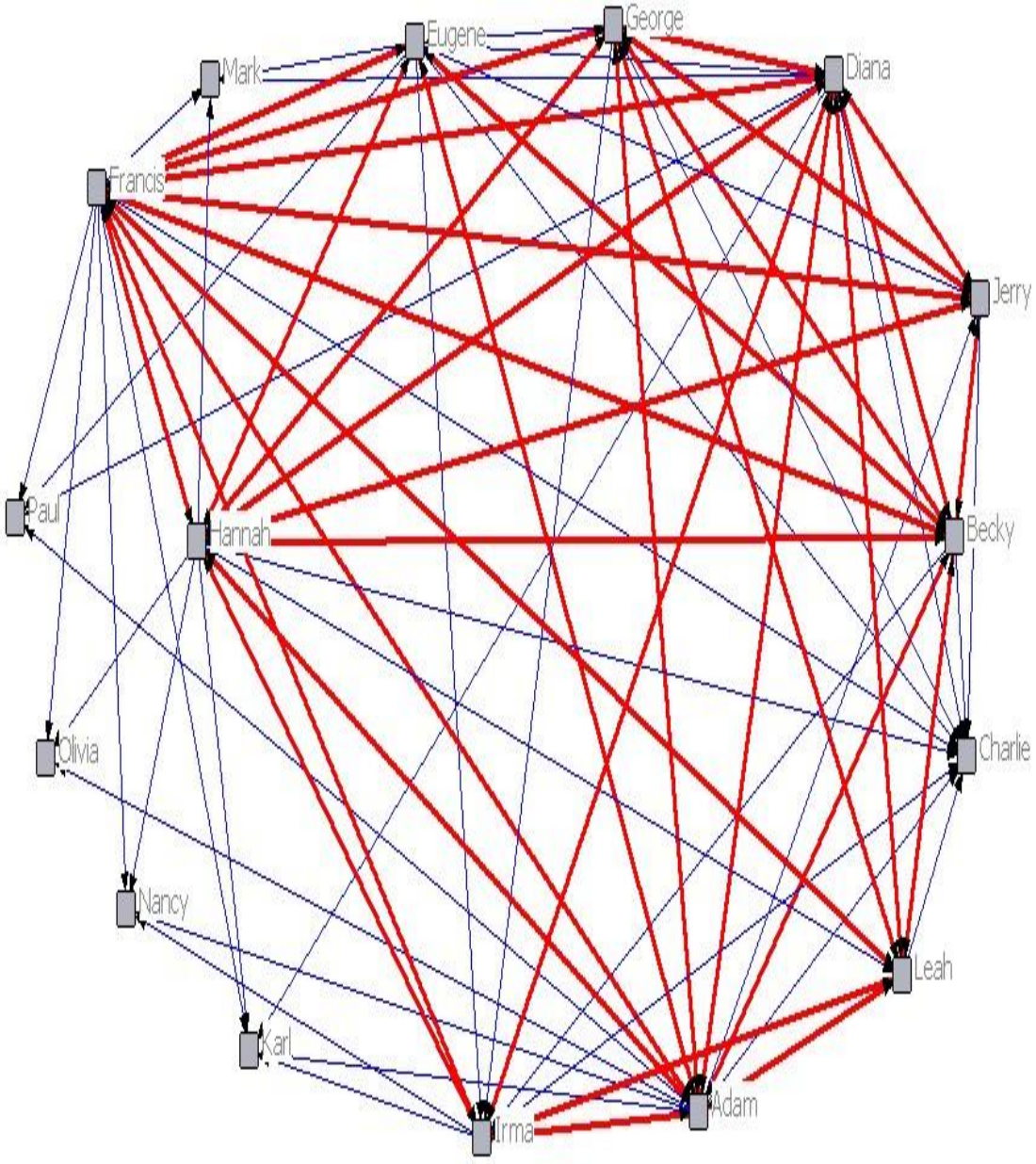


Legend:

Red= Reciprocal Tie

Blue= Non-reciprocal Tie

Figure C27: Face-to-Face/Informal Contact Frequency- Reciprocity

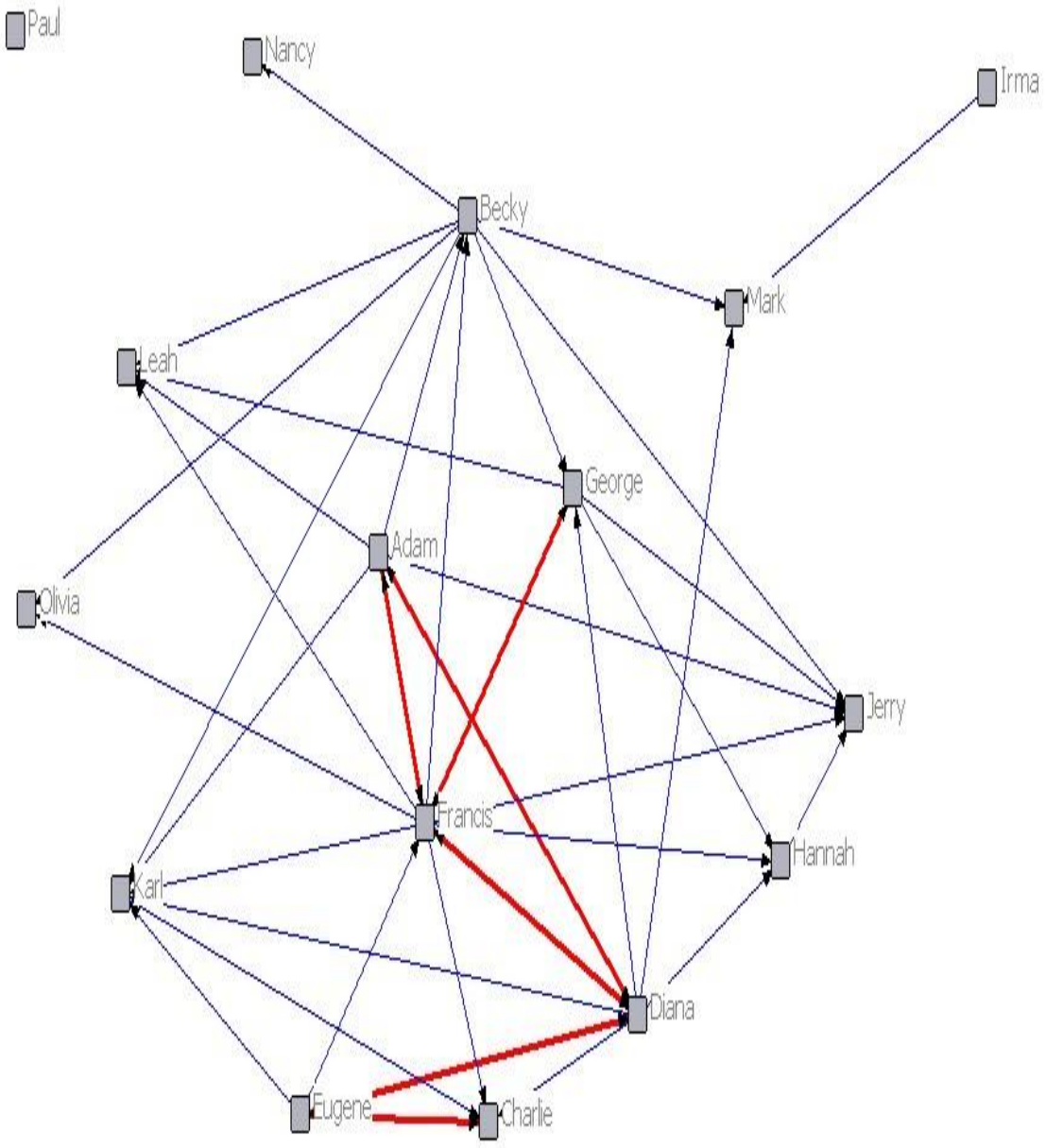


Legend:

Red= Reciprocal Tie

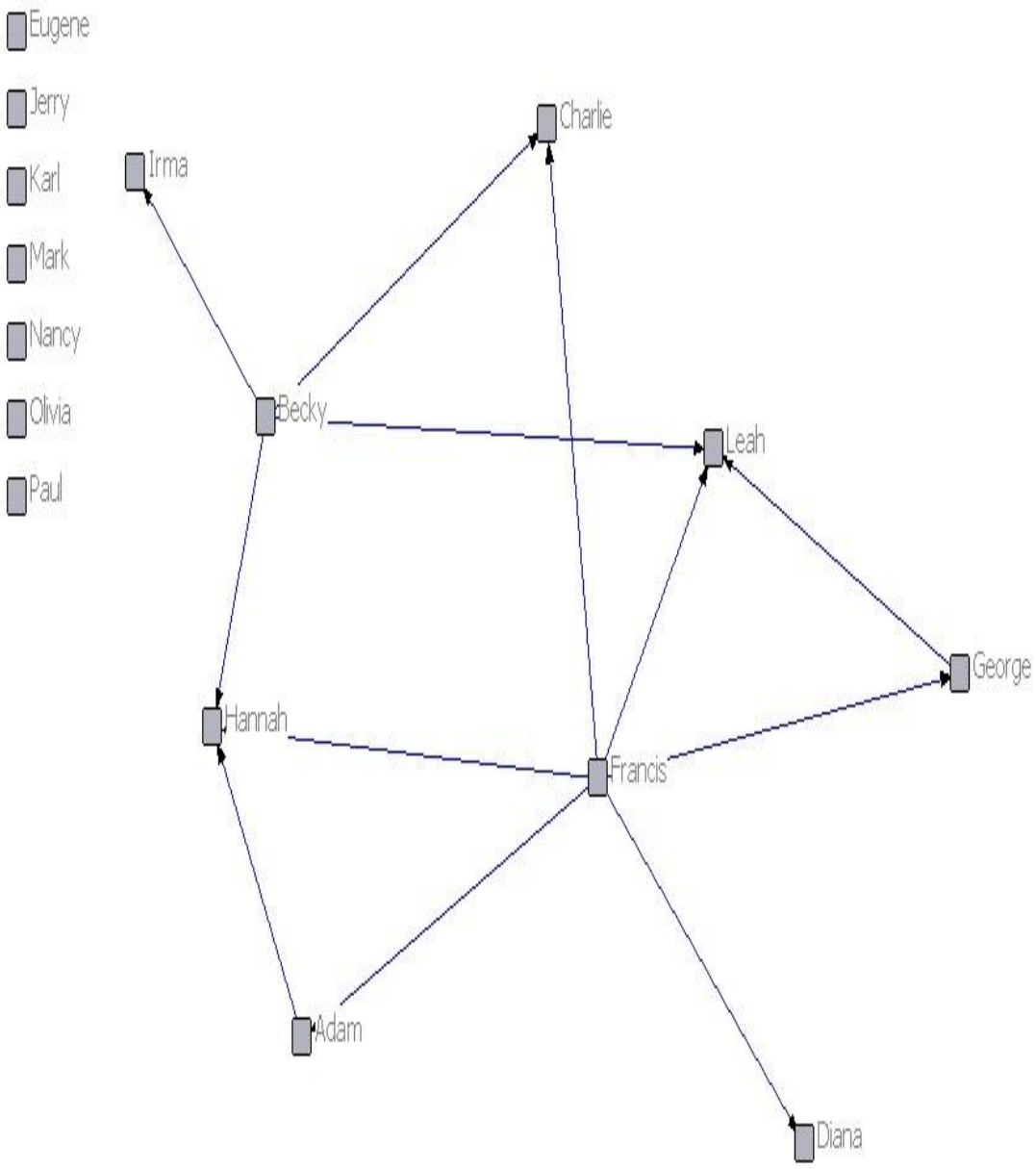
Blue= Non-reciprocal Tie

Figure C28: Meetings Contact Frequency between Organizations- Reciprocity



Legend:
Red= Reciprocal Tie
Blue= Non-reciprocal Tie

Figure C29: Phone Contact Frequency between Organizations- Reciprocity

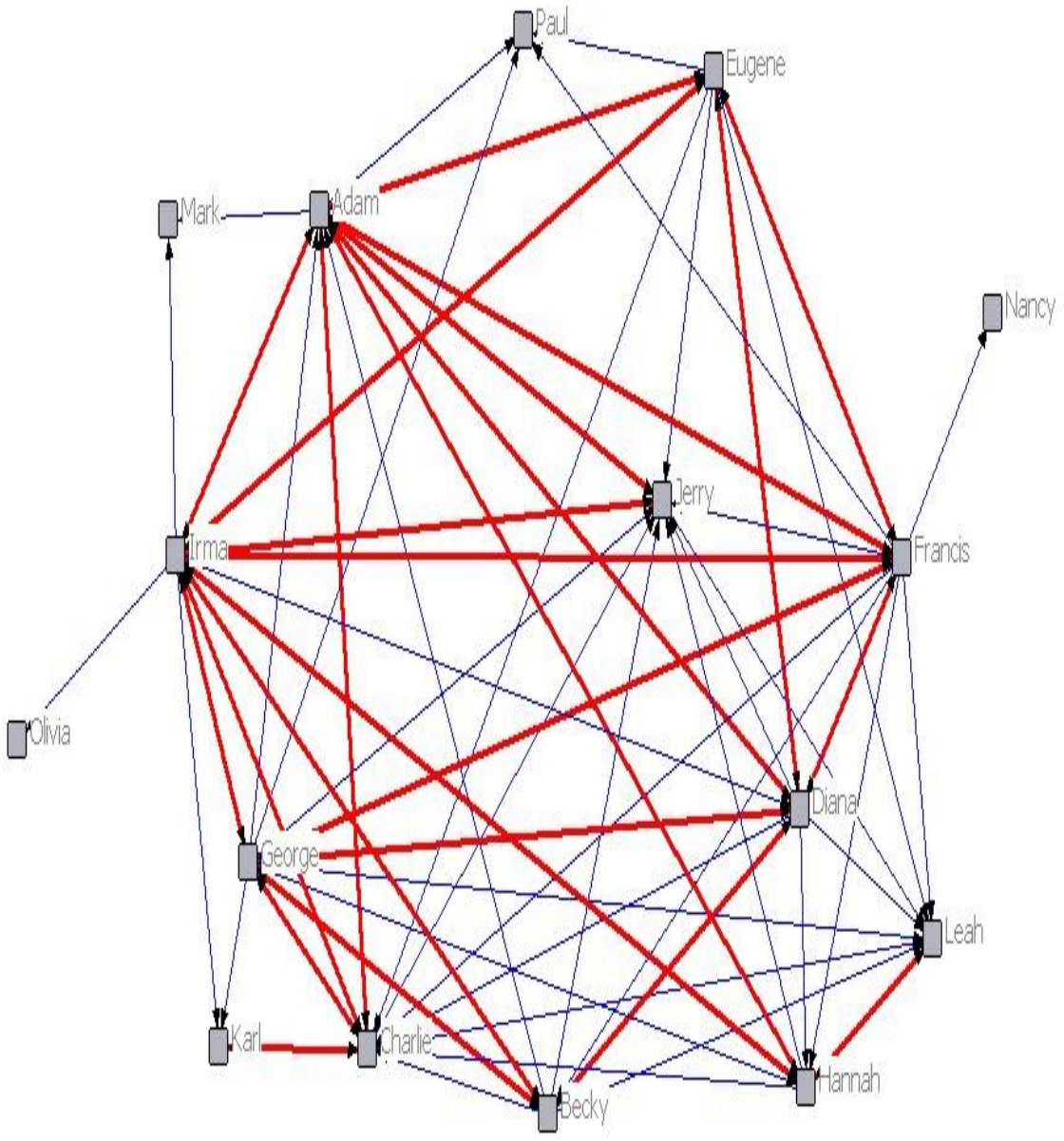


Legend:

Red= Reciprocal Tie

Blue= Non-reciprocal Tie

Figure C30: E-mail Contact Frequency between Organizations- Reciprocity

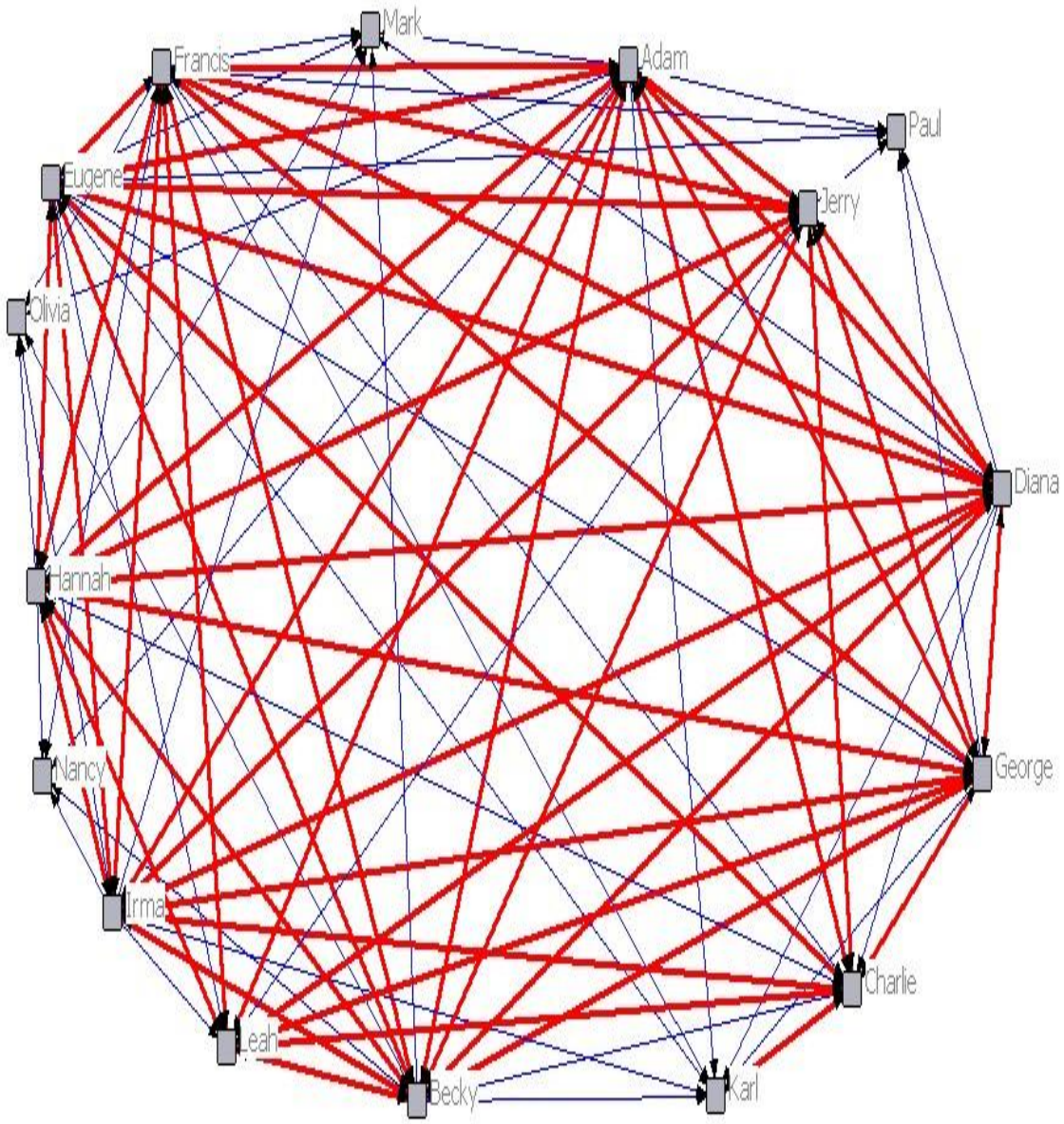


Legend:

Red= Reciprocal Tie

Blue= Non-reciprocal Tie

Figure C31: All Channels- Number of People in Contacts- Reciprocity

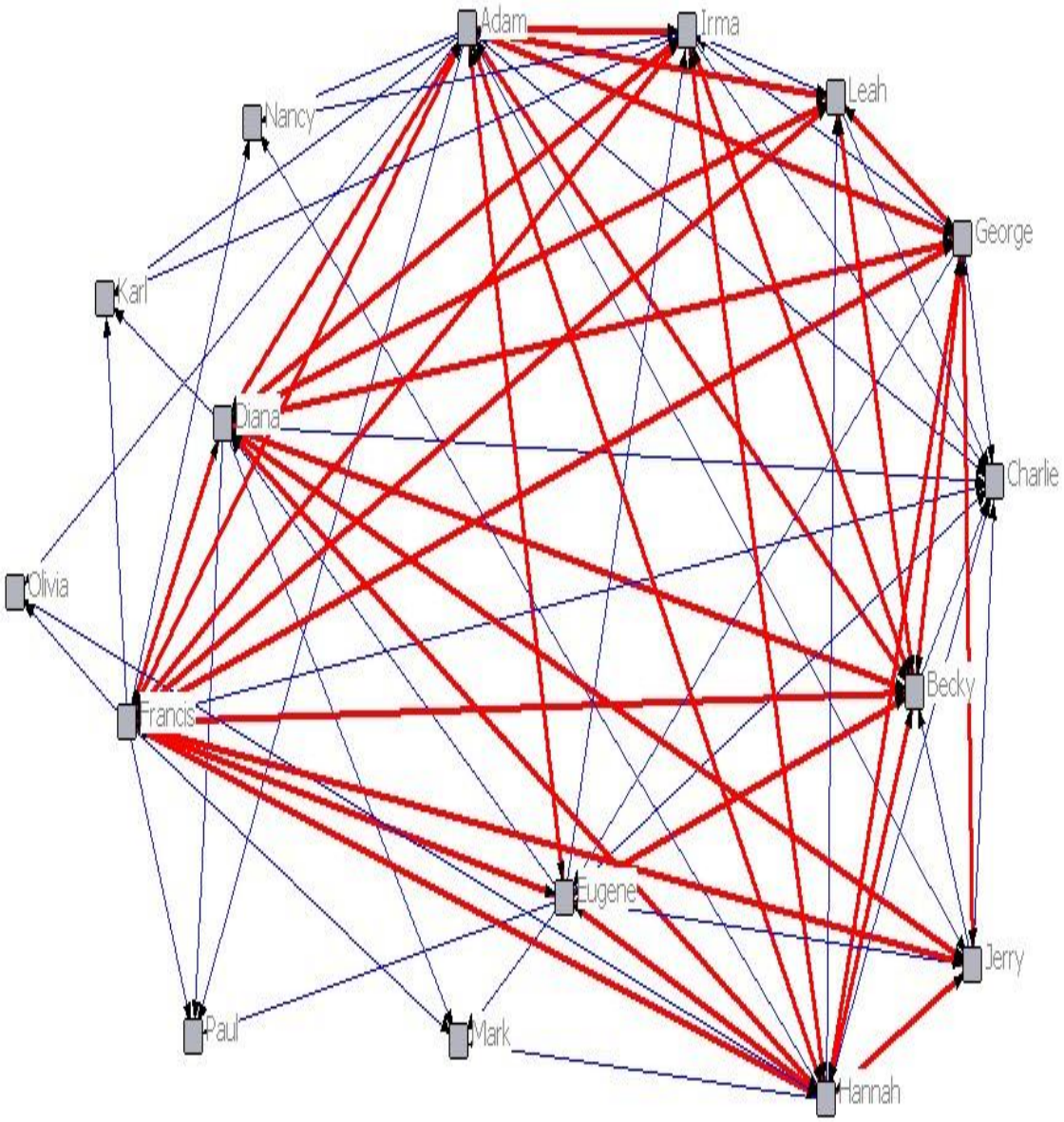


Legend:

Red= Reciprocal Tie

Blue= Non-reciprocal Tie

Figure C32: Face-to-Face/Informal- Number of People in Contacts- Reciprocity

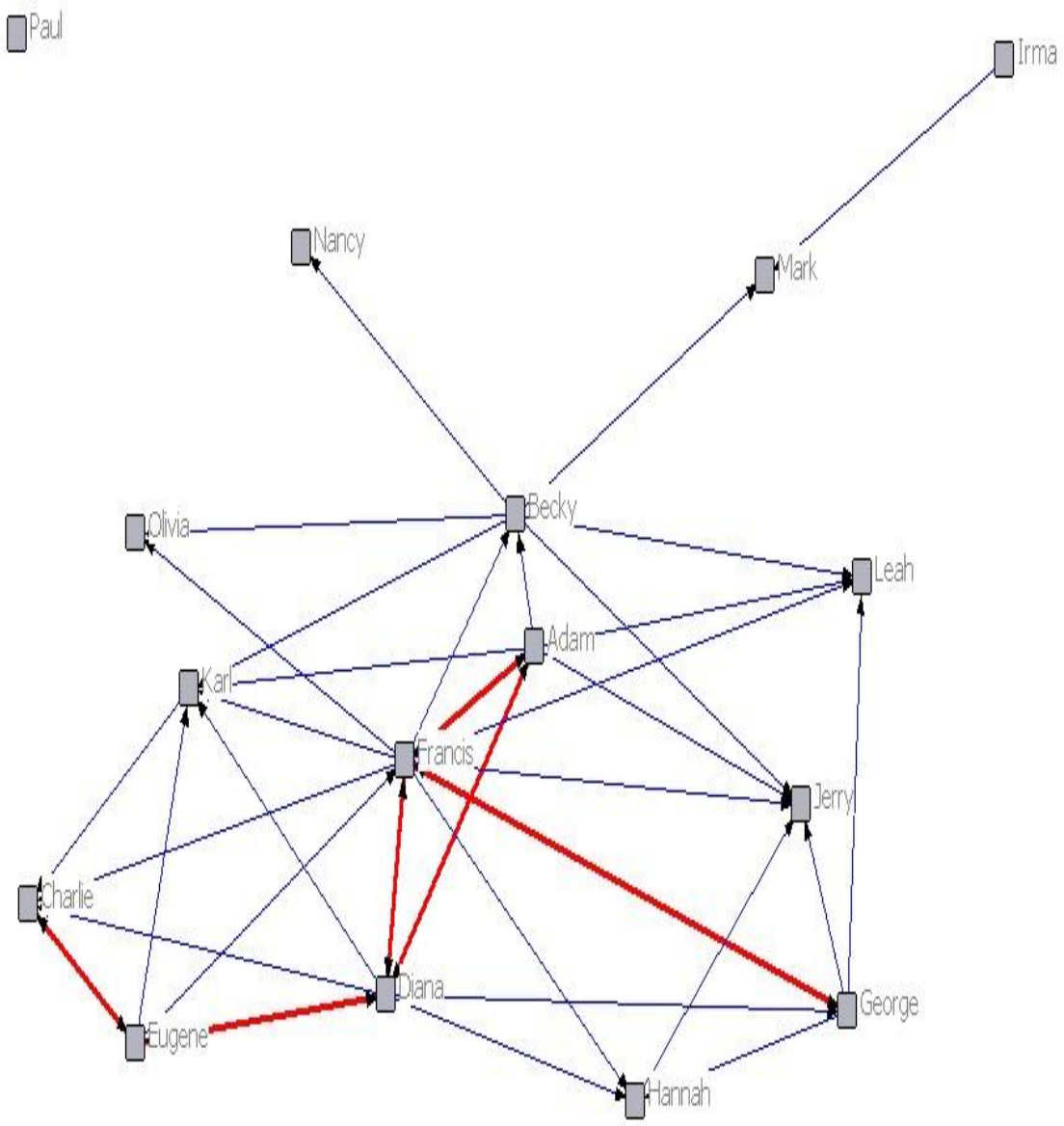


Legend:

Red= Reciprocal Tie

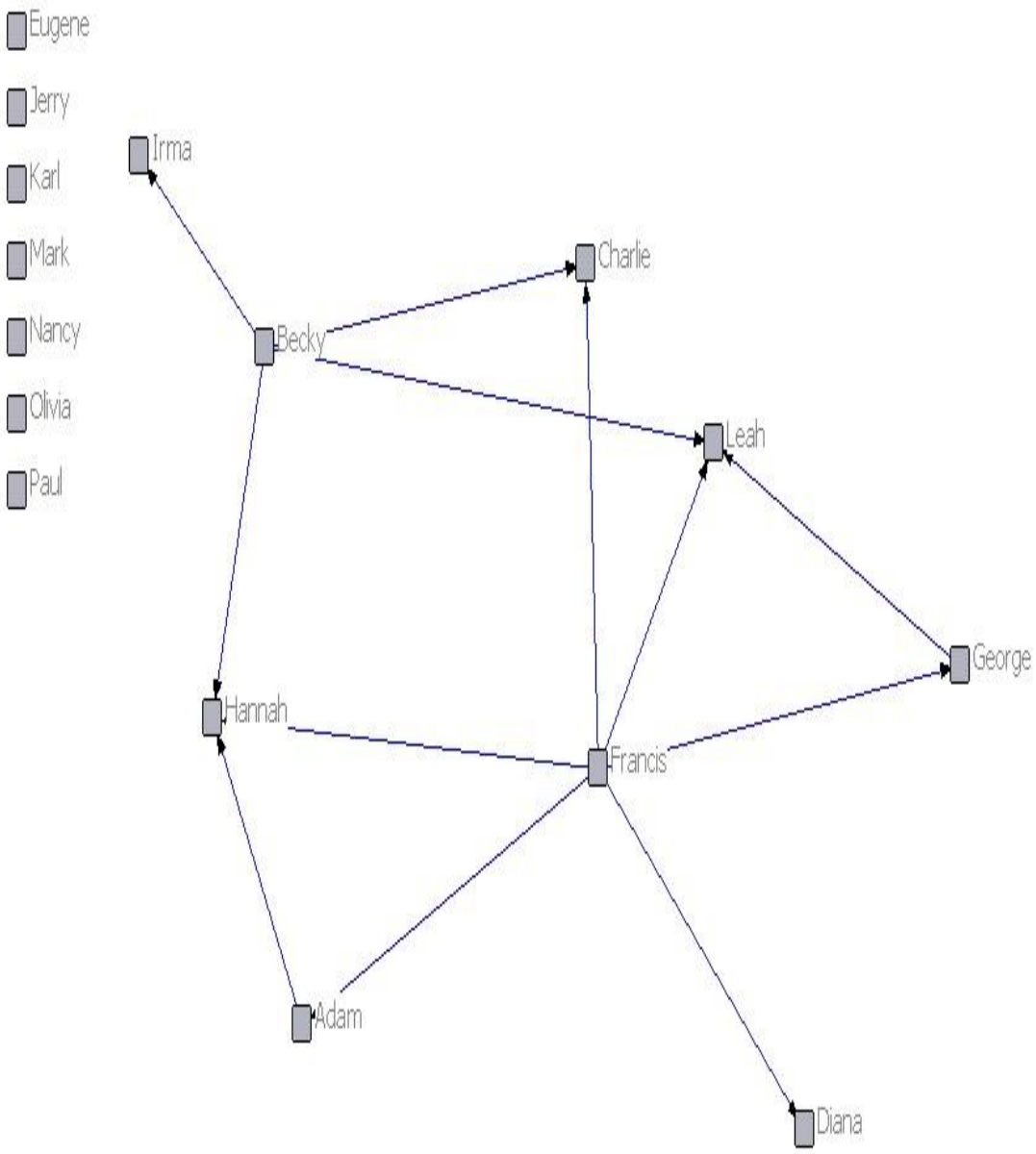
Blue= Non-reciprocal Tie

Figure C33: Meetings- Number of People in Contacts- Reciprocity



Legend:
Red= Reciprocal Tie
Blue= Non-reciprocal Tie

Figure C34: Phone- Number of People in Contacts- Reciprocity

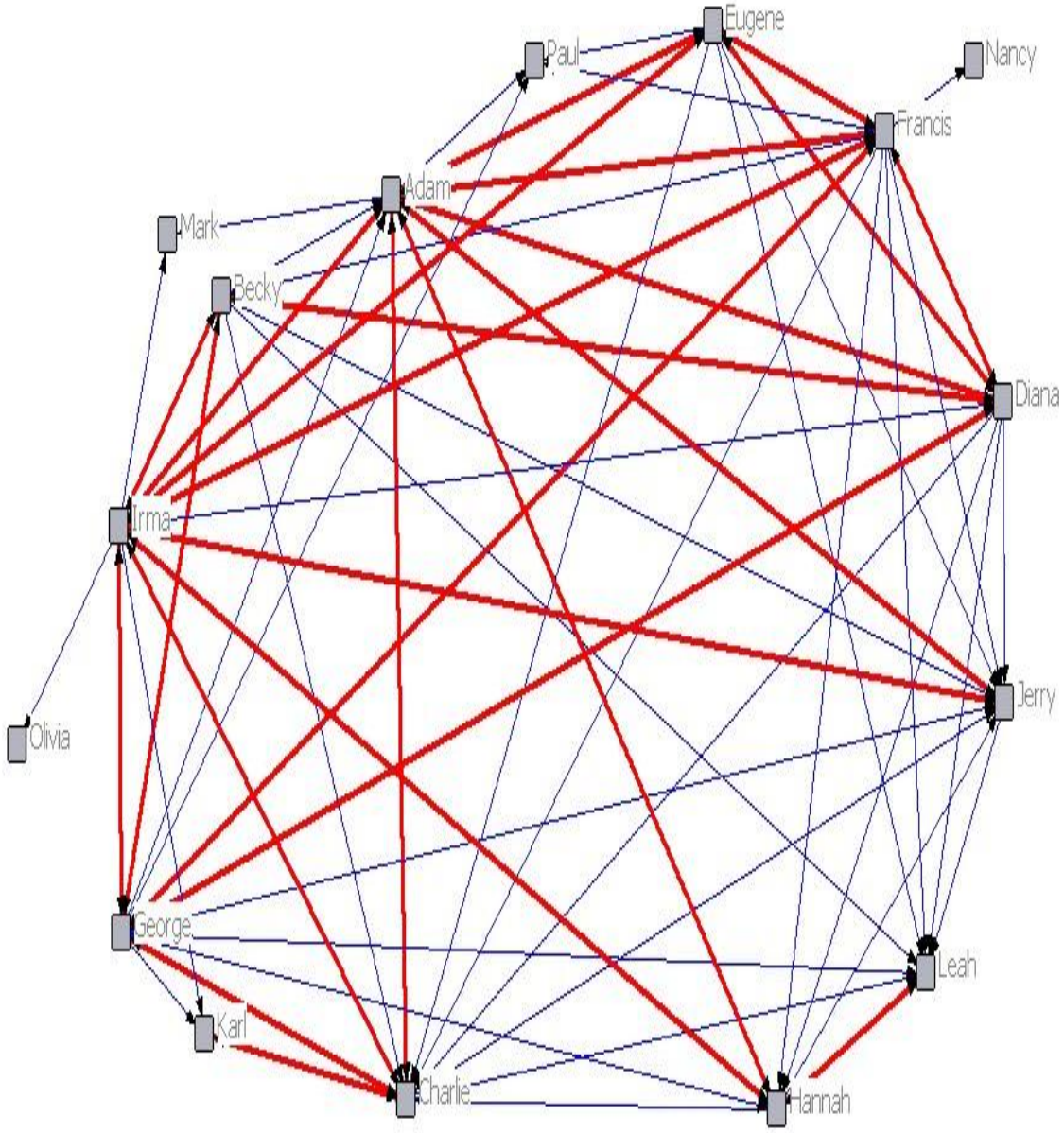


Legend:

Red= Reciprocal Tie

Blue= Non-reciprocal Tie

Figure C35: E-mail- Number of People in Contacts- Reciprocity

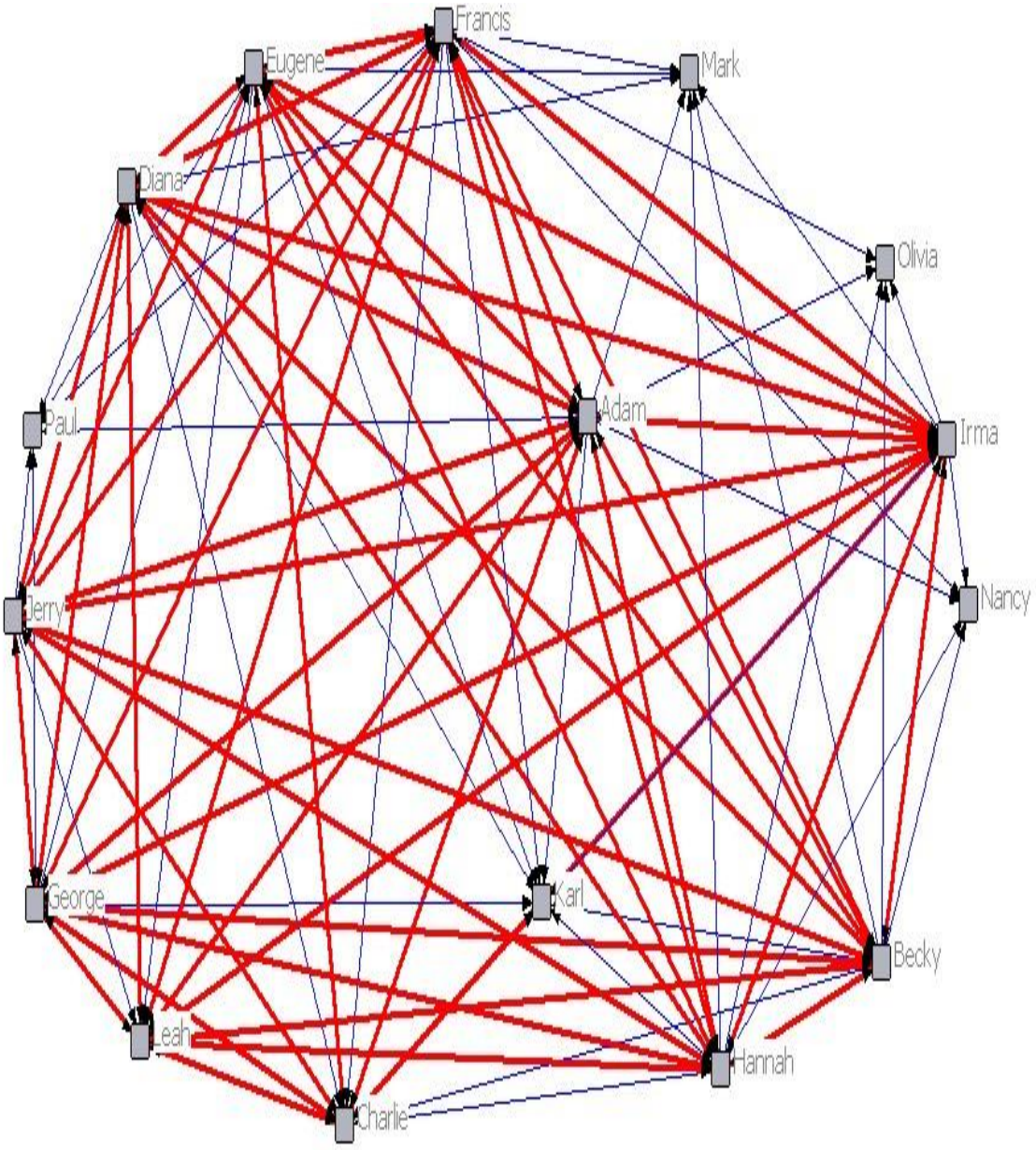


Legend:

Red= Reciprocal Tie

Blue= Non-reciprocal Tie

Figure C36: All Directions Contact Frequency between Organizations- Reciprocity

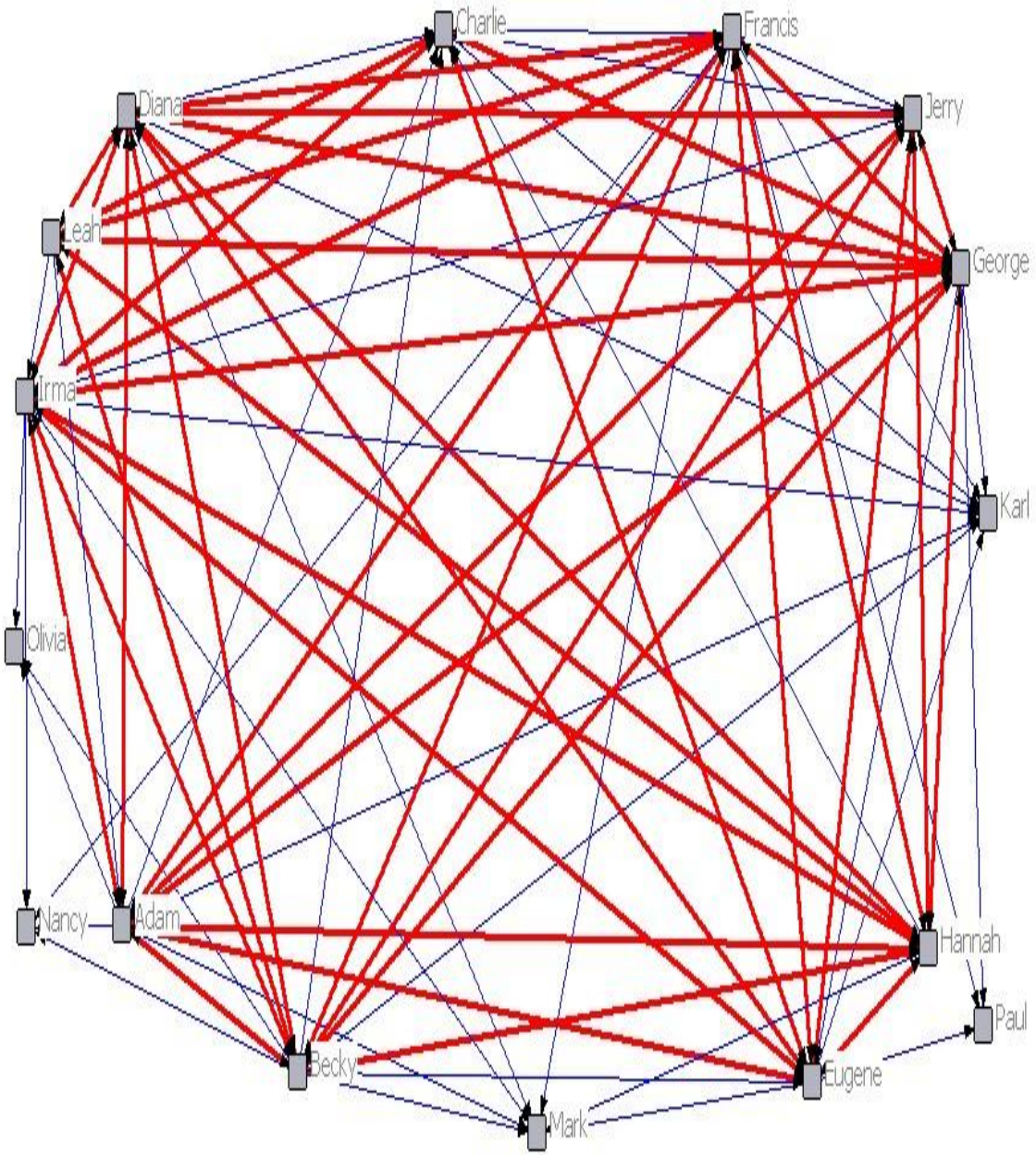


Legend:

Red= Reciprocal Tie

Blue= Non-reciprocal Tie

Figure C37: Cybernetic Contact Frequency between Organizations- Reciprocity

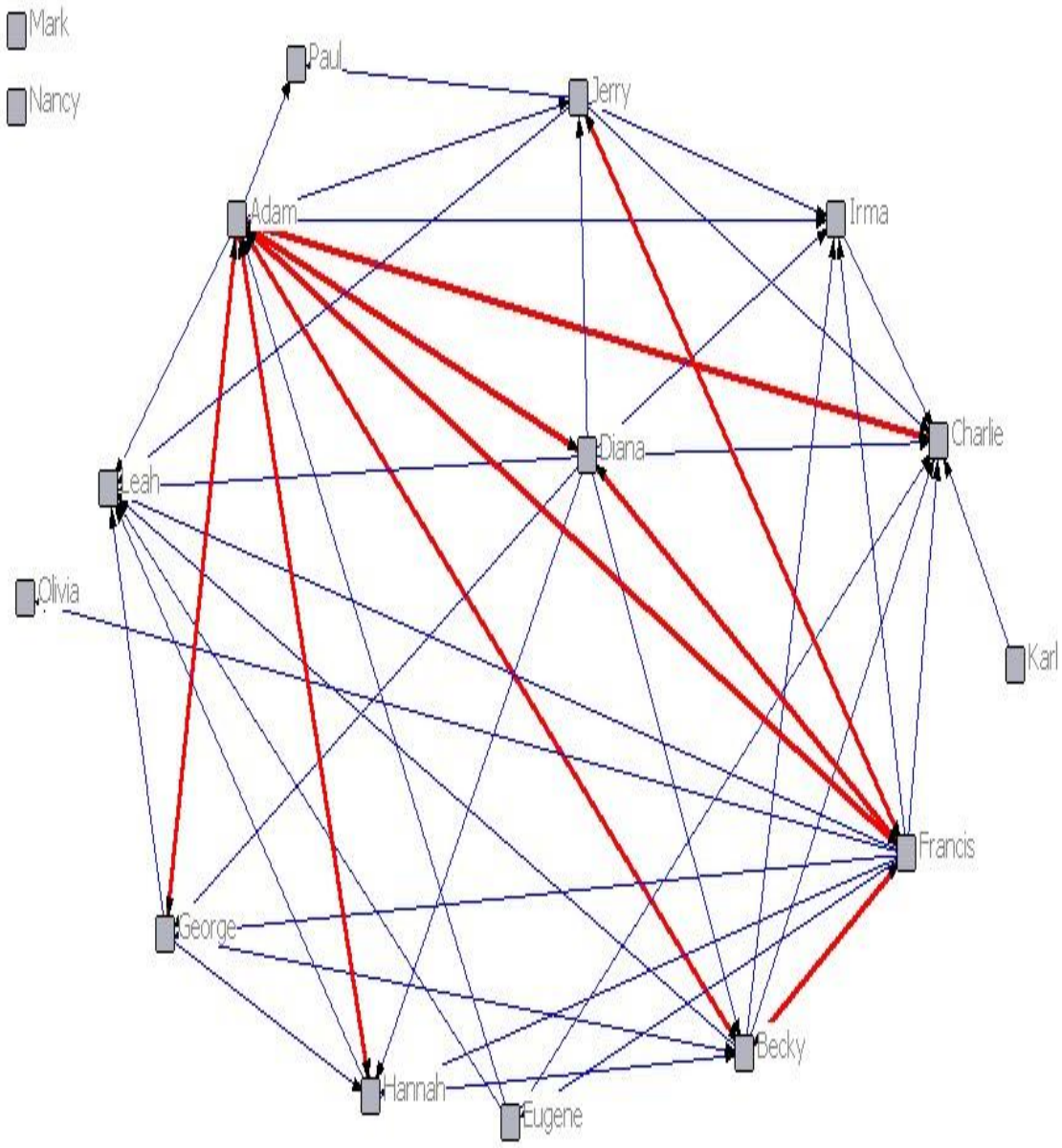


Legend:

Red= Reciprocal Tie

Blue= Non-reciprocal Tie

Figure C38: Unidirectional Contact Frequency between Organizations- Reciprocity

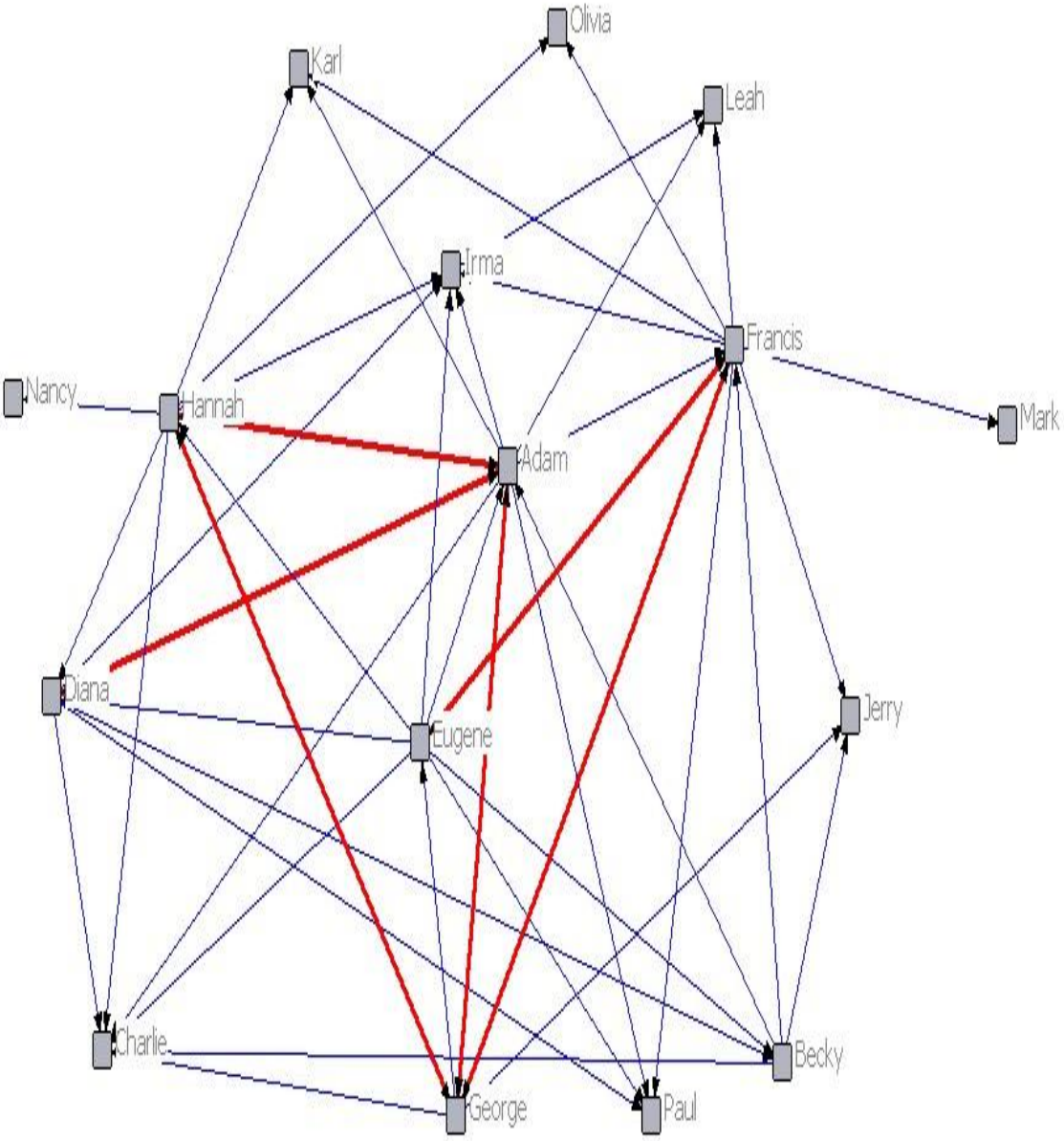


Legend:

Red= Reciprocal Tie

Blue= Non-reciprocal Tie

Figure C39: Don't Exchange Information Contact Frequency- Reciprocity

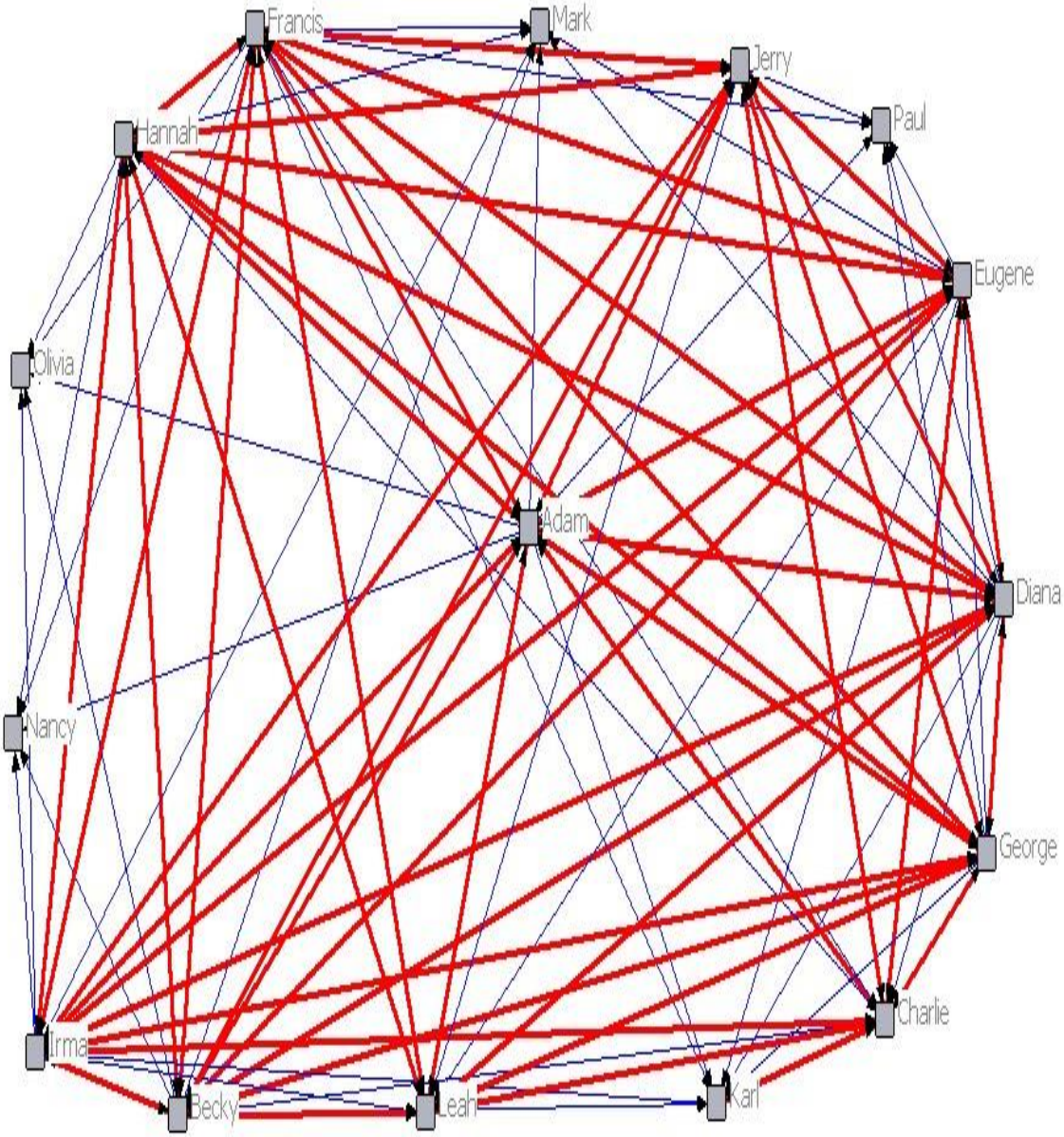


Legend:

Red= Reciprocal Tie

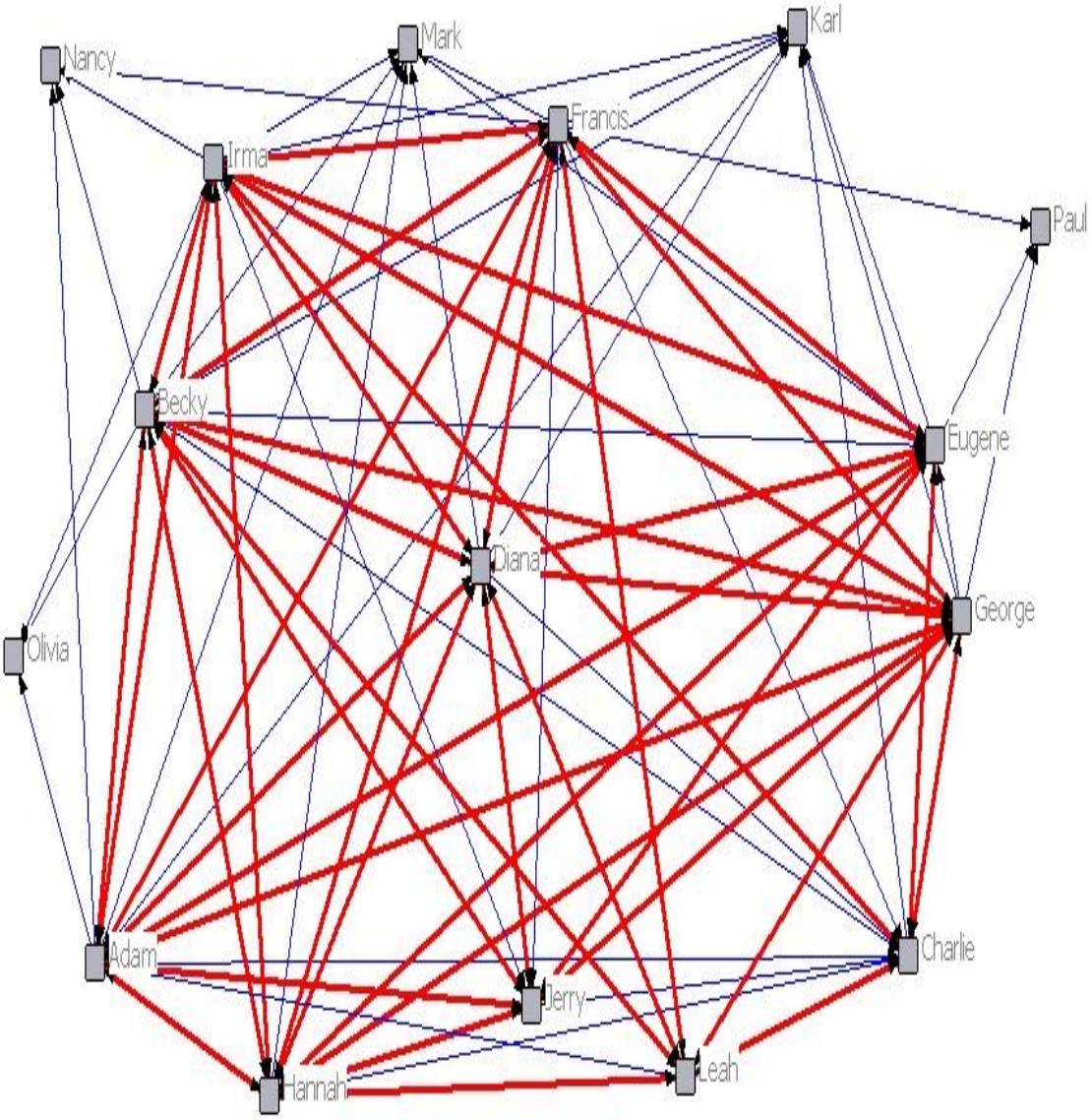
Blue= Non-reciprocal Tie

Figure C40: All Directions- Number of People in Contacts- Reciprocity



Legend:
Red= Reciprocal Tie
Blue= Non-reciprocal Tie

Figure C41: Cybernetic- Number of People in Contacts- Reciprocity

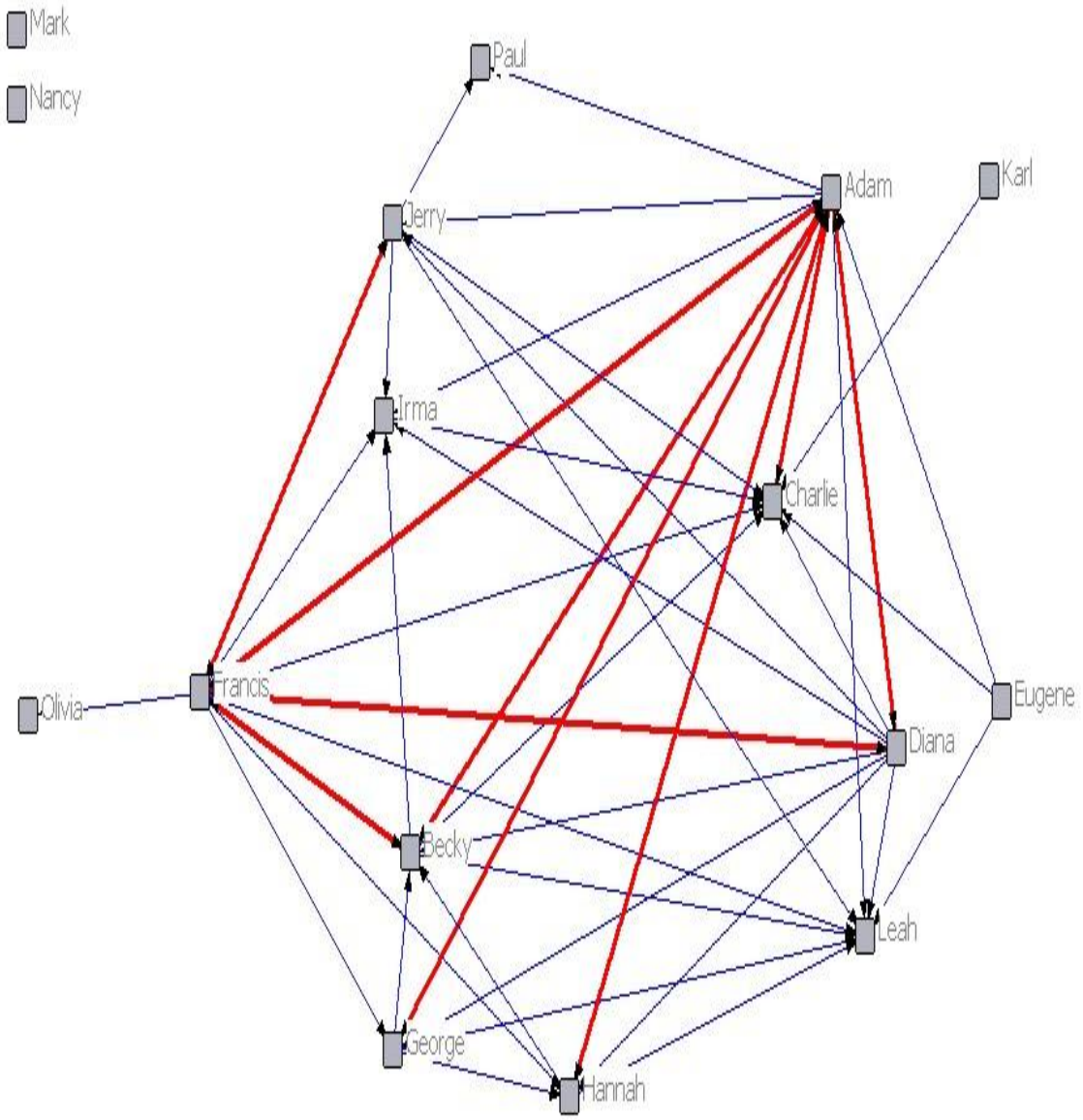


Legend:

Red= Reciprocal Tie

Blue= Non-reciprocal Tie

Figure C42: Unidirectional- Number of People in Contacts- Reciprocity

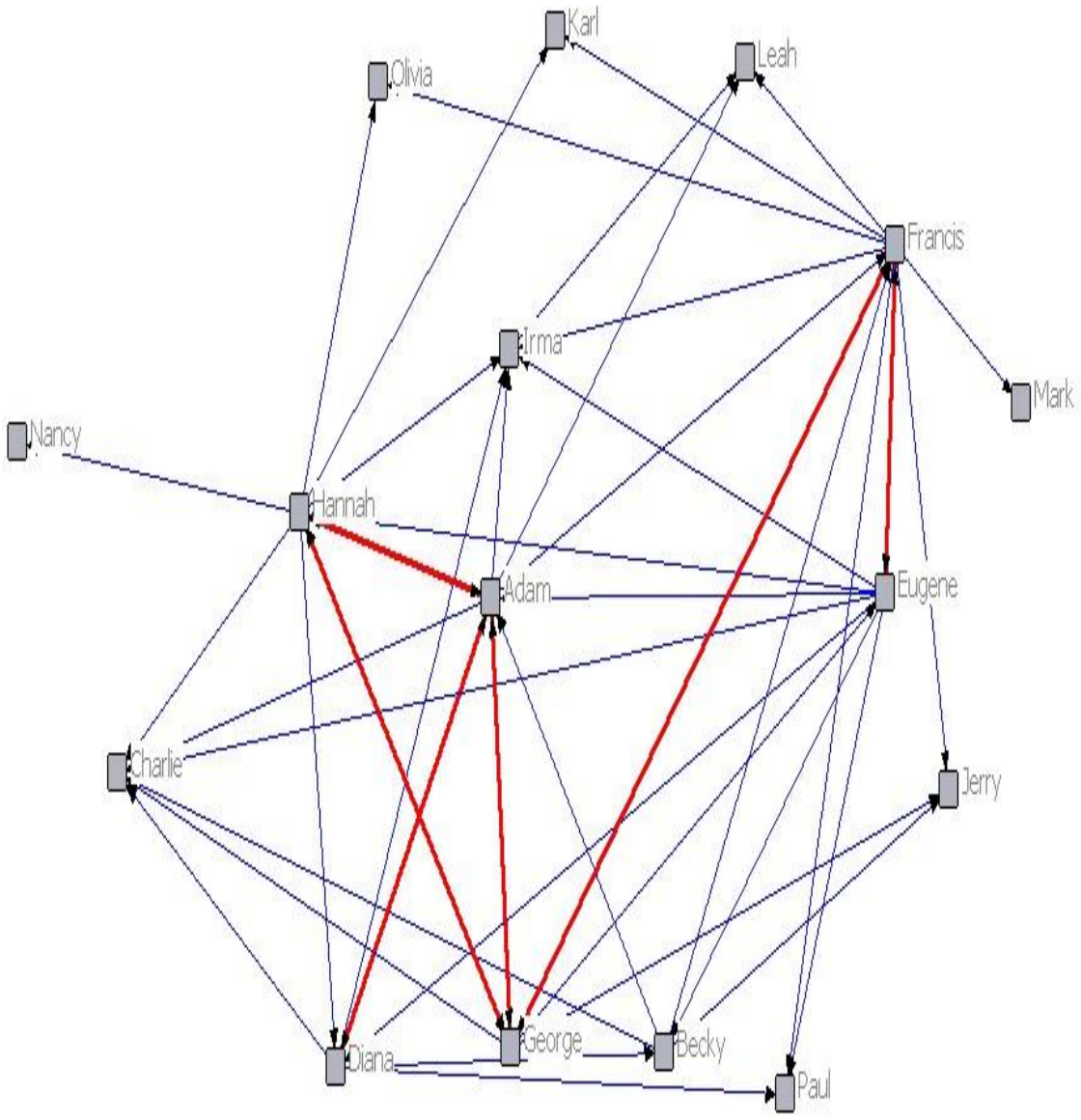


Legend:

Red= Reciprocal Tie

Blue= Non-reciprocal Tie

Figure C43: Don’t Exchange Information- Number of People- Reciprocity

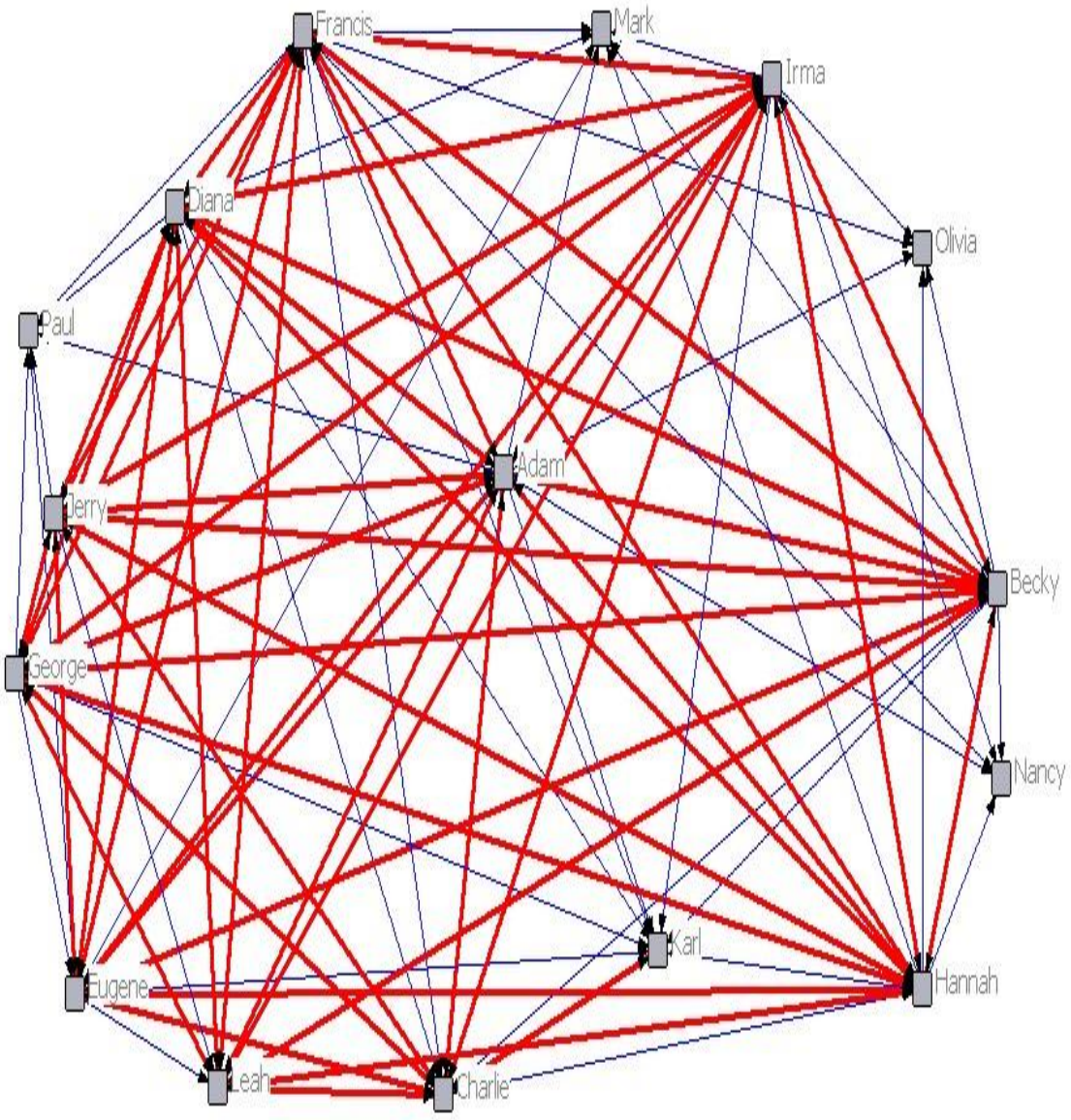


Legend:

Red= Reciprocal Tie

Blue= Non-reciprocal Tie

Figure C44: All Channels Individual-to-Organization Collaboration- Reciprocity

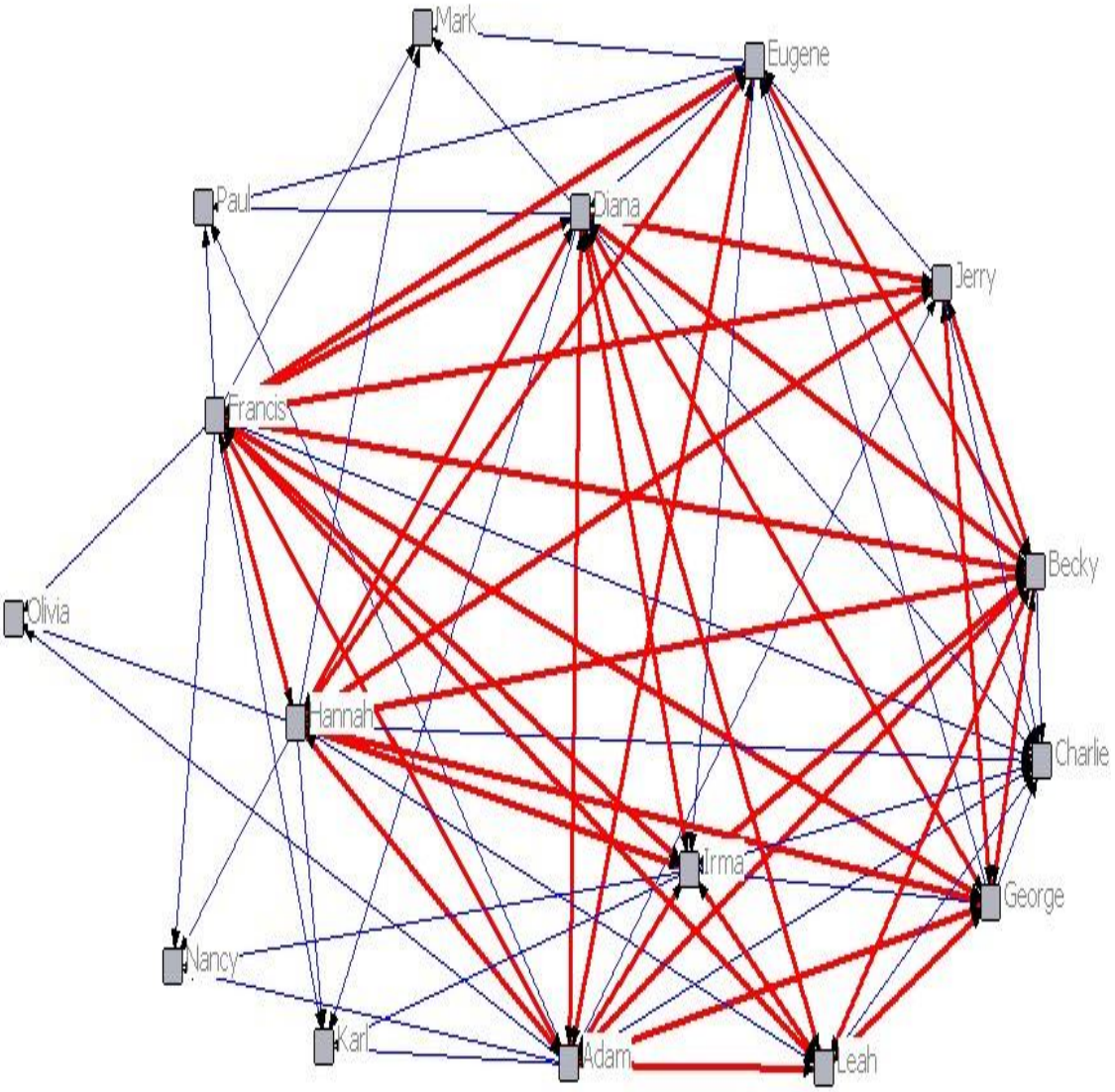


Legend:

Red= Reciprocal Tie

Blue= Non-reciprocal Tie

Figure C45: Face-to-Face/Informal Individual-to-Organization Collaboration-Reciprocity

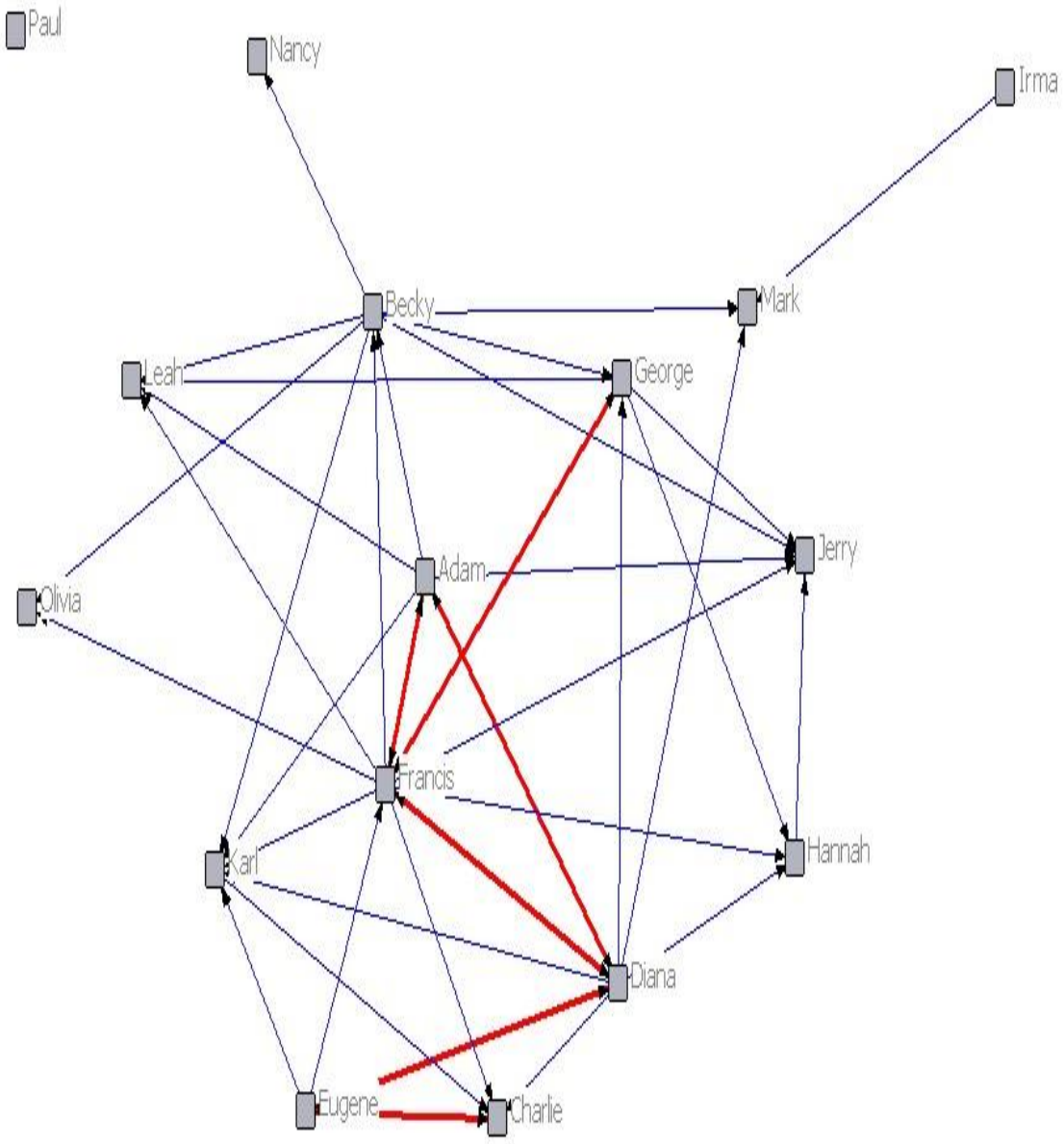


Legend:

Red= Reciprocal Tie

Blue= Non-reciprocal Tie

Figure C46: Meetings Individual-to-Organization Collaboration- Reciprocity

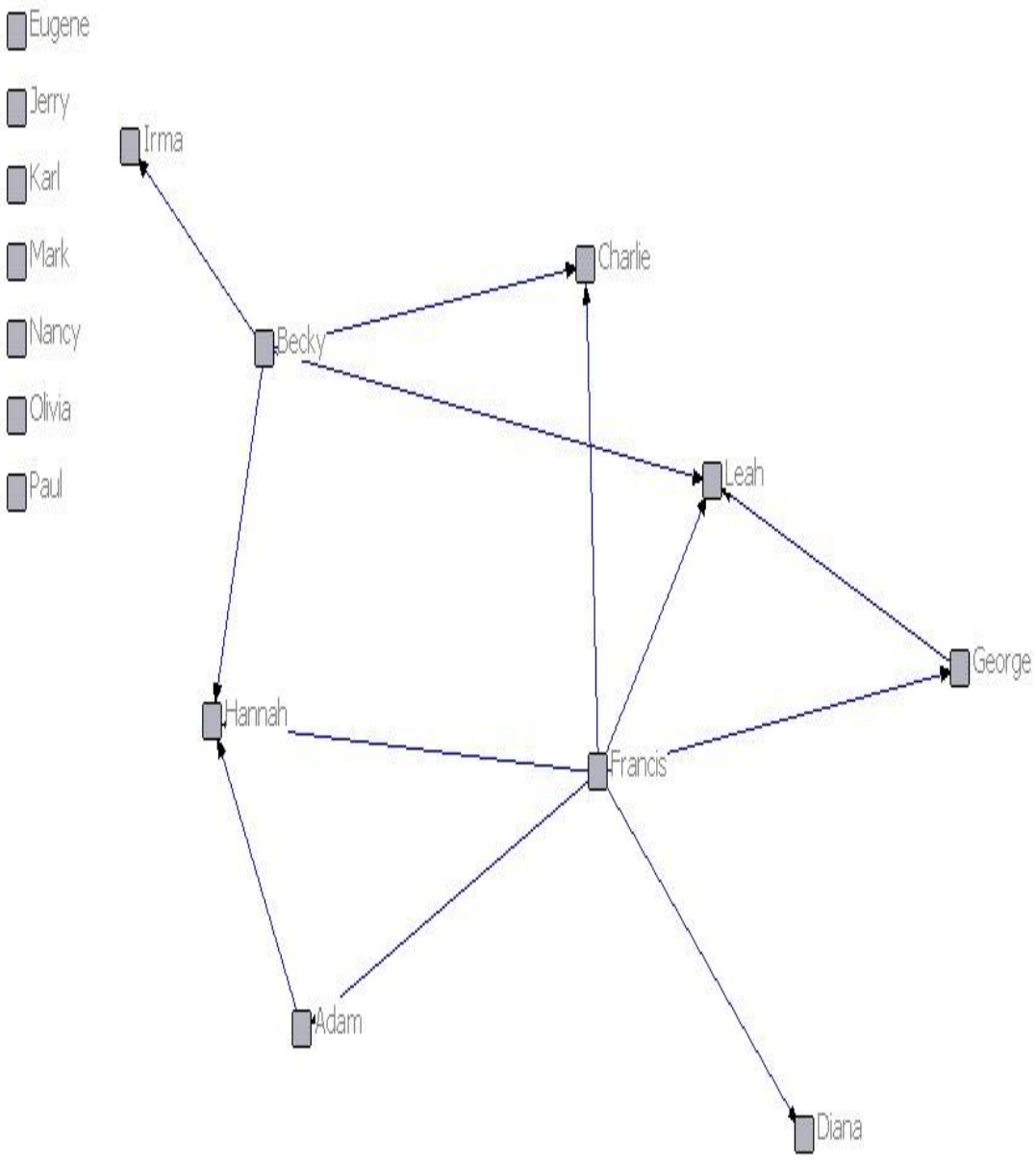


Legend:

Red= Reciprocal Tie

Blue= Non-reciprocal Tie

Figure C47: Phone Individual-to-Organization Collaboration- Reciprocity

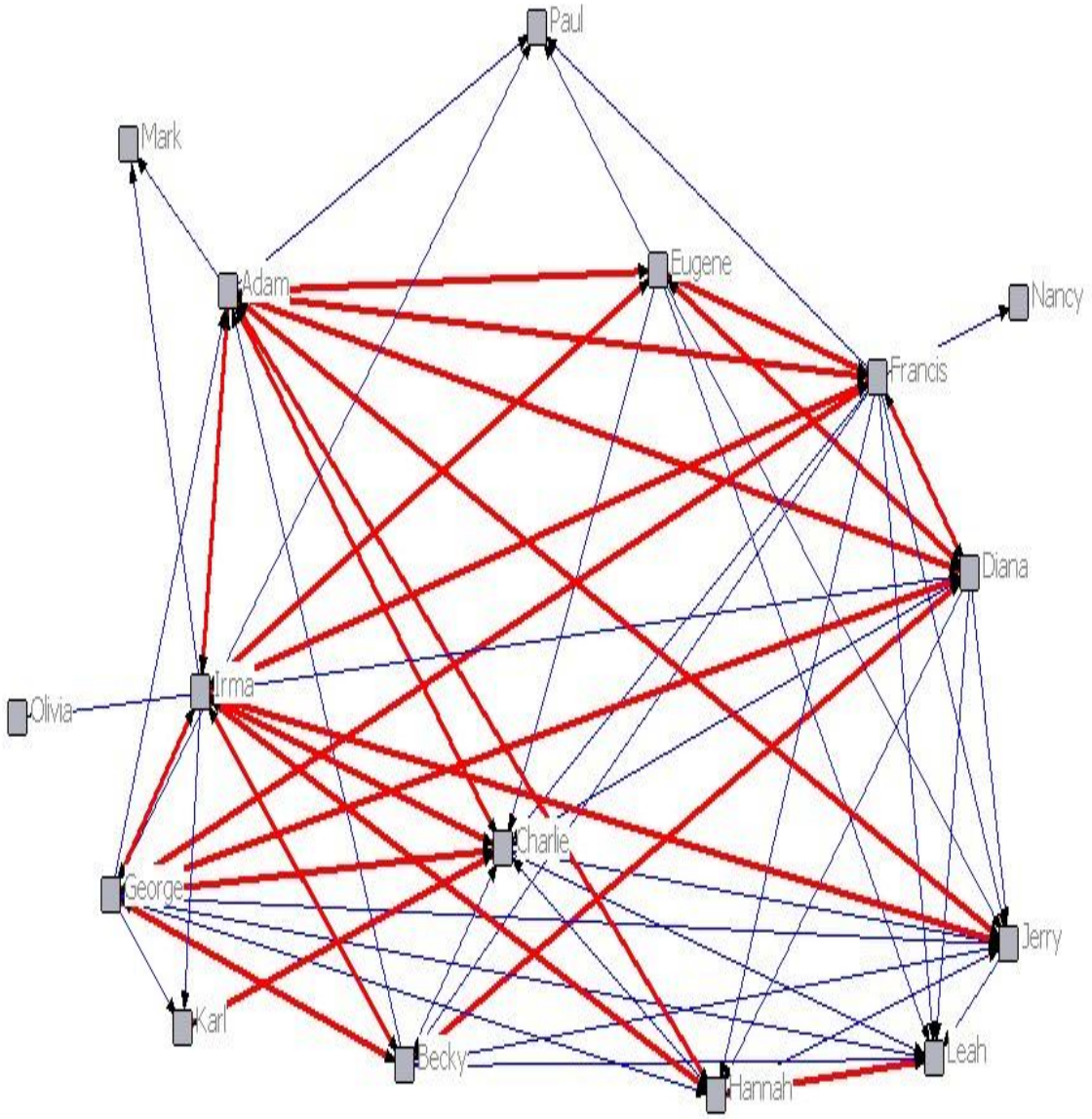


Legend:

Red= Reciprocal Tie

Blue= Non-reciprocal Tie

Figure C48: E-mail Individual-to-Organization Collaboration- Reciprocity

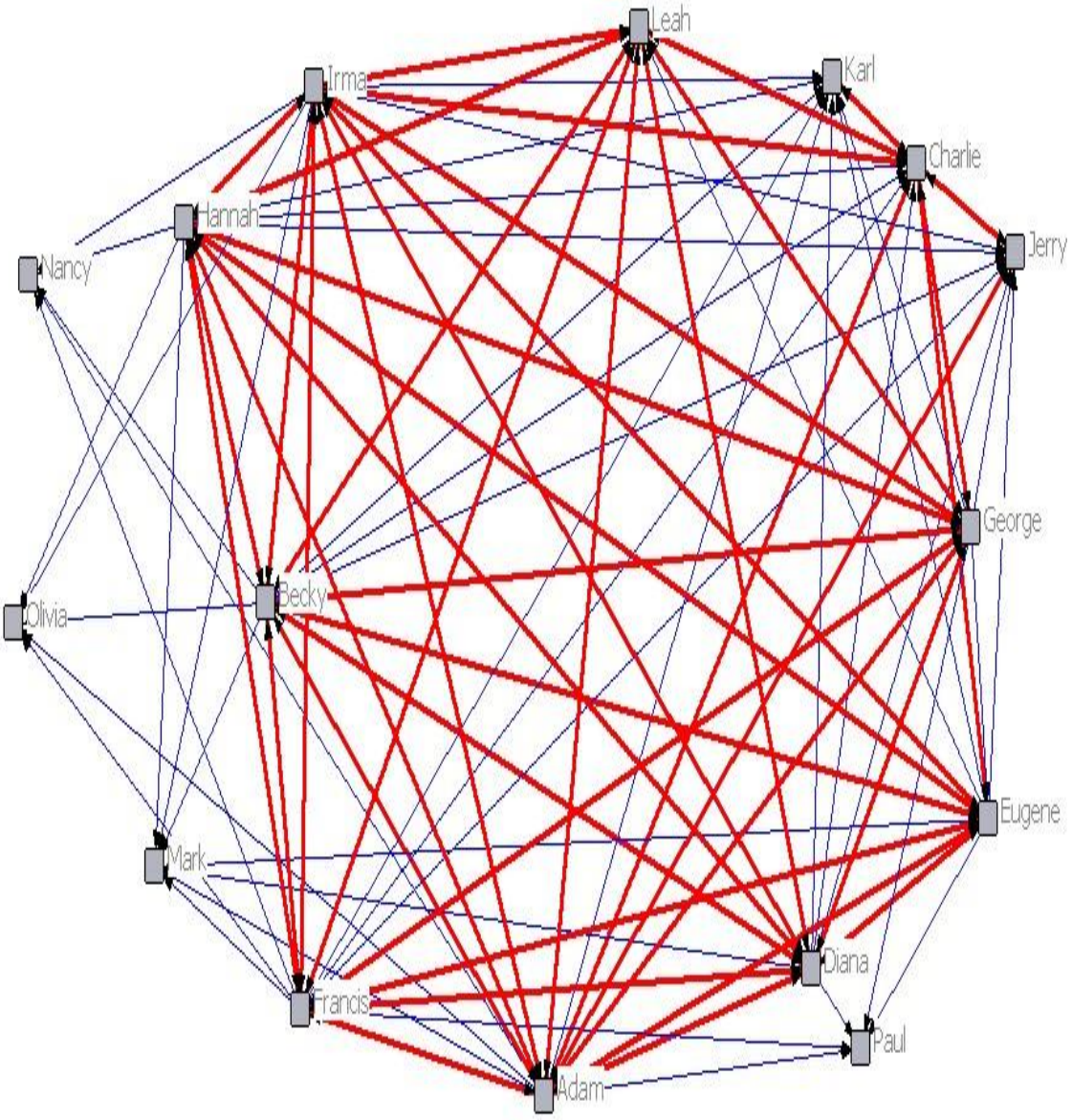


Legend:

Red= Reciprocal Tie

Blue= Non-reciprocal Tie

Figure C49: All Channels Organization-to-Organization Collaboration- Reciprocity

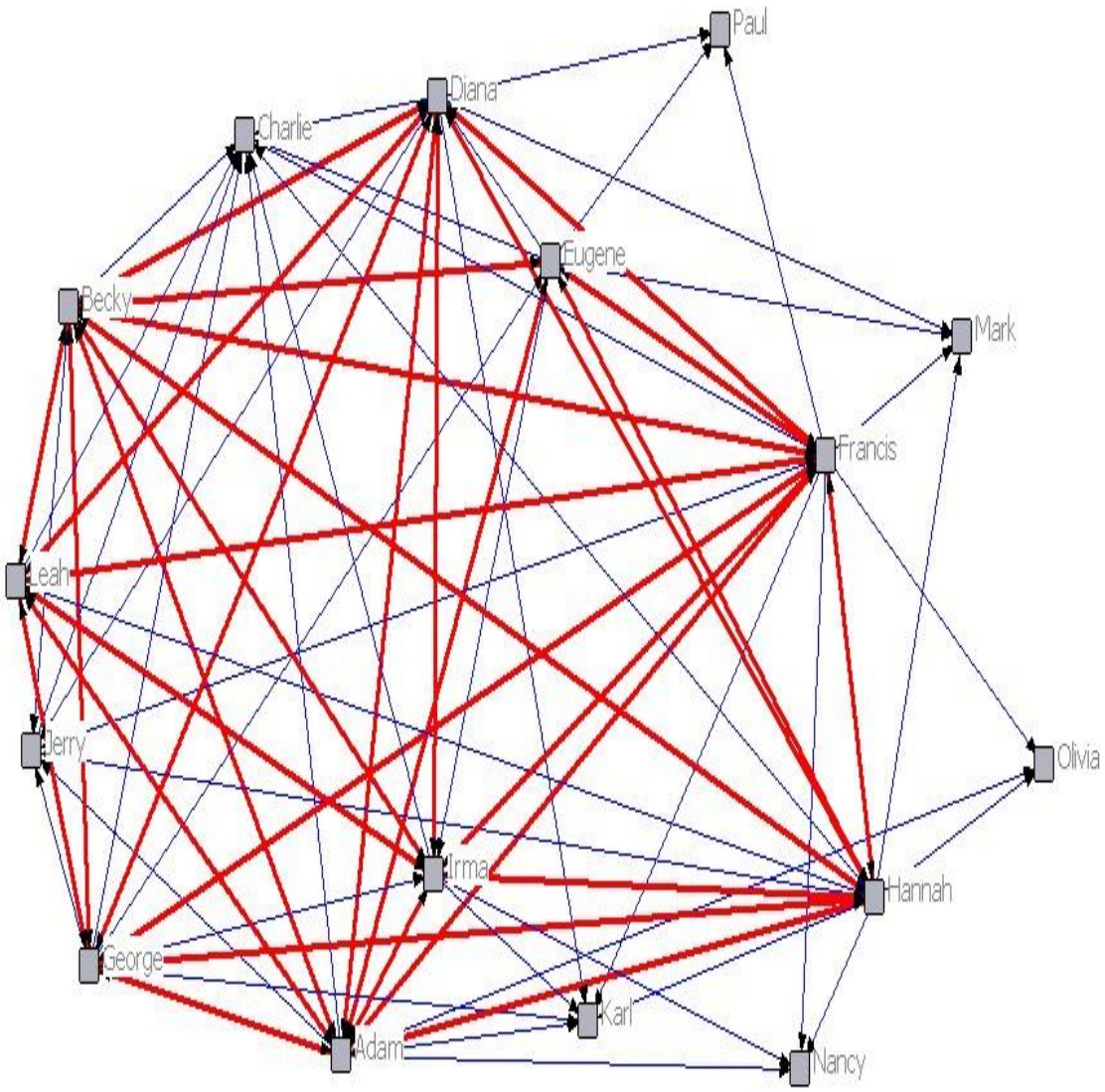


Legend:

Red= Reciprocal Tie

Blue= Non-reciprocal Tie

Figure C50: Face-to-Face/Informal Organization-to-Organization Collaboration-Reciprocity

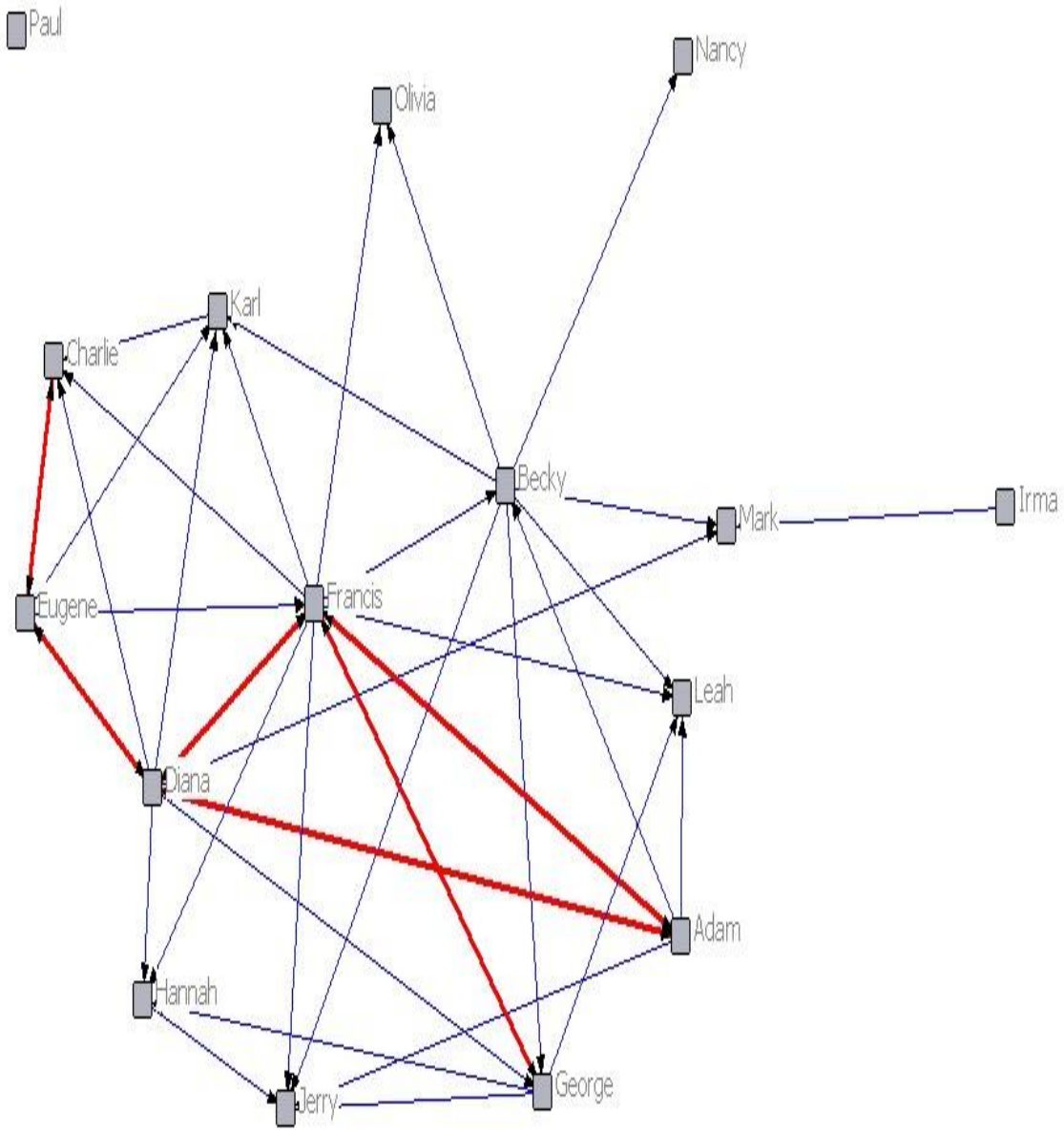


Legend:

Red= Reciprocal Tie

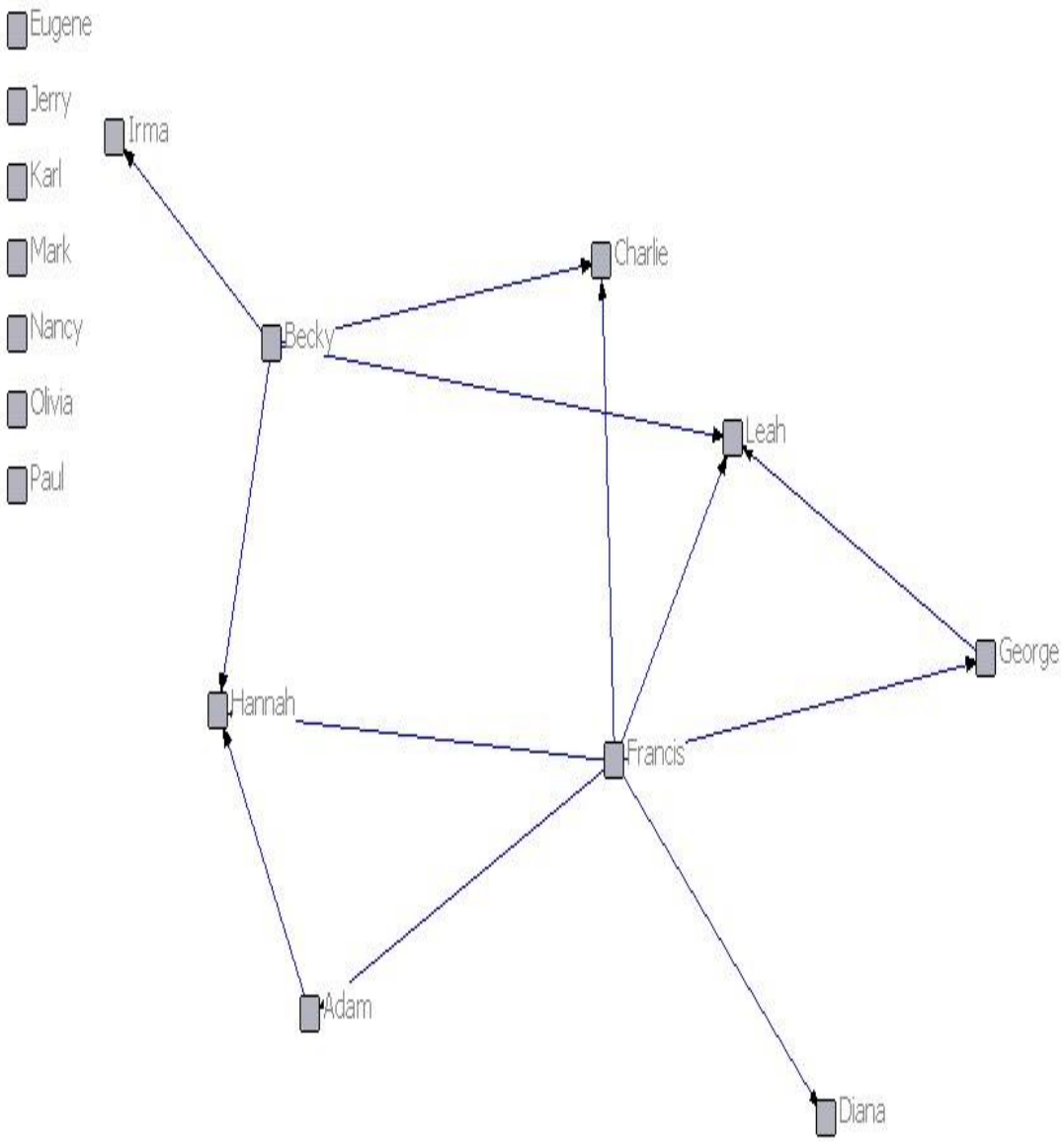
Blue= Non-reciprocal Tie

Figure C51: Meetings Organization-to-Organization Collaboration- Reciprocity



Legend:
Red= Reciprocal Tie
Blue= Non-reciprocal Tie

Figure C52: Phone Organization-to-Organization Collaboration- Reciprocity

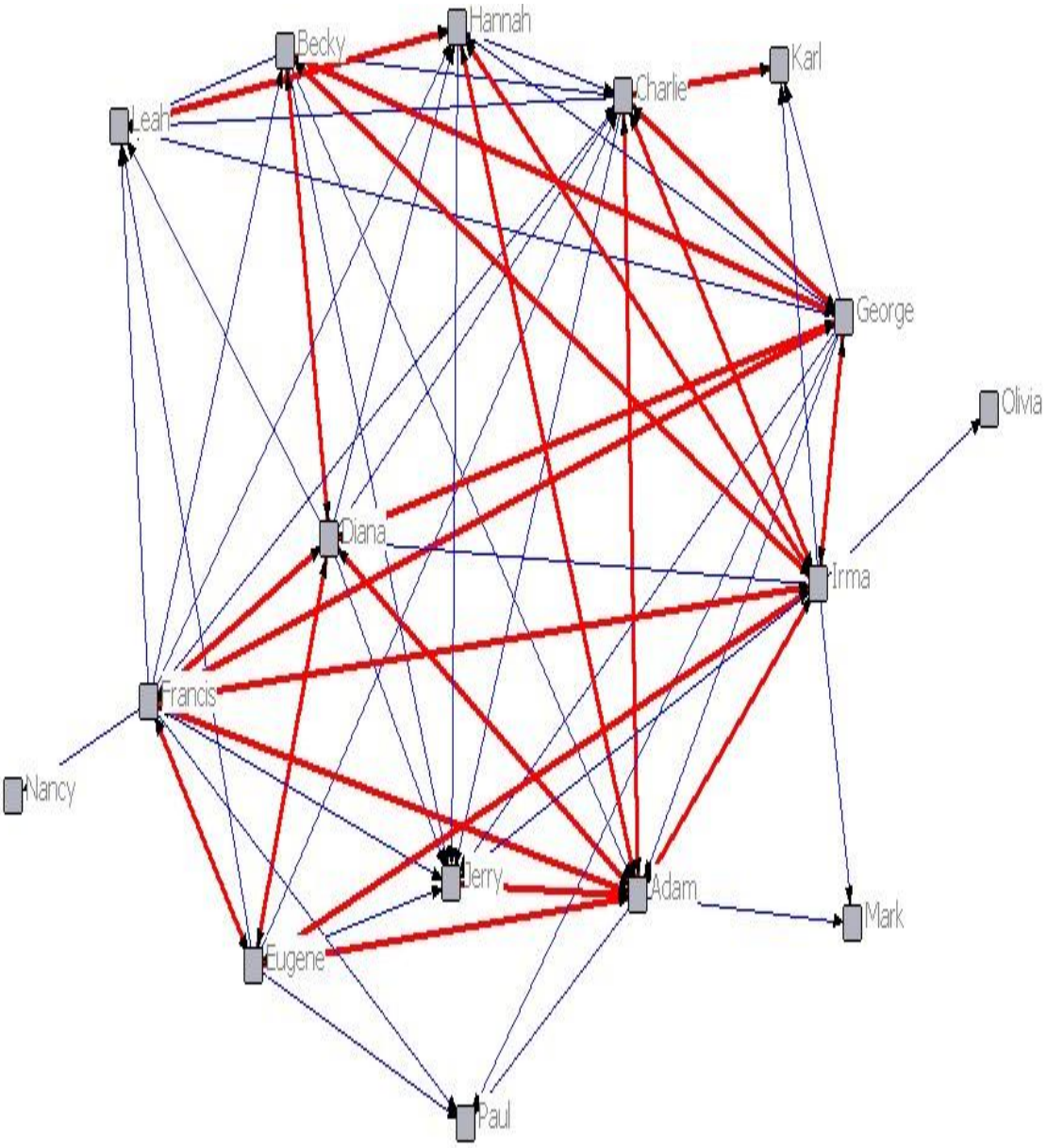


Legend:

Red= Reciprocal Tie

Blue= Non-reciprocal Tie

Figure C53: E-mail Organization-to-Organization Collaboration- Reciprocity

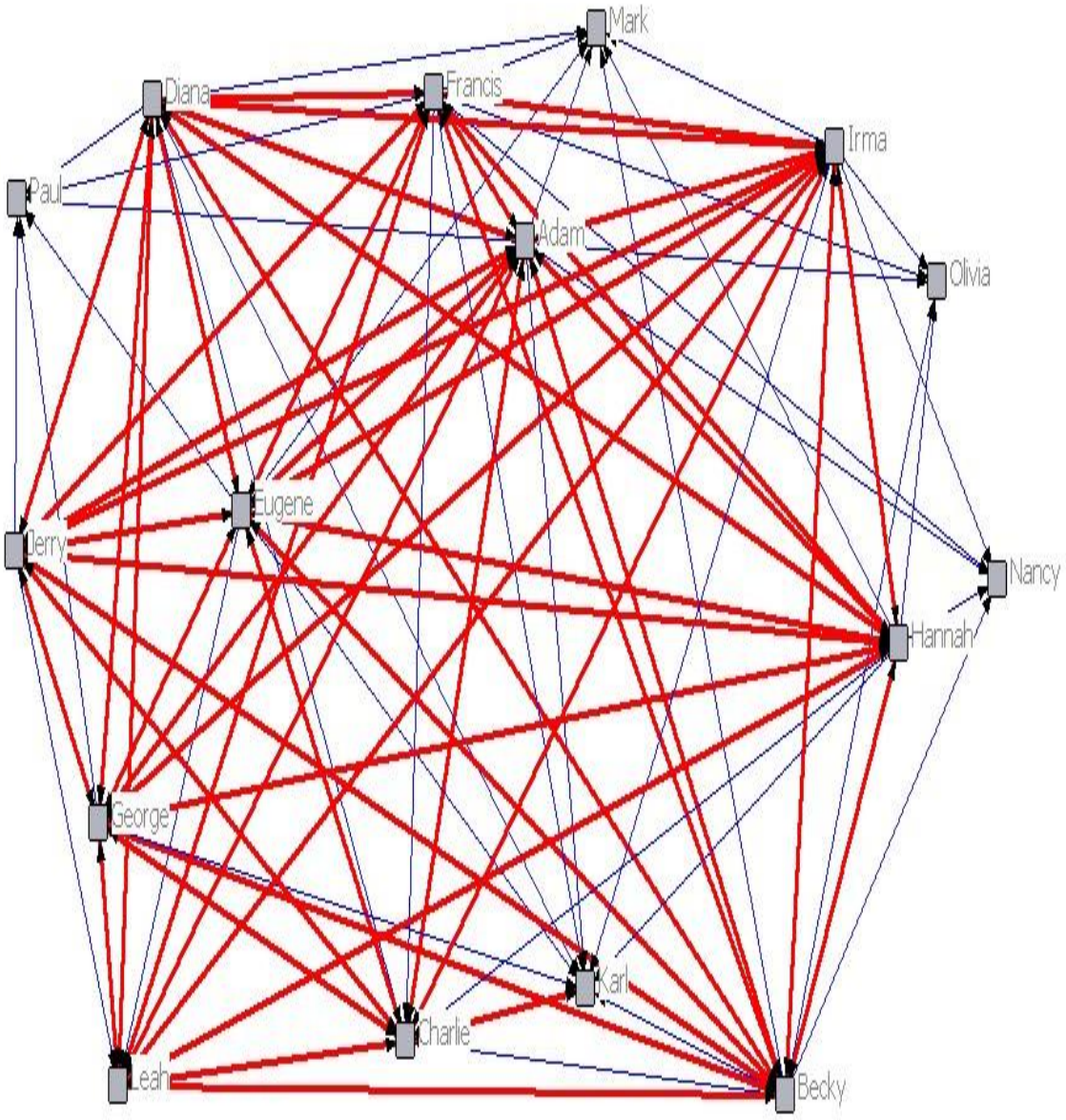


Legend:

Red= Reciprocal Tie

Blue= Non-reciprocal Tie

Figure C54: All Directions Individual-to-Organization Collaboration- Reciprocity

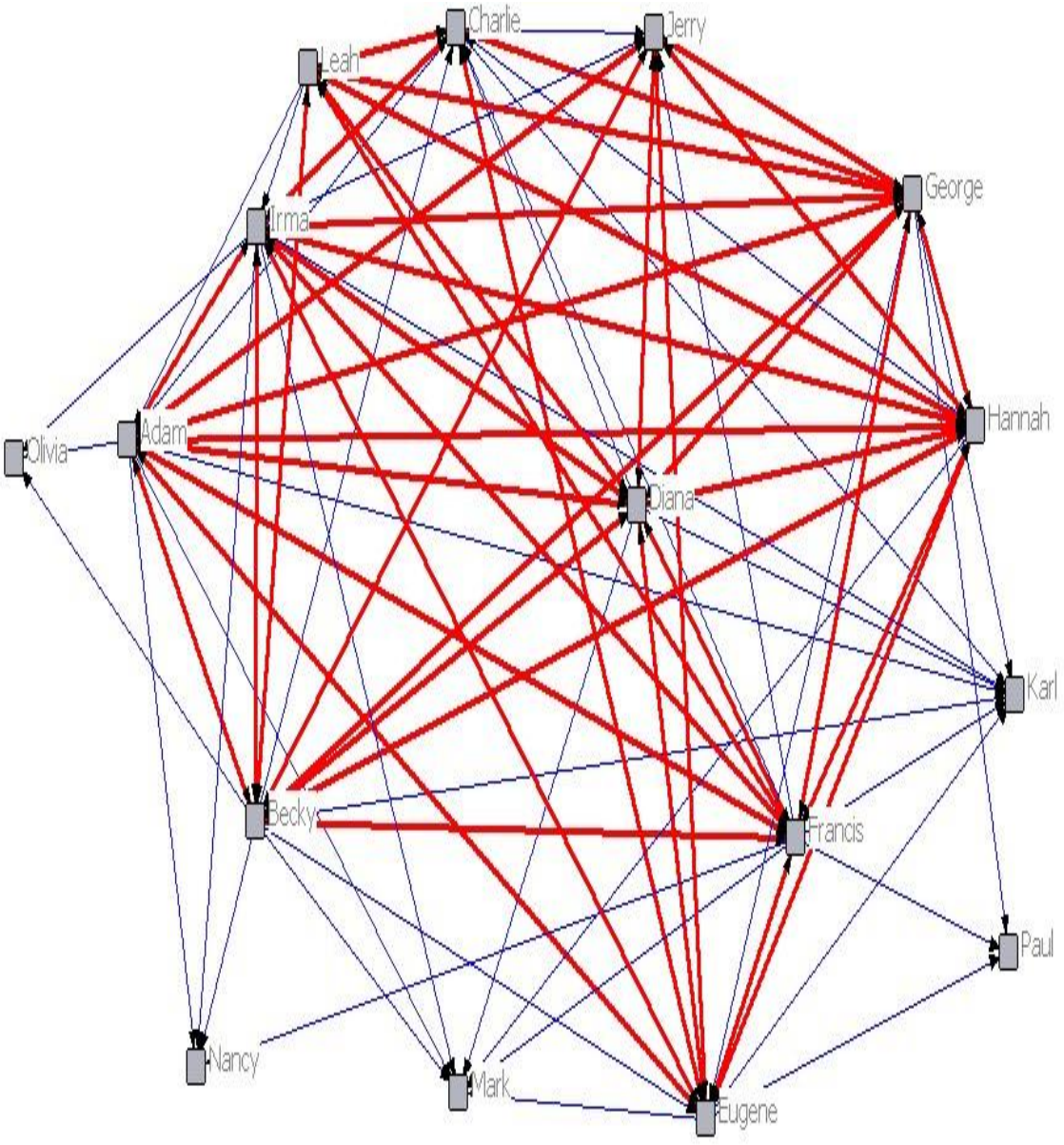


Legend:

Red= Reciprocal Tie

Blue= Non-reciprocal Tie

Figure C55: Cybernetic Individual-to-Organization Collaboration- Reciprocity

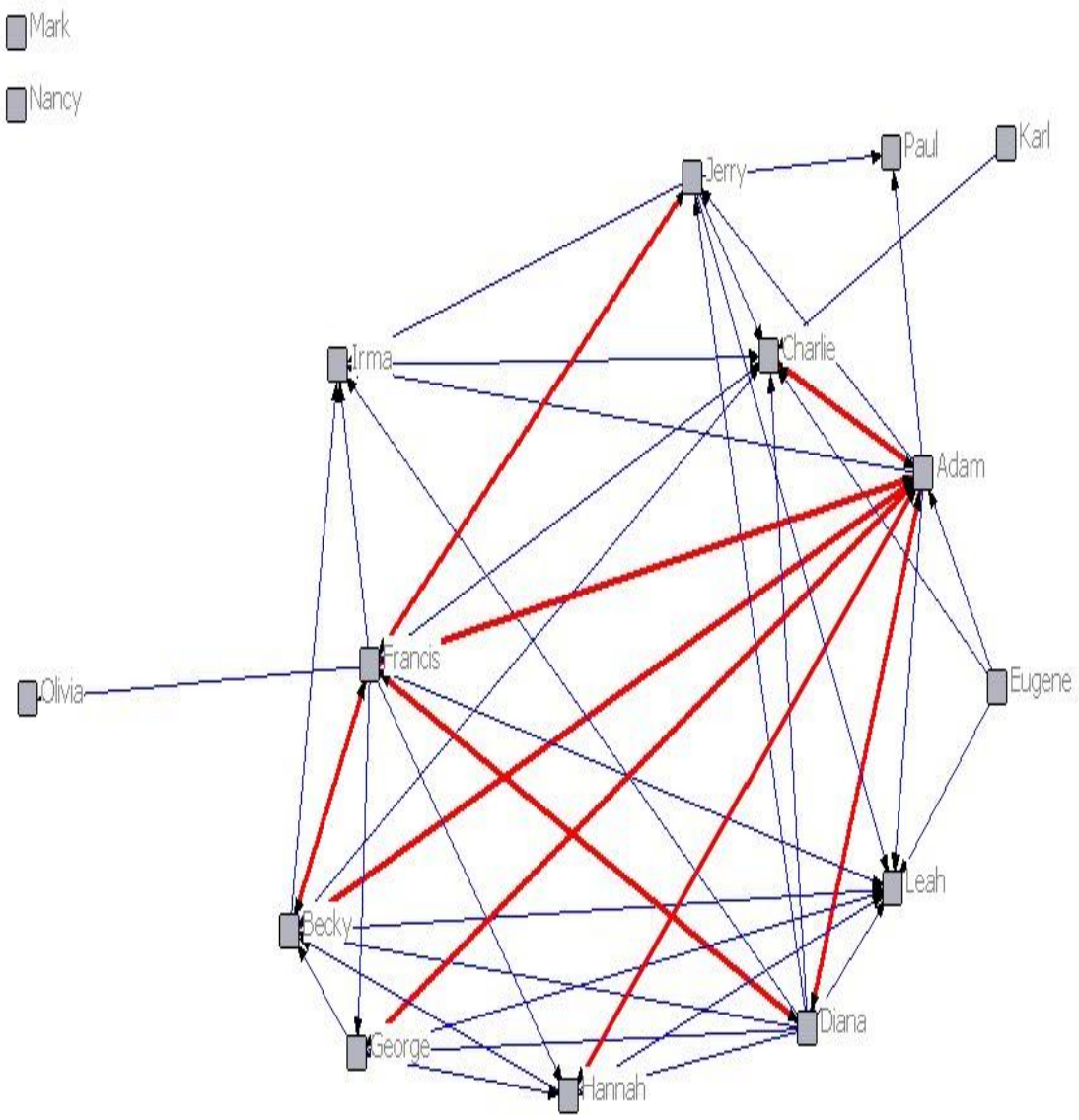


Legend:

Red= Reciprocal Tie

Blue= Non-reciprocal Tie

Figure C56: Unidirectional Individual-to-Organization Collaboration- Reciprocity

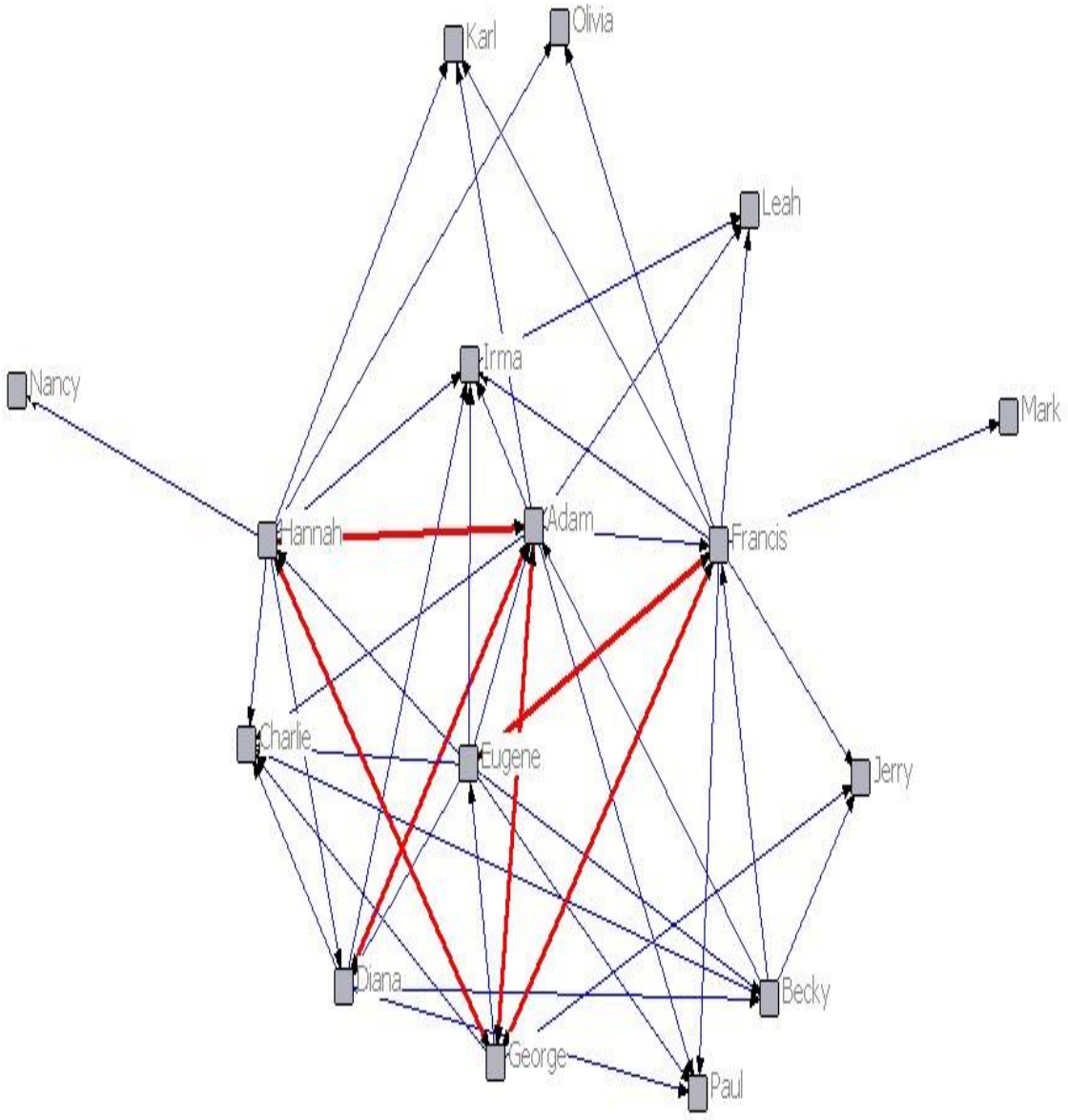


Legend:

Red= Reciprocal Tie

Blue= Non-reciprocal Tie

Figure C57: Don’t Exchange Information Individual-to-Organization Collaboration-Reciprocity

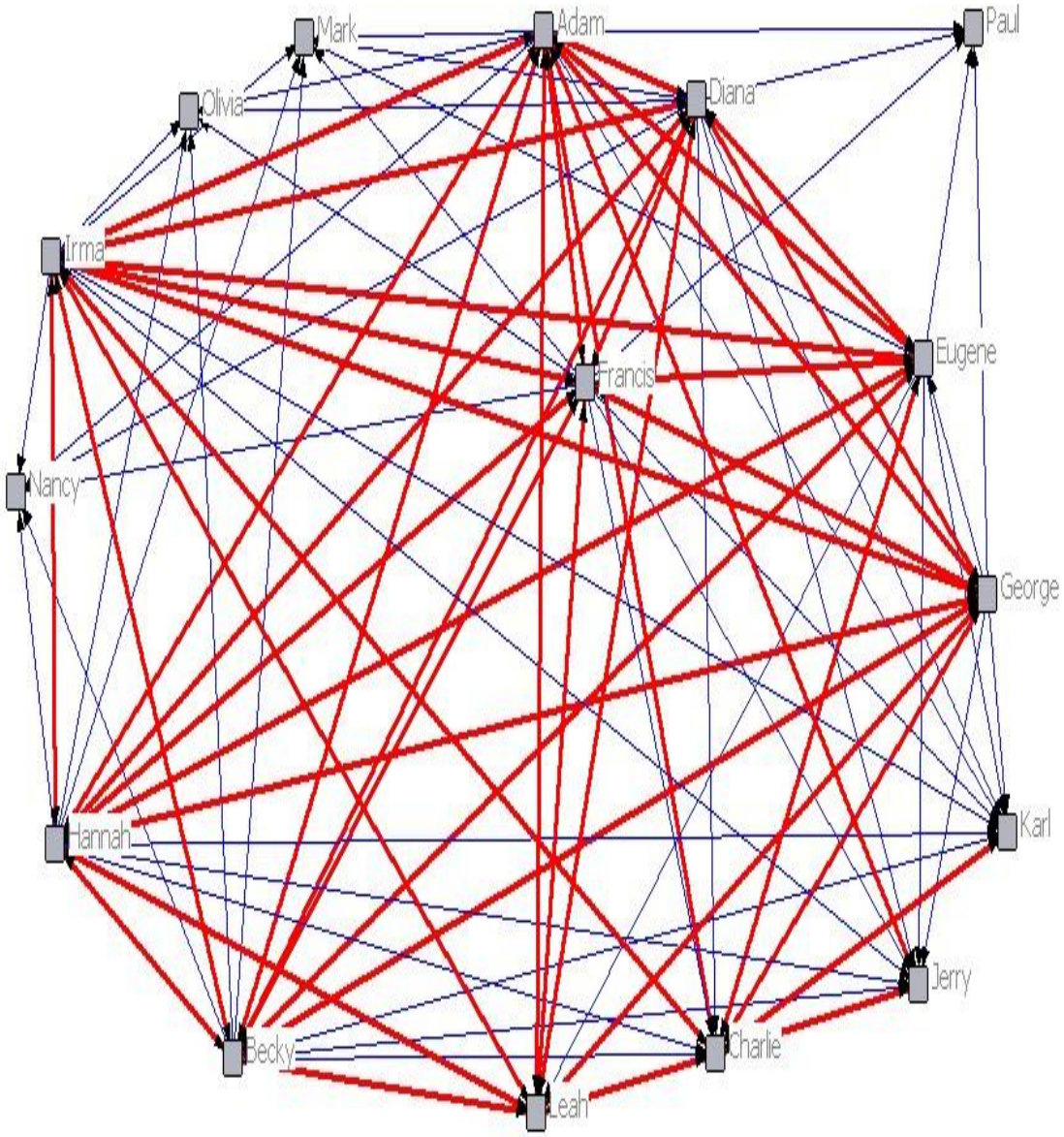


Legend:

Red= Reciprocal Tie

Blue= Non-reciprocal Tie

Figure C58: All Directions Organization-to-Organization Collaboration- Reciprocity

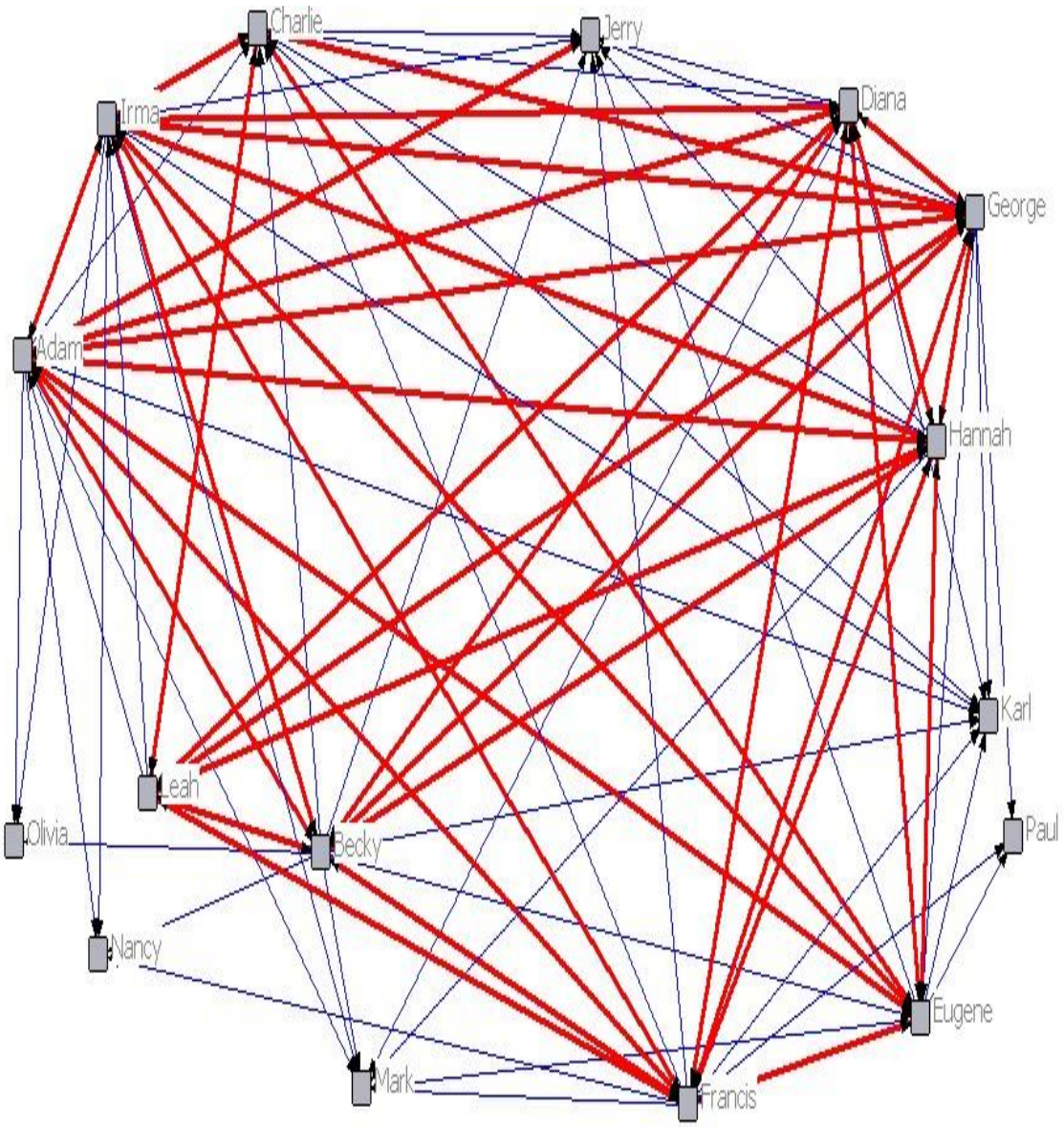


Legend:

Red= Reciprocal Tie

Blue= Non-reciprocal Tie

Figure C59: Cybernetic Organization-to-Organization Collaboration- Reciprocity

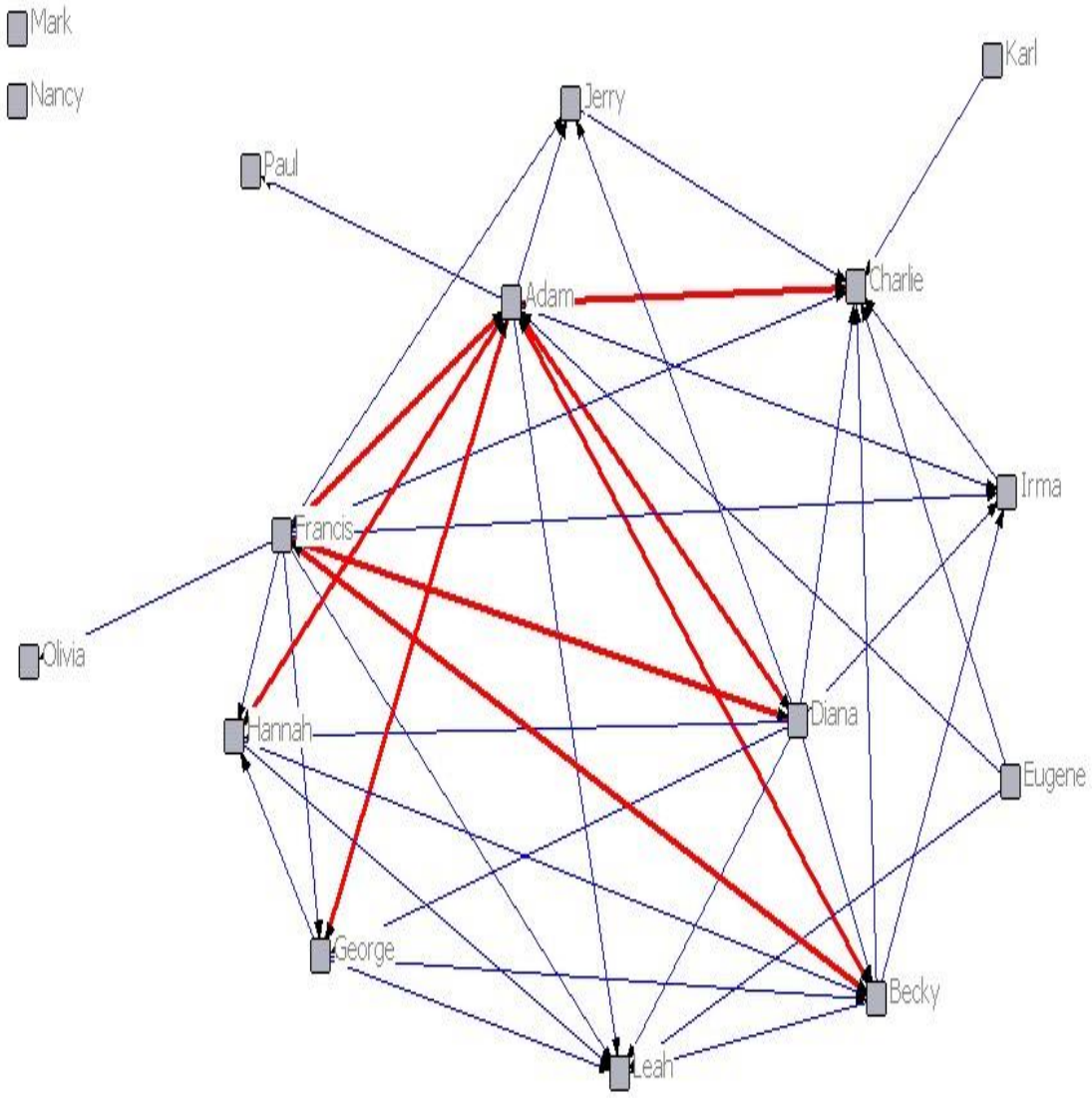


Legend:

Red= Reciprocal Tie

Blue= Non-reciprocal Tie

Figure C60: Unidirectional Organization-to-Organization Collaboration- Reciprocity

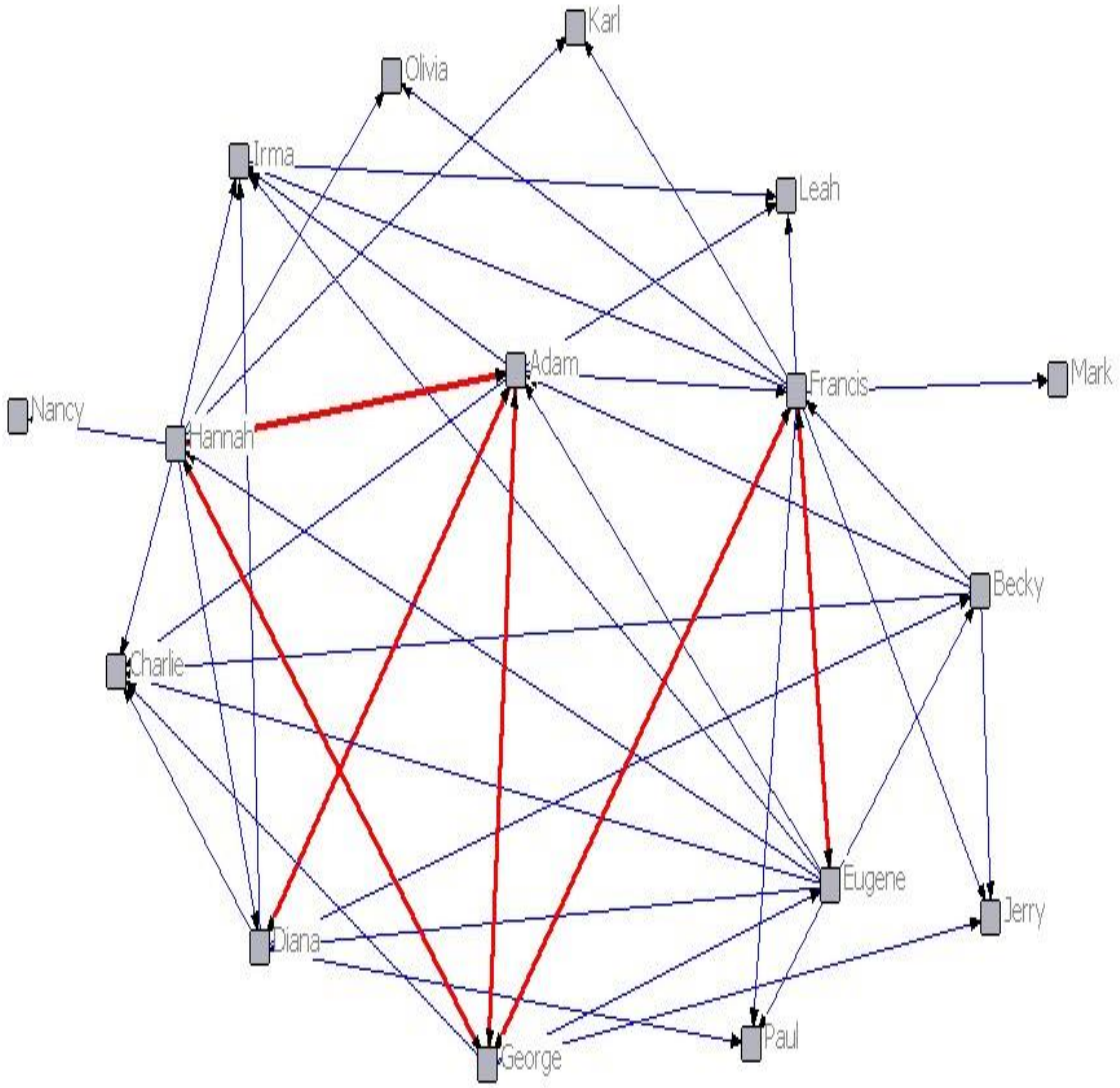


Legend:

Red= Reciprocal Tie

Blue= Non-reciprocal Tie

Figure C61: Don’t Exchange Information Organization-to-Organization Collaboration-Reciprocity



Legend:

Red= Reciprocal Tie

Blue= Non-reciprocal Tie