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ALIGNING STAKEHOLDERS' EXPECTATIONS: THE ROLES OF IT GOVERNANCE AND AN ORGANIZING VISION

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Abstract

IT activities influencing multiple business entities may be managed through a shared service center (a.k.a. an IT cooperative) that provides IT services to support various business functions. The IT cooperative consists of stakeholder groups with individual expectations of the IT cooperative‘s roles and responsibilities, based on which stakeholders engage in various IT-related behaviors. In order to promote desirable IT behaviors, IT activities are directed, controlled, and coordinated through appropriately architected IT governance. Desirable IT behaviors are also shaped by an organizing vision. It is not clear, however, how exactly IT governance and the organizing vision of the IT cooperative achieve desirable IT behaviors. The focus of this study is on explicating the roles of IT governance and an organizing vision in achieving appropriate behaviors of different stakeholders relative to an IT cooperative. Looking through the lens of the theory of collective mind and the knowledge-based view of the firm, we consider how IT governance and an organizing vision align divergent cognitive structures to improve consistent understandings of expected roles and responsibilities. We also analyze the extent to which an alignment of expected roles and responsibilities, as understood by different stakeholders, leads to desirable IT behaviors. This research adopts a longitudinal design, coupled with quantitative and qualitative analyses and action research approach. The findings provide both theoretical and pragmatic implications.

Key Words: IT Governance, Organizing Vision, Cognition Alignment, IT Cooperative.

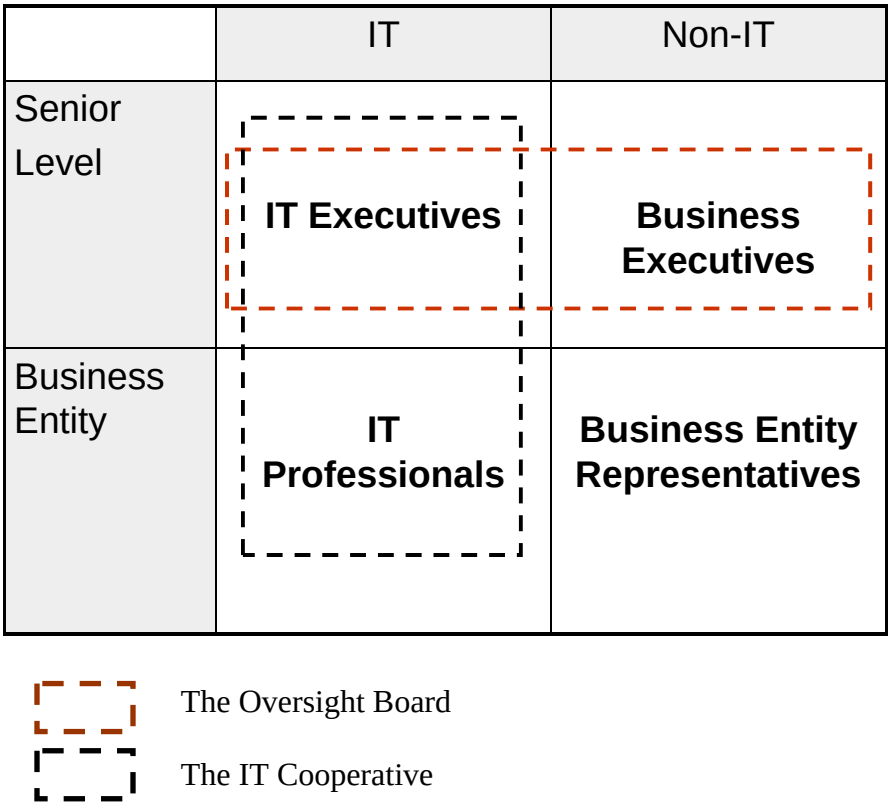
Chapter I: Introduction

In order to successfully achieve business objectives and create competitive advantage, organizations increasingly rely on the use of intra- and inter-organizational information systems (IS) (Johnston and Vitale, 1988). In an intra-organizational context, the management of IS and information technology (IT) related activities can be centralized or decentralized, depending on specific needs of IT. IT activities are localized (or decentralized) within business units if IT assets will be implemented and used by a single unit alone. However, it is more efficient to manage IT from an enterprise-wide perspective when two or more business units are involved in the use of the same IT assets (Cross, Earl and Sampler, 1997). Business organizations centrally manage intra-organizational information systems through an IS department, to implement IT products and provide shared services to other business units. Similarly, in an inter-organizational environment, multiple business entities from different organizations may often need to use the same information systems to facilitate business transactions across organizational boundaries. Under such circumstances, an inter-organizational IT cooperative could play the role of an intra-organizational IS department, to manage inter-organizational information systems and provide shared services to various business entities.

We are interested in the performance of an inter-organizational IT cooperative. We define an *inter-organizational IT cooperative* as an inter-organizational service center that provides IT services to support business entities across distinct organizational boundaries. Similar to an IS department within an organization, the inter-organizational IT cooperative (hereafter referred to simply as the *IT cooperative*) consists of IT

executives and IT professionals, operating under the direction of an oversight board. The oversight board typically is comprised of business executives (in this case, from multiple organizations) and, as is increasingly the case the most senior IT executives (Feeny, Edwards and Simpson, 1992). Being an integral part of the oversight board, senior IT executives focus on the common IT needs of business entities, and are responsible for developing IT policies and strategies, prioritizing IT initiatives, bridging IT groups and business entities, and gate-keeping technological resources diffused throughout business entities with the needs to leverage shared IT services (Benjamin, Dickinson and Rockart, 1985). IT professionals implement the ideas of business and IT executives to provide services for the clients of the IT cooperative, which may be represented by business and/or IT managers from the entities with the needs to leverage shared IT services. Taken together, business executives, IT executives, managers from business entities, and IT professionals all represent different groups of stakeholders, who, by its definition, are individuals and constituencies in an organization "that contribute, either voluntarily or involuntarily, to its wealth-creating capacity and activities, and who are therefore its potential beneficiaries and/or risk bearers" (Post, Preston and Sachs, 2002). These stakeholder groups are actively involved with the directions and actions of the IT cooperative. Specifically, representatives of business entities (i.e. business stakeholders) request IT services; IT executives and IT professionals (i.e. IT stakeholders) work together to provide required services and, the oversight board coordinates interactions between IT stakeholders and business stakeholders (see Figure 1.1) (Fonstad and Robertson, 2006).

Figure 1.1 Stakeholder groups involved with the IT cooperative



The IT cooperative's clients involve business entities across organizational boundaries, with each business entity independently divesting its own IT projects via its own IT management and processes. Under such circumstances, the IT cooperative faces the challenge of creating economies of scale and scope, while at the same time accurately understanding clients' needs and serving multiple clients. To what extent the IT cooperative understands the service requirements of multiple clients significantly determines the IT cooperative's success, and it is important for managers to become aware of the factors that contribute to the improvement of an IT cooperative's performance (Nelson and Cooprider, 1996). The focus of this study therefore, is to explore how an IT cooperative provides satisfactory services that are consistent with client requirements. Specifically, this study explores the processes of defining desirable

IT behaviors to be engaged by the IT cooperative, as conceptualized by multiple stakeholders (e.g. clients, IT stakeholders, etc) involved with the IT cooperative. Integrating the literature of IT governance and organizing vision, this research asks what impacts IT governance and an organizing vision have on achieving consistent definitions of desirable IT behaviors across different stakeholder groups in the inter-organizational context. Or in other words, how can IT governance and an organizing vision be leveraged to enhance the clarity and consistency of an inter-organizational IT cooperative's roles and responsibility, and consequently to improve the performance of the IT cooperative?

1.1 A Conceptual Research Model

Literature on IT governance suggests that organizations with effective IT governance structures tend to have better performance, as appropriate IT governance structures promote desirable IT behaviors by directing, controlling, and coordinating IT activities (Sambamurthy and Zmud, 1999). IT governance structures orchestrate interdependent actions by enabling the right people to participate in the right decisions relative to a firm's IT-related strategies and activities (Weill and Ross, 2004). Thus, IT governance is an important component of organizational IT capability, and previous research has shown that organizations found to generate substantial returns on IT investments have implemented effective IT governance structures (Weill and Ross, 2004). However, the IT governance literature lacks sufficient explanation regarding the ways in which IT governance induces desirable IT behaviors. Also, the study of IT governance has been limited in inter-organizational contexts. To take a step further, this study (recognizing the desirability of attaining stakeholders' mutual understandings of

desirable IT behaviors to be engaged by the IT cooperative) suggests that appropriately architected IT governance will lead to shared interpretations of the roles and responsibilities of an IT cooperative among multiple stakeholder groups, which will consequently improve the performance of the IT cooperative regarding providing satisfactory services to multiple clients.

Also considered in the study's design is the organizing vision (Swanson and Ramiller, 1997), i.e. a "community representation" in a multi-organizational context, of the roles and responsibilities of the IT cooperative. An organizing vision is largely shaped by an institutional process, through which stakeholders across organizational boundaries exchange their expectations and negotiate a public definition of the IT cooperative's roles and responsibilities. The negotiation of an organizing vision is characterized by both agreement and disagreement, and the organizing vision is more meaningful to stakeholders when it is interpretable, plausible, important, and consistent (Ramiller and Swanson, 2003). We suggest that a higher degree of the meaningfulness of the organizing vision tends to improve shared understandings of the roles and responsibilities of the IT cooperative and, based on these shared understandings, it is more likely that appropriate IT behaviors will occur, consequently improving the performance of the IT cooperative.

1.2 Research Questions

To evaluate the performance of an IT cooperative, the perspectives of the IT cooperative's clients will be considered. As a major function of an IT cooperative is to provide shared services to its clients across organizational boundaries and to support the business functions of each business entity, the IT cooperative's performance will be

reflected by the *client satisfaction* with the activities enacted by the IT cooperative, as well as critical events implying questionable services that are provided. The expectation-confirmation literature indicates that actors evaluate the performance of the IT cooperative based on their belief systems (Anderson and Sullivan, 1993; Bhattacherjee, 2001). Stakeholders from each client entity have their own beliefs regarding desirable IT behaviors, which are negotiated and learned and are likely distinct in varying ways from stakeholders from other client entities. Individual stakeholders in the IT cooperative also have various viewpoints, which may or may not be the same as those of stakeholders from client entities. So, there are two major sets of expectations of desirable IT behaviors to be engaged by the IT cooperative: expectations held by stakeholders from client entities, and expectations held by stakeholders in the IT cooperative. Both expectations can be dynamic, and disagreements with the IT cooperative's roles and responsibilities are possible both within these two sets and across these two sets. However, whether or not the IT cooperative will provide satisfactory services to clients depends on the degree to which expectations of desirable IT behaviors to be engaged by the IT cooperative are aligned within and across clients and IT professionals (Johnson and Lederer, 2005).

The alignment of stakeholders' expectation thus is predicted to have impacts on the IT cooperative's performance in this dissertation, and we will explore the factors contributing to such an alignment. Specifically we ask the following questions: a) *to what extent the alignment of stakeholders' expectations may be improved through appropriately architected IT governance and/or an organizing vision*; and, b) *to what extent an alignment of stakeholders' expectations will improve the performance of an IT*

cooperative? We propose that appropriately architected IT governance structures are expected to minimize divergent interests and facilitate shared interpretations, which in time may result in aligned expectations of different stakeholders. Furthermore, the alignment of stakeholders' expectations may also result from a meaningful organizing vision. As a community idea, the organizing vision creates a common base across stakeholders from multiple organizations to be used in building shared understandings of the roles and responsibilities of the IT cooperative (Ramiller and Swanson, 2003). The focal community constituting the organizing vision includes not only stakeholders associated with the IT cooperative, but all interested parties and their networks of relationships. The organizing vision is created and reinforced through an institutional process, during which stakeholders make sense of the organizing vision (Swanson and Ramiller, 1997).

Taken together, the main effects of IT governance and an organizing vision on the IT cooperative's performance are mediated through an alignment of the belief systems of client entities and IT stakeholders in the IT cooperative. Specifically, all stakeholders associated with the IT cooperative are involved in IT decisions and other IT-related activities and behaviors through the IT cooperative's governance structures. Concurrently, the organizing vision shapes the community definition of desirable IT behaviors to be engaged by the IT cooperative. Therefore, both IT governance and organizing vision are influential in achieving an alignment of the expectations of client entities and IT stakeholders and consequently, improved performance of the IT cooperative.

To summarize, the research questions of this dissertation are to explicate the direct impacts of both IT governance and the organizing vision on improving the IT cooperative's performance through aligning stakeholders' expectations of desirable IT behaviors. Looking through the theory of collective mind and the knowledge-based view of the firm, this research will integrate the literature of coordination, control, and communication with the literature of IT governance, to examine the extent to which IT governance communicates, coordinates, and controls divergent belief systems, to achieve consistent understandings of appropriate IT activities to be engaged by the IT cooperative. This research will then examine how the meaningfulness of an organizing vision impacts shared understandings of desirable IT behaviors, followed by an analysis of the extent to which the alignment of stakeholders' expectations consequently leads to improved performance of the IT cooperative.

1.3 Expected Contributions

A major contribution that this research will potentially make is the exploration of how IT governance induces desirable IT behaviors and consequently improved organizational performance in an inter-organizational context. Such a contribution is especially timely today, given the increasing prevalence of multi-organizational IT-enabled business platforms (Boudreau, Loch, Robey and Straub, 1998) and the observation that for stakeholders interacting across organizations, such issues as dominating control and opportunistic behavior tend to induce stakeholder conflicts (Kumar and Van Dissel, 1996). Existing literature suggests that organizations with effective IT governance structures tend to outperform other organizations, as effective governance structures encourage appropriate IT behaviors (Weill and Ross, 2004).

However, the linkage between IT governance structures and desirable IT behaviors largely remains a black box, for both inter- and intra-organizational contexts. In particular, very limited empirical research attention has been directed at how IT governance structures might be best implemented to facilitate inter-organizational collaboration.

To fill these gaps, this study will advance the field of IT governance through unfolding the nature of IT governance in an inter-organizational environment. First, this research *identifies the underlying problems* associated with inappropriate IT behaviors across organizational boundaries. Because of the divergence of interests and the tacit nature of knowledge, stakeholders across interacting organizations are likely to have very different interpretations of the roles and responsibilities of an IT cooperative providing shared services to multiple clients. Given the lack of consistent understandings, services generated by the IT cooperative are unlikely to meet the requirement of every client, resulting in poor performance of the IT cooperative.

As a solution to this problem, this research suggests that organizations could leverage appropriately architected IT governance practices given *three primary roles played by IT governance* to induce appropriate IT-related behaviors: control, coordination, and communication.

In addition, this research also examines *the meaningfulness of an organizing vision* with regard to the achievement of shared understandings of desirable IT behaviors to be engaged by the IT cooperative. It will make contribution to the IT governance literature by relating an organizing vision to IT governance and to subsequent organizational performance. Prior literature on organizing vision has explored the

production and sustenance of organizing visions in a multi-organizational context (Ramiller and Swanson, 2003; Swanson and Ramiller, 1997) but has not addressed the impact of organizing visions on firm performance. As a step-forward, this study discusses directly how an organizing vision could be leveraged along with IT governance to induce desirable behaviors and consequently to achieve superior performance.

In conclusion, the expected contributions of this dissertation are four-fold: 1) it examines the nature of IT governance in an inter-organizational context, 2) it begins to open up the "black box" of IT governance, revealing the control, coordination, and communication processes through which desirable IT behaviors are encouraged via shared understandings across organizational boundaries, 3) it relates the alignment of stakeholders' understandings of desirable IT behaviors to be engaged by the IT cooperative, which has been identified as an antecedent of organizational performance (Lind and Zmud, 1995; Ranganathan and Sethi, 2002), to the effectiveness of IT governance structures, and 4) it suggests the ways an organizing vision could be leveraged to further promote this shared understanding, consequently further improving organizational performance.

1.4 Organization of Dissertation

The dissertation will proceed as follows. Chapter 2 provides a literature review touching on the phenomena and major constructs reflected in the study's research model. First, a discussion of previous research on IT governance structures and contingency influences is presented and discussed in terms of what has been done and how much we understand IT governance. The literature on communication, control, and coordination shed light on the roles of IT governance structures and is integrated into the discussion of

IT governance structures. The resulting discussion provides a justification of the selection of research constructs and the propositions of the relationships among them. The proposed research model can thus be understood based on the framework defined in this chapter. Chapter 3 draws on the literature foundation and presents the research model and hypotheses. Possible reasons for a misalignment of the expectations of desirable IT behaviors held by client entities and IT stakeholders are discussed. Research hypotheses are then proposed to suggest how IT governance and an organizing vision will mitigate this misalignment and consequently result in improved performance of an IT cooperative. Constructs and resulting relationships are presented. Chapter 4 proposes action research as the research methodology, and presents the survey instrument to be used to both obtain insights regarding the construct relationships depicted in the research model and, in doing so, furthering the aims of this action research design. Analyses and results are presented in Chapter 5, followed by discussions of findings in Chapter 6. Lastly, Chapter 7 identifies the contributions and theoretical and managerial implications of the study, and points out limitations and directions for future research.

Chapter II: Literature Review

This chapter begins with an overview of IT governance, gaps in the literature of IT governance, and specific roles served by IT governance. The chapter then moves on to the review of the relevance of an organizing vision, and the connection between cognitive structures and subsequent behaviors that constitute organizational performance.

2.1 Previous Research in IT Governance

The need for assuring IT value, the management of IT-related risks, and increased requirements for control over information constitute the core of IT governance (Cobit 4.0). "IT governance represents the framework for decision rights and accountabilities to encourage desirable behavior in the use of IT" (Weill, 2004, p.3). IT governance is closely related to but different from IT management, in that IT management is associated with getting things done, while IT governance involves deciding what things to do and how they should be done. The fundamental concepts of IT governance were researched starting as early as the 1960's, but under different terms, such as computer systems management controls (Garrity, 1963), IT decision making responsibilities (Boynton, Jacobs and Zmud, 1992), and IS organizational structure (Von Simson, 1990), etc. It was not until the 1990's that the term "IT governance" was popularly used.

IT governance comprises primarily three areas: what IT decisions must be made (i.e. decisions), who has the decision rights (i.e. structures) for these decisions, and how these decisions should be made (i.e. processes and criteria). One of these three dimensions, governance structure (or, governance mode), has been most widely studied. IT governance structure defines who assumes the rights and responsibilities of IT decision-making activities, and spells out the rules and procedures that ensure the

enterprise's IT sustains and extents organizational strategies and objectives. Two distinct research streams primarily deal with IT governance structures (Brown and Grant, 2005): one on IT decision loci, and the other one on IT governance contingencies.

2.1.1 Basic IT Governance Structures

The first stream of research on the locus of decision-making responsibilities evolves from a traditional bi-polar notion of decision rights to a vertical and horizontal expansion of IT cooperative structures. In most business organizations, information systems are initially decentralized within business functions, and IT accountabilities are delegated amongst senior managers, line managers, and IS managers within IT-using functions (Ross, 2003). Having managers responsible for IS in their own functional operations addresses individual needs but lacks an enterprise-wide perspective on IT use. To avoid the duplication of IT services and products and to create economies of scale and scope, organizations respond by relying on an IS function to integrate business functions with IT. This IS function is the sole provider of common IT products and services, with associated IT responsibilities centralized within this function. Yet, subunits remain free to exert influences on these shared organizational uses of IT as well as their own decisions to implement unit specific IT-enabled business solutions. Thus, organizational subunits can acquire IT resources and services internally through an IS function, or through their own actions (Keen, 1985). Embedded in this IT environment are the concepts of centralized and decentralized loci of IT decision making, where specific IT-related decision-making authority is placed either in a central organizational body to allow for an enterprise-wide integration of IT and economies of scale, or within

individual business units to enable the customization of solutions and to improve the responsiveness to business unit needs (Jenkins and Santos, 1982; Wetherbe, 1988).

2.1.2 Expanded IT Governance Structures

Centralized and decentralized decision-making structures each have advantages and disadvantages, as listed in Table 2.1 (Boynton and Zmud, 1987; Cross, Earl and Sampler, 1997). A balance of IT decision accountabilities is necessary so as to "simultaneously provide centralized direction and coordination while recognizing the value of increased discretion regarding IT decision making on the part of managers throughout the organization" (Boynton and Zmud, 1987, p.61).

Table 2.1 Advantages and Disadvantages of Two IT Governance Structures

	Advantages	**Disadvantages**
Centralization	Sets IT standards and provides an enterprise-wide perspective for infrastructure planning, application portfolio planning and development; facilitates cost control; creates economies of scale.	Deprives subunits of the freedom of maintaining responsibilities for certain activities; may overlook subunit needs; adds layers of hierarchy and bureaucracy.
Decentralization	Presents subunits with the opportunities to obtain customized solutions to address business needs; generates localized optimization.	Duplicates and fragments IT products and services.

Based on the organizational needs of balancing the benefits of both centralized and decentralize decision-making structures, subsequent research provided an expanded understanding of IT governance structures and examined hybrid solutions of decision loci (Brown, 1997). It was suggested that governance structures were related to the nature of IT-related decisions. There are several major types of IT decisions that are usually made within an organization, as summarized in Table 2.2. Relative to these decisions, Zmud,

Boynton, and Jacobs (1986) proposed a federal mode of governance as a way to separate decision rights of different types of IT activities. Specifically, core IT decisions such as IT infrastructure and IT investment would be centralized to ensure enterprise-wide consistency, while decisions associated with IT use such as business applications would be decentralized to allow for the input of business units. In this way, a centralized IT cooperative acts like the federal government to operate critical IT services and maintaining overall IT infrastructures; in addition, it also influences the actions of subunits by establishing policies and procedures within which business units control a portion of the overall IT activities (Hodgkinson, 1996).

A recently developed taxonomy embraces six discrete classifications of decision loci, as a way to capture the variations of centralized, decentralized, and federal governance modes. These variations include business monarchy, IT monarchy, feudal, federal, IT duopoly, and anarchy (Weill and Ross, 2004). The differences among these six IT governance archetypes are whether IT decision rights are located with senior managers, IS managers, or line managers alone, or with a group of different managers.

Table 2.2 Major IT Decisions

IT Decision	Descriptions

IT Architecture	• Deals with the technical guidelines and standards to be used in the enterprise (Weill and Ross, 2004).
	• Consists of both logical and technical components (Broadbent and Kitzis, 2005).
	  o The logical architecture provides the high-level description of the agency's mission, functional requirements, information requirements, system components, and information flows among the components.
	  o The technical architecture defines the specific IT standards and rules that will be used to implement the logical architecture. IT infrastructure decisions are about whether, why, and how the enterprise will build and sustain a set of shared IT services.

IT Investment and Prioritization	• Associated with how much and where to invest, and how to justify and approve IT-enabled business initiatives (Weill and Ross, 2004).
Business Application	• Decides what applications are needed by business units or divisions to support their business functions or processes (e.g. automated payroll system) and how to go about getting these applications (e.g. purchase or build) (Broadbent and Kitzis, 2005).
Sourcing	• Deals with whether to outsource the implementation and/or the management of IT or to do it in-house (Lacity and Willcocks, 1998).
IT Human Resource	• Deals with the recruitment, retention, and improvement of IT human resources (Agarwal and Ferratt, 1999).

2.1.3 Contingency Influences

In light of governance mode, studies were done to understand how and why an organization adopted a specific IT governance structure, and under what conditions would firms implement a hybrid IT governance solution rather than a uniform one. Early research of this stream focused on a variety of individual factors that influenced the adoption of a particular IT governance design, ranging from industry (Ahituv, Neumann and Zviran, 1989; Clark, 1992), firm size (Ahituv, Neumann and Zviran, 1989; Ein-Dor and Segev, 1982), corporate strategy (Brown and Magill, 1994; Tavakolian, 1989), to

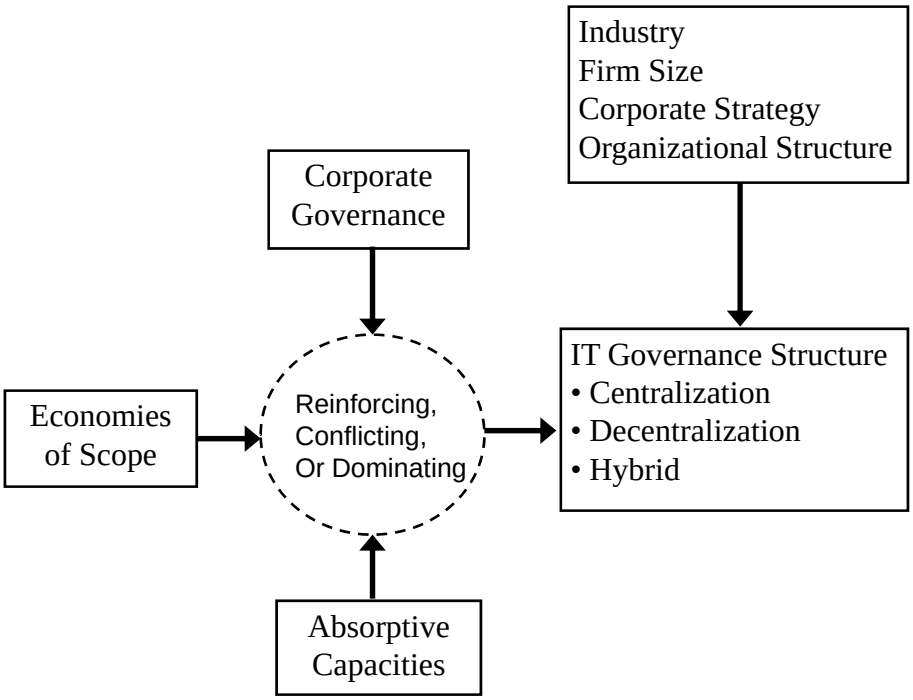
organizational structure (Applegate, McFarlan and McKenney, 1996; Olson and Chervany, 1980). It was found that organizations with a centralized structure, or a "defender" competitive strategy were more likely to adopt a centralized IT governance structure (Ein-Dor and Segev, 1982; Tavakolian, 1989). Industry and firm size also seemed to have impacts on IT governance design (e.g. Sambamurthy and Zmud, 1999).

As researchers confronted the reality that IT governance structures depended on the confluence of many contingency factors that in practice interacted with one another, studies shifted away from single contingency analyses to multiple contingency analyses. A representative piece on this topic is Sambamurthy and Zmud's work (1999), in which they categorized the influential factors that were previously explored into three forces (i.e. corporate governance, economies of scale, and absorptive capacity) and studied the reinforcing contingencies, conflicting contingencies, and dominating contingencies among these three forces. Using a different approach, Brown and Magill (1998) examined corporate-level and business-level contingencies and potential conflicts among them, and proposed how these multiple influential factors were likely to affect the locus of decision-making responsibilities.

To summarize (see Figure 2.1), earlier studies in IT governance focused on governance structures as a dependent variable, and explored the major types of governance modes as well as the determinants for organizational selection of a particular type of IT governance structure. It was revealed that governance structures were related to the nature of IT decisions, and a particular type of governance modes might be more appropriate for certain IT decisions. In addition, governance structures were also

influenced by other organizational factors such as corporate structure, subunit IT knowledge, and economies of scope.

Figure 2.1 Determinants of IT Governance Structures



2.2 The Nature of IT Governance

Recent studies looked at IT governance structures as the independent variable and examined its impacts on organizational performance. Firms implementing effective IT governance structures were noticed to have similar outcomes in terms of performance, indicating that the selection of governance structures alone did not guarantee improved productivity or efficiency. "Researchers are unanimous that a universal best IT governance structure does not exist" (Brown and Grant, 2005, p.703). Weill and Ross (2004) echoed on this statement by revealing that leading firms with different performance focus accomplished success through distinctive patterns of IT-related decision-making. The exploration of the impacts of IT governance structures on firm

performance definitely enhanced our knowledge in IT governance. However, existing literature stops at suggesting that firms could improve performance through implementing effective IT governance, whereas such a statement could not justify a generalizing theory to explain *why* and *how* effective IT governance improves organizational performance, neither does it address the *definition* of effective IT governance, or in other words, what IT governance arrangements are effective. In order to comprehend these issues, it is necessary to unfold the nature of IT governance structures.

IT activities are "directed, controlled, and coordinated through IT governance arrangements" (Sambamurthy and Zmud, 1999, p.262), implying that the major roles of IT governance are communication, control, and coordination. Appropriately architected IT governance engages communication approaches to improve enterprise-wide awareness of IT policies and procedures (Weill and Ross, 2005). At the same time, appropriately architected IT governance controls and coordinates IT-related activities.

2.2.1 Communication Aspects of IT Governance

Necessary information exchanges are premises of dyadic interaction and effective collaboration among people involved in IT decision-making, and through effective communication, shared understandings of appropriate IT behaviors are more likely to be achieved (Andres and Zmud, 2001-2002; Lind and Zmud, 1995). Communication is a transmission process through a channel (Krone, Jablin and Putnam, 1987). According to communication theory, communication processes include four major components: source, message, channel, and receiver (Rogers and Agarwala-Rogers, 1976). Communication constituting these four components is characterized by communication structure and

facets of communication. Communication structure refers to vertical or horizontal communication; facets of communication include frequency, direction, modality, and message content (Connolly, 1977; Krone, Jablin and Putnam, 1987).

There are several ways of assessing communication structures, among which vertical communication and horizontal communication are frequently used. Vertical communication occurs across hierarchical positions, such as between senior managers and line managers, or between line managers and unit supervisors; in comparison, horizontal communication occurs among peers with non-hierarchical relationships (Thompson, 1967). Vertical communication may also be described as centralized communication, implying that the communication is mediated by a supervisor. Similarly, horizontal communication may be represented as decentralized communication, through which employees within a work unit are fully connected (Tushman, 1979). Horizontal communication increases the opportunity for feedback and error correction, and is efficient for generating and synthesizing different perspectives. Vertical communication, on the other hand, is more sensitive to information saturation (Becker and Baloff, 1969).

Communication process can be characterized by four important facets: frequency, direction, modality, and content (Rogers and Agarwala-Rogers, 1976). Communication frequency refers to the amount of communication between organizational members. Organization theorists suggest that a minimal amount of communication is necessary to ensure information exchange, but that too much communication can lead to information overload and dysfunctional consequences (Guetzkow, 1965).

Communication direction is characterized by uni-directionality and bi-directionality (Mohr and Nevin, 1990). Uni-directional communication reflects message

flows from senders to receivers, without allowing feedback to the sender. Bidirectional communication, on the other hand, permits reciprocal communication between the sender and the receiver.

Communication modality refers to the medium of communication, which is the method used to transmit information (Farace, Monge and Russell, 1977). Communication modality can be categorized according to the medium's ability to transmit a variety of cues including feedback, facial cues, language variety, and personalization. Different communication media have different properties, with respect to social cues enabled by the media (Daft and Lengel, 1986). Rich media with enhanced social context cues provide organization members with opportunities of sharing subjective perceptions, and create a sense of shared interpretive meaning (Sproull and Kiesler, 1991; Zack, 1993). Communication modality has also been distinguished in a four-way (2 by 2) classification of commercial/non-commercial and personal/impersonal modes (Moriaty and Spekman, 1984). Under commercial modes, information is controlled by those involved in the communication process, while under noncommercial modes information is controlled by a third party. Personal modes correspond to one-to-one contact, whereas impersonal modes refer to mass communication. Another way to categorize communication modality is based on a formal/informal dichotomy. Formal communication generally flows through written modes or formal meetings, and informal modes are more personalized that can occur outside the organizational premises (Ruekert and Walker, 1987).

Communication content refers to the message that is transmitted. Content has been categorized by the type of information exchanged, and the type of content influence

strategy. Types of information exchange may be implied by either predetermined categories, such as service characteristics and IT use activities, or by the perceptions of the parties in an interaction about the nature of the content (Mohr and Nevin, 1990). In terms of content influence strategy, direct and indirect influences are distinguished (Frazier and Summer, 1984). Direct communication is designed to imply or request specific actions, whereas indirect communication is designed to change beliefs and attitudes about the desirability of intended behaviors. Direct influence is used when prompt or immediate compliance is required, and when the information receiver needs to take an action that is not in his/her best interests (Stern and Heskett, 1969). In comparison, indirect influence is appropriate when the behavior in question is related to common or shared goals, as the required perceptual change relates to altering individual cognitions linking the intended behavior to their ultimate objectives (Cadotte and Stern, 1979).

In conclusion, communication structures and communication facets lead to varying outcomes of communication with regard to the shaping and sharing of individual cognitions. Specifically, both horizontal communication and bi-directional communication allow information receivers to exchange their understandings of the information in a two-way fashion, and communication media with rich social cues also create more opportunities for creating shared interpretations. Another facet of communication, communication frequency, increases the amount of information exchanged but is also subject to increased risk of information overload. Furthermore, the effects of communication are associated with individuals' self-interests as well. Given that direct content influence requires individuals to comply with rules and regulations not

in their best interest. When interacting parties do not share common goals, direct content influence strategies are more appropriate and will bring quicker effects in directing desirable behaviors.

2.2.2 Control Aspects of IT Governance

Embedded in IT governance is the idea of control over information and technology assets. "A control system is an organization's set of procedures for monitoring, directing, evaluating, and compensating its employees" (Anderson and Oliver, 1987). Through effective controlling, IT governance ensures appropriate management of IT risks and opportunities, thus optimizing the support of IT to business goals (Brown and Magill, 1994).

Drawing upon control theory, there are two underlying control strategies: performance evaluation and minimizing the divergence of preferences among organizational members (Eisenhardt, 1985). These two strategies are complementary, and one strategy can replace the other to enforce control in an organization. Control through performance and behavior evaluation (a.k.a. formal controls) emphasizes the measurement of either employee behaviors or the outcome of those behaviors, depending on the information characteristics of a task (Thompson, 1967). Specifically, with greater ability to measure outcomes, organizations should implement outcome control. Otherwise, behavioral control is preferable if sufficient knowledge of the transformation process is available (Ouchi, 1979). Given that individuals all have different self-interests and objectives that may not be in alignment with organizational goals, both outcome and behavioral control mechanisms provide measures and rewards that motivate individuals to align their personal goals and objectives with those of the organization. Note that

either behavior or outcome control becomes unnecessary in the absence of the divergence of preferences, and "relaxation of the divergent preferences assumption is analogous to social control" (Eisenhardt, 1985, p.137). Thus, the focus of formal control mechanisms is to manage the discrepancies of organizational members' self-interests, whereas social controls are applicable to situations where mutual goals and objectives are shared.

Social controls (a.k.a. informal control) use mechanisms based on social and people strategies (Jaworski, 1988). One type of social control is clan control, which cultivates common values and interdependencies of organizational groups via selection and socialization of individuals (Ouchi, 1980). Clan controls can considerably influence behaviors through socialization of norms and values (Orlikowski and Robey, 1991). With a sense of identity with and commitment to the group, clan controls reward and reinforce behaviors in accordance with the group's values. In comparison to formal controls, clan controls are implemented when both transformation process and outcomes are difficult to measure. Furthermore, the focus of clan controls is on creating shared interests by grouping those with common goals and objectives, rather than minimizing divergent interests by implementing performance and behavioral evaluations.

Another type of informal control is self-control, stemming from individual objectives and standards (Manz and Harold, 1986). With self-control, an individual is intrinsically motivated and is "entirely independent of formal organizational control mechanisms or clan norms" (Kirsch, 1996, p.3), and such controls are appropriate for tasks involving autonomy and intellectual creativity. However, self control is irrelevant to this study because it focuses on the self regulation of stakeholders' behaviors. Self controls are effective in situations where individuals set their own objectives and

standards, whereas this study involves the alignment of social objectives underlying stakeholders' interpretations.

A general taxonomy of control classifies different types of control (e.g. formal or informal control) into mechanistic control and organic control. Mechanistic controls rely on formal rules and standardized operating procedures and routines, while organic controls are more flexible and responsive (Chenhall, 2003; Galbraith, 1973). For instance, controls through cultures, norms, or groups are more organic, whereas controls through standardization, rules, and formalization are more mechanistic. Based on manager's discretion within groups and interdependence between groups, organic controls involve higher discretion and power, coordination by mutual adjustment and high interdependence between work groups (Perrow, 1970).

Besides minimizing divergent preferences (as enabled by formal controls) and cultivating shared self-interests (as facilitated by clan controls), control mechanisms are also associated with the ability to manage knowledge flow within a firm, because of the properties of information processing (Nelson and Winter, 1982) and enabled alignment of individual and organizational objectives (Camillus, 1986). "All control mechanisms influence the firm's knowledge management process by affecting how knowledge is acquired, disseminated, interpreted, and used to accomplish organizational goals" (Turner and Makhija, 2006, p.197). Taking a step further, Turner and Makhija (2006) considered the nature of knowledge and analyzed the impacts of organizational controls on the stages of the knowledge management process. Their study is summarized in Table 2.3.

In conclusion, the primary contributions of previous studies in control are the types and functionality of control, and the organizational outcomes of control.

Stakeholders in organizations may share a common high-level goal, whereas their specifications of task processes (e.g. how task should be accomplished, who should be responsible, and how things should be delegated, etc) may be conflicted given individual pursuit of short-term interests (Sherif, Zmud and Browne, 2006). Such goal conflicts are likely to result in a lack of commitment and deteriorate organizational performance (Locke, Latham and Erez, 1988). In the presence of goal conflicts, control mechanisms are proved to be effective to either minimize divergent interests or promote shared objectives (Eisenhardt, 1985). Formal controls align individual interests with organizational objectives via performance and behavioral evaluations. Informal controls, specifically social controls, cultivate shared interests among individuals through socialization. The resulting outcome of control is usually the minimization of divergent preferences.

Furthermore, control mechanisms also impact knowledge management processes and improve organizational learning behaviors. Clan controls are particularly effective in stimulating common interpretations and understandings of both behavior- and outcome-related knowledge, whereas two types of formal controls promote common and shared interpretations of either behavior- or outcome-related knowledge.

2.2.3 Coordination Aspects of IT Governance

In order to have the IT cooperative provide satisfactory services, stakeholders need to work with each other by exchanging explicit ideas about the expected roles and responsibilities of the IT cooperative. Such knowledge transfer is problematic, however, because of knowledge boundary barriers (Carlile, 2002). Stakeholders from different groups have specialized expertise in their knowledge domains, which is embedded in the

contexts of their respective practice (Lave and Wenger, 1991). Knowledge from one domain is therefore hard to understand without experiencing the same practice context. Thus, simply sharing syntax across various groups is not sufficient due to the tacit nature of knowledge embedded in practices (Polanyi, 1966).

Knowledge boundaries also challenge the learning of explicit knowledge across stakeholder groups. Without the necessary knowledge in a specialized area, one stakeholder group may experience low degrees of absorptive capacity, and will find it difficult to integrate new knowledge obtained from another group into the existing knowledge (Cohen and Levinthal, 1990). Thus, a shared interpretation of expected IT behaviors will not simply result from the effort of exchanging stakeholders' perceptions. Rather, it is dependent on how well stakeholder groups can share mental structures across knowledge boundaries through effective coordination.

Coordination occurs through structural and non-structural devices to provide for lateral functioning and interaction across units (Brown, 1999). Coordination is defined as "the direction of individuals' efforts toward achieving common and explicitly recognized goals and the integration or linking together of different parts of an organization to accomplish a collective set of tasks (Kraut and Streeter, 1995, p.69). In addition to achieving shared values and tasks, coordination also solves the problems of knowledge integration and improves convergent expectations (Kogut and Zander, 1996). Coordination occurs at the organizational level (Meyer, 1972) or within work units (Parson, 1962), and coordination may be understood by the degrees of structural integration (Weber, 1947) or processes of collaboration (March and Simon, 1958).

Table 2.3 The Impacts of Organizational Controls on Knowledge Management Process
(Source: Turner and Makhija, 2006, p.205)

	Knowledge Management Process							
	Knowledge Acquisition		Knowledge Transfer		Knowledge Interpretation		Knowledge Application	
Control Type	Behavior-Related Knowledge	Outcome-Related Knowledge	Behavior-Related Knowledge	Outcome-Related Knowledge	Behavior-Related Knowledge	Outcome-Related Knowledge	Behavior-Related Knowledge	Outcome-Related Knowledge
Outcome	Significant	Negligible	Negligible	Significant	Diverse Interpretations	Common Interpretations	Originality	
Behavior	Negligible	Negligible	Low	Negligible	Unshared Interpretations	Unshared Interpretations	Presence	
Clan	Moderate	Moderate	Significant	Significant	Common Interpretations	Common Interpretations	Adaptability	

Table 2.4 Mintzberg's (1979) Coordination Taxonomy

	Coordination Functionalities
Mutual Adjustment	Achieves coordination by the simple process of informal communication.
Direct Supervision	Achieves coordination by having one person issue orders or instructions to several others whose work interrelates.
Standardization of Plan	Achieves coordination through the establishment of schedules by which the activities in organizations are performed.
Standardization of Work Process	Achieves coordination by specifying the work processes of people carrying out interrelated tasks.
Standardization of Output	Achieves coordination by specifying the results of the work.
Standardization of Skills and Knowledge	Achieves coordination of work by virtue of the related training the workers have received.
Standardization of Norms	Achieves coordination by controlling the norms infusing the tasks, usually for the entire organization, so that everyone functions according to the same set of beliefs.

March and Simon (1958) classified the processes through which organizations can be coordinated by programming and feedback. Coordination by programming is an *impersonal* coordination mode that uses pre-established plans, schedules, formalized rules, and policies and procedures (Adler, 1995; Van De Ven and Delbecq, 1976). From a knowledge perspective, impersonal coordination mechanisms are codified and require minimal verbal communication among organizational members (Galbraith, 1970). In comparison, coordination by feedback is conceptualized as mutual adjustments based upon new information (Thompson, 1967), which are developed through a *personal* mode (Adler, 1995; Van De Ven and Delbecq, 1976). Through personal coordination, individuals engage in mutual task adjustments via vertical or horizontal channels of communication (Hall, 1972), and mutual adjustments are vested in group members via scheduled or unscheduled meetings (Hage, Aiken and Marrett, 1971).

A third taxonomy of coordination is a set of coordination mechanisms described by Mintzberg (1979): mutual adjustment, direct supervision and five kinds of standardization of: plan, work processes, outputs, skills, and norms (Table 2.4). Using Van De Ven et al's typology, these seven mechanisms can also be concisely categorized into impersonal and personal coordination.

To integrate various taxonomies of coordination, basic coordination mechanisms that can be classified under personal and impersonal coordination are listed in Table 2.5 (Willem and Scarbrough, 2002). Mechanisms based on impersonal or personal coordination differ in their possibilities of sharing information and explicit knowledge (Galbraith, 1973). Unlike personal coordination that involves group interactions, impersonal coordination depends on pre-established plans, schedules, formalized rules, and policies and procedures (Van De Ven and Delbecq, 1976), and require minimal verbal communication among organizational members (Galbraith, 1970). With impersonal coordination mechanism, stakeholders are not explicitly encouraged to exchange ideas and cognitions through a discourse. Rather, they are given pre-specified rules and policies in written forms regarding what behaviors are appropriate. Personal coordination, on the other hand, involves personal ties developed based on trust, which stimulate the development of shared understandings.

Table 2.5 The Coordination Mechanisms

	Coordination Mechanisms
Impersonal (programmed)	Planning, procedures, manuals, standards, rules, goals, routines, policies, schedules, mental models, and hierarchical decision-making, etc.
Personal (feedback)	Teams (incl. Projects), mutual adjustment, integration roles, liaisons, direct supervision, and personal networking, etc.

In the IS literature, coordination through a focal group (or personal mechanisms) has been an important mechanism to create lateral organizational capabilities between an IT unit and one or more business units. Studies showed that the use of an IS steering committee with business representatives led to favorable outcomes such as coordination and integration of IT activities (Gupta and Raghunathan, 1989), and the use of interpersonal groups increased coordination across units especially when IT responsibilities were decentralized (Blanton, Watson and Moody, 1992).

To summarize, drawing upon the existing literature of coordination, there are two major types of coordination that are widely accepted in the literature: impersonal coordination and personal coordination. In terms of creating common interpretations, personal coordination mechanisms (e.g. groups) have been found to be effective compared to impersonal coordination (e.g. policies and rules), because personal mechanisms encourage stakeholders to exchange ideas and cognitions through group interactions. Examples of personal coordination used in IT governance structures include steering committees and councils, etc.

2.3 IT Governance in an Inter-Organizational Context

In addition to the lack of explanation regarding why and how effective IT governance improves organizational performance in the intra-organizational context, the study of IT governance in an inter-organizational context is also limited. The governance of IT-related behaviors concerns not only the activities within an organization but also, where shared services become necessary for multiple organizations to promote efficiency and generate business value, across organizations as well. Through shared services, existing business functions are concentrated into a new business unit, which has a

separate governance structure and is a semi-autonomous, to provide pre-defined services (Bergeron, 2003). This shared service provider is different from a centralized governance structure, because in addition to offer a high degree of control and economies of scale, a shared service provider also allows customers to have a degree of ownership over the service delivery. It is also different from a decentralized governance structure, because although focusing on customers, the service provider is restricted by the resources and capabilities of the organization in which it is situated (Janssen and Joha, 2006). Thus, the governance structure implemented in a shared service provider captures the benefits of both centralization and decentralization, which generates economies of scale and scope by centralizing activities and at the same time, fulfills various needs of multiple customers.

Most prior studies on IT governance have focused on intra-organizational contexts. Nevertheless, studies of inter-organizational IT governance are equally, if not more, important. Inter-organizational shared service platforms typical have an objective of promoting efficiency, integration and cooperation among a set of firms. However, the organizational entities involved in an inter-organizational IT shared service platform are likely to be characterized by incompatible objectives and cultures, with each emphasizing their own perceived benefit streams, resulting in opportunistic behavior that damages other actors' benefits (Moss-Kanter, 1994). Furthermore, tensions also tend to arise when one party attempts to obtain dominating control (Cavaye, 1995; Webster, 1993).

Therefore, inter-organizational systems, such as shared service providers, are associated with many challenges. These challenges can be addressed through formal governance structures that reduce equivocality and the potential for misinterpretations

and misunderstandings (Kumar and Van Dissel, 1996). However, as mentioned earlier, IT governance in the inter-organizational context has not received much prior research attention.

2.4 Institutionalization of Collective Cognitions via Organizing Vision

The IT innovation literature suggests that early use of IT is based on rational organizational choices, while later adoption is institutionalized and influenced by social practices (Tolbert and Zucker, 1983). Swanson and Ramiller (1997) argued, however, that institutional processes were engaged from the beginning of an organization's IT use and played a crucial role in creating and shaping collective cognitions of the use of IT both within and across firms. Such institutional processes are enacted via an organizing vision, which is a focal community idea for the application of information technology in organizations and is a cognitive product of community members' efforts of making sense of what IT products should be implemented and how IT should be used in organizations (Weick, 1995). The concept of organizing vision initiated by Swanson and Ramiller (1997) was developed in a multi-organizational context. The situating community of an organizing vision constitutes social actors across organizations who share common interests in a particular IT activity. The organizing vision is produced and sustained through a discourse of this community, which is characterized by both agreement and disagreement. The discourse is negotiated within the community, and interested parties struggle with the public interpretations of the organizing vision. Community members have diverse interests in the resulting interpretations and they compete for interpretation dominance over the content of the organizing vision (Meindl, Stubbart and Porac, 1994). This competition process is a battle of power and coalition, as social actors subdue to the

powerful ones and those with shared interests may ally to achieve greater political and economic voice (Powell and Brantely, 1992).

An organizing vision is relevant not only to the adoption and diffusion of IT applications but also to the provision and use of IT services. The perceptions of stakeholders who access an IT shared service platform are subject to institutional processes regarding what services should be provided and how they should be provided. Stakeholders play an active role in this institutional process by understanding each other's expectations of desirable IT behaviors to be engaged by the IT cooperative and generating a community idea (i.e. an organizing vision) of the services to be provided by that organization. Such an organizing vision evolves and changes over time through the interactions and negotiations of stakeholders.

According to Swanson and Ramiller (1997), organizing visions come into being to provide necessary interpretations relative to a broad social context and give institutional coherence to IT activities (Milliken, 1990). In doing so, an organizing vision invites discussion that may lead to shared cognition, thus facilitating the process of interpretation. The organizing vision imposes institutional coherence regarding desirable IT behaviors across different stakeholders. It draws attention to the organizational expectations of desirable IT behaviors to be engaged by the IT cooperative, and invites discussion that leads to shared interpretations. Simultaneously, an organizing vision also links IT to business aspects that are of organizational interests, to legitimate IT activities in business concerns, and encourages the material realization of appropriate behaviors in a broad business environment, which, through a structuration process, reinforces the shared interpretations held by stakeholders (Giddens, 1979). The legitimation role of

organizing visions is further enabled by the reputation and identities of those who promulgate it and who undertake it. Lastly, an organizing vision attracts resources and facilitates exchange to support the material realization of activities related to IT, thus activating and shaping market forces.

Nevertheless, in reality, stakeholders are not passive receivers of an organizing vision. Rather, stakeholders make sense of desirable IT postures. IT stakeholder has individual interpretations or perceptions of IT-related behaviors as expected by client entities. Through discourse, IT stakeholders exchange cognitive structures with client entities to conceptualize a sensible image (i.e. an organizing vision). The stakeholders' interactions are characterized by both disagreement and agreement (Swanson and Ramiller, 1997). Thus, the understanding of an organizing vision by stakeholders involved with the IT cooperative may suffer a lack of coherence. To achieve social agreement underlying an organizing vision, the discourse is negotiated across the organization, and powerful parties play a major role in shaping the organizing vision through a dominant logic (Prahalad and Bettis, 1986). Over time, an organizing vision is interpretively flexible, as stakeholders remain flexible during their engagement in the constitution and development of the organizing vision; and the organizing vision will undergo refinement and capacity growth (Orlikowski, 1992; Pinch and Bijker, 1984).

In a more recent study, Ramiller and Swanson (2003) identified the reaction of social actors to an organizing vision. The response was characterized with four dimensions, which speak to the meaningfulness of an organizing vision in terms of its interpretability, plausibility, importance, and discontinuity. Both interpretability and plausibility deal with the quality of the community discourse that produces and maintains

the organizing vision. *Interpretability* concerns the intelligibility and informativeness of the discourse, and it revolves around such aspects as clarity, consistency, richness, and balance. *Plausibility* on the other hand, addresses distortions in the discourse, focusing on the misunderstandings, exaggerations, and misplaced claims of the organizing vision. *Importance* is further reflected by business benefit, practical acceptance, and market interest, which imply the quality and value of the organizing vision and to what extent a particular IT activity is worthy of the community's interest. Lastly, *discontinuity* concerns with how great a conceptual departure from individuals' perceptions the organizing vision poses (conceptual discontinuity) and how much difficulty is entailed in implementing the organizing vision (structural discontinuity).

Therefore, individuals within an organization formulate their perceptions of expected IT behaviors through an institutionalization process, during which individual interpretation is created and shaped by an organizing vision. To what extent the organizing vision is meaningful, along the dimensions of interpretability, plausibility, importance, and discontinuity, impacts social actors' responses. Collective cognitions are easier to produce when an organizing vision is more meaningful.

2.5 Linkage between Cognitions and Behaviors

Cognitions about IT use have been shown to have a significant impact on subsequent behaviors. Because of the differences in their experiences and the fundamental cognitive processes, individuals develop different beliefs and expectations about IT (Lewis, Agarwal and Sambamurthy, 2003). These beliefs and expectations are important in explaining the subsequent IT-related behaviors. As supported by the Technology Acceptance Model (TAM), beliefs concerning the ease and usefulness of a

technology affect the outcomes associated with technology use and usage intentions (Davis, Bagozzi and Warshaw, 1989).

The linkage between individual cognitions and subsequent behaviors find its root in the Theory of Reasoned Action (TRA), which suggested that individuals' attitude toward a behavior, along with their perception of how others think they should behave (subjective norms), influence their intentions to exhibit behaviors (Ajzen and Fishbein, 1980). Both attitude and subjective norms derive from an individual's cognitive structures that direct individual behaviors in a voluntary environment. In addition to attitude and subjective norms, perceived behavioral control has been identified as another factor influencing individual behaviors (Ajzen and Madden, 1986). Perceived behavioral control is also shaped by cognitive beliefs, putting more weight on the impacts of cognition on subsequent behaviors.

As indicated in the literature summarized above, individual cognition is an important determinant of subsequent behaviors. When organizational members share common interpretations of expected IT activities, it is more likely that individuals will engage in consistent behaviors that make sense to each one of them. The extent to which organizational members agree with, or approve of each other's behaviors therefore becomes a function of shared interpretations**.**

2.6 Literature Review Conclusion

Chapter II first identifies several gaps in the existing literature regarding how IT governance achieves appropriate IT-related behaviors and the application of IT governance in inter-organizational contexts. The chapter then provides a general review and integration of the prior literature on IT governance structures, communication,

control, and coordination aspects of IT governance, and organizing vision. One of the primary focuses of this chapter is on summarizing the communication, control, and coordination roles played by IT governance in minimizing divergent interests and facilitating shared interpretations across knowledge domains. As discussed earlier, communication structures (vertical or horizontal) and communication processes (frequency, direction, modality, and content) embedded in IT governance have different effects on the production and exchange of individual cognitions. Types of control are associated with the alignment of individual objectives or the cultivation of shared interests, and controls also improve organizational learning through their impacts on knowledge management processes. Lastly, combinations of formal/informal and impersonal/personal coordination mechanisms also result in different impacts in terms of encouraging stakeholders to exchange ideas and cognitions.

In addition to IT governance, organizing vision is another focus of Chapter II. An organizing vision promotes common understandings via involving stakeholders to exchange and negotiate individual cognitions. Furthermore, collective interpretations are more likely to generate when an organizing vision is more meaningful. Through appropriately architected IT governance and a meaningful organizing vision, divergent interests are minimized and shared understandings are shaped, based on which stakeholders engage in desirable IT-related behaviors.

Chapter III: Research Model & Propositions

Organizations with effective IT governance have been found to be associated with more desirable IT behaviors and improved business performance (Weill, 2004). How IT governance encourages organizational members to enact desirable IT behaviors, however, is an under-explored topic. In addition, empirical examinations of IT governance in an inter-organizational context are lacking. To address these limitations of the existing literature, perspectives from the collective mind theory and the knowledge-based view will be considered, and the literature of coordination, control, and communication will be integrated with the literature of IT governance. This chapter starts with a description of the IT governance in an inter-organizational context, followed by an analysis of possible reasons for a misalignment of stakeholders' expectations of desirable IT behaviors. Research propositions are then proposed to suggest how IT governance and organizing vision mitigate this misalignment, and consequently result in improved performance of an IT cooperative providing an shared IT service platform.

3.1 Governance Structure of the IT Cooperative

In the focal context, the purpose of the IT cooperative is to provide shared services to entities across organizational boundaries. In order for stakeholders to have consistent understandings of the roles and responsibilities of the IT cooperative, an alignment of their expectations needs to be achieved both within client and IT stakeholder groups, as well as between client and IT stakeholder groups. Relative to the IT cooperative, there are two spheres of activities in which stakeholders interact with each other and stakeholders' expectations are influenced. One is the *IT governance council*, through which clients of the IT cooperative provide input to and interact with the

professionals in the IT cooperative. Although coming from different organizations, IT stakeholders and client stakeholders work together in the IT governance council as peers rather than supervisors and subordinates, and there are no substantially hierarchical differences among them. Thus, the primary alignment issue relative to stakeholders' expectations in this IT governance council concerns the alignment across client stakeholders and IT stakeholders.

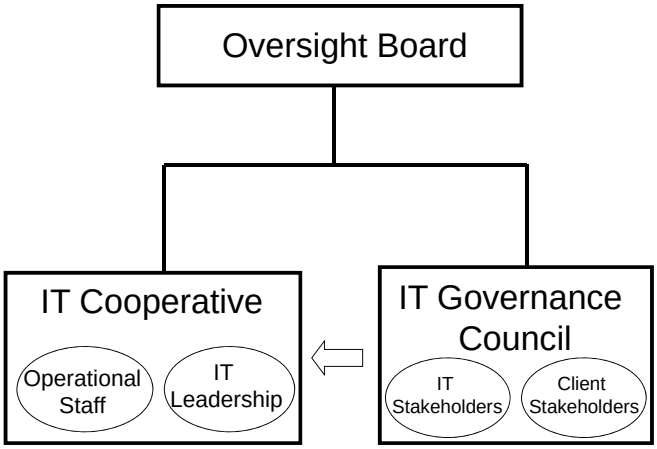
The other sphere of activities is the *IT cooperative*. The IT stakeholders in the IT cooperative involve the IT leadership and the IT operational staff, with the IT operational staff reporting directly to the IT leadership and indirectly (through the IT leadership) to the IT governance council. Specifically, the IT leadership interacts with client stakeholders through the IT governance council to define the roles and responsibilities of the IT cooperative, and IT professionals operating the IT cooperative execute those roles and responsibilities. At the same time, the operational IT stakeholders also have the liberty to suggest services not required by the IT governance council but thought to be beneficial based on their professional experiences. As the actions taken by the IT cooperative are determined by the agreement of the IT leadership and IT operational personnel, the alignment issue within the IT cooperative concerns the alignment amongst IT stakeholders.

In addition to its IT governance council and operational staff, the IT cooperative also involves an oversight board that supervises its performance. This oversight board has authority over the IT cooperative, but not over client members who participate in the IT governance council and who have to follow the direction of the top management team from their own organizations. Thus, the oversight board of the IT cooperative serves as a

supra-entity, with a primary purpose of resolving any agency problems among stakeholders involved with the IT cooperative.

Therefore, there are three major bodies relative to the IT cooperative: an oversight board, an IT governance council, and an operational unit (see Figure 3.1). The oversight board is a supra-entity, while the operational unit in fact works under the direction of the IT governance council. Client and IT stakeholders in the IT governance council act as peers who work collaboratively to define the roles and responsibilities of the IT cooperative. Because of different relationships amongst stakeholder groups, the nature of IT governance may be different across these three major bodies.

Figure 3.1 Governance Structure



3.2 Interpretation Incoherence

The IT cooperative provides shared services to client entities. At the same time, client entities also have access to IT groups in their own organizations. Therefore, the IT cooperative takes responsibilities for some but not all of clients' IT activities. In order that consistent behaviors are engaged enterprise wide, stakeholders develop shared

understandings (or, a collective mind) of one another through heedful interrelationships (Weick and Roberts, 1993) that facilitate the performance of the IT cooperative.

In order to satisfy clients, stakeholders in an IT cooperative are expected to engage in appropriate IT behaviors, determined via negotiations between IT stakeholders and clients. Clients on the one hand, define those IT behaviors desired from the IT cooperative based on their expectations. IT stakeholders, on the other hand, also have their own understandings of what is expected from them (subjective norms). Their interpretations may be different from the expectations of clients. In order for the IT cooperative to engage in appropriate IT behaviors that are approved by clients and IT stakeholders, a shared understanding, or a collective mind, about the roles and responsibilities of the IT cooperative is necessary. Collective mind is described as an individual's "disposition to heed". The performance of the IT cooperative will be improved if each individual stakeholder has the desire and means to be heedful to the goals of the IT cooperative (Crowston and Kammerer, 1998). However, various factors may hinder the building and maintaining of these "heedful" dispositions and capacities, and the incoherence between IT stakeholders' understandings of desirable IT behaviors and clients' expectations of desirable IT behaviors results in a misalignment of stakeholders' expectations of desirable IT behaviors to be engaged by stakeholders in the IT cooperative. To better understand the antecedents of such a misalignment, divergent interests and the tacit nature of knowledge provide helpful explanations.

3.2.1 Divergent Interests

In the context of an IT cooperative, there are multiple principals (business entities) but a single agent (the IT cooperative). The oversight board of the IT

cooperative makes efforts to coordinate stakeholders' interactions and to foster a level of goal alignment between principals and the agent. However, the IT cooperative usually pays more attention to inter-organizational (i.e. enterprise) IT concerns, whereas clients primarily focus on issues at the entity level, the IT cooperative and client entities can arrive at distinctive operating objectives and interests. Thus, client entities and the IT cooperative are each motivated to engage in activities that will maximize their own utility. Because of such a divergence of interests, stakeholders have inconsistent expectations of desirable IT behaviors that should be carried out in the IT cooperative.

3.2.2 Bounded Rationality

Although client entities affected by the IT cooperative have divergent objectives, they often share mutual value. By leveraging the services provided by a central IT cooperative, business entities garner economies of scale. The centrally-coordinated IT service provider will also maximize its benefits by assuming responsibility for managing the task interdependencies around IT, for which the business entities would otherwise be responsible. Under such circumstances, coordination and scale benefits are more attractive than individual benefits that each stakeholder group may be able to realize independently (Davis, Schoorman and Donaldson, 1997). Given that services provided by the IT cooperative simultaneously impact more than one business group, individual stakeholders' utility functions will be maximized through collectivistic behavior.

Nevertheless, social actors are constrained by bounded rationality. Stakeholders engage in IT activities within time constraints and cognitive limitations that prevent them from understanding all the aspects of expected roles and responsibilities (Simon, 1955). From a knowledge-based view, bounded rationality results from absorptive capacity

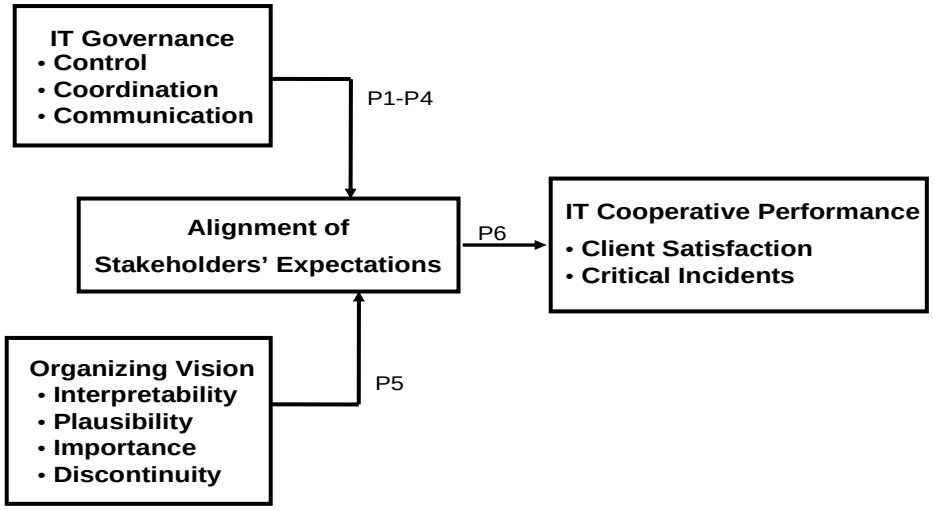
(Cohen and Levinthal, 1990) and the tacit nature of knowledge (Grant, 1996). Looking from the perspectives of IT stakeholders, clients express their expectations of the IT cooperative in a language that is shaped by their knowledge domain. Because of absorptive capacity, IT stakeholders may have difficulties in absorbing knowledge from the clients' domain, which prevents them from sharing the same understandings with clients to the fullest extent. Because of the tacit nature of knowledge, some expectations from clients cannot be explicitly articulated. Again, situated across knowledge domains, IT stakeholders will not be able to understand clients, especially if clients' conceptions are not expressed in explicit words. The same is true if we look from the perspectives of clients. In other words, bounded in specialized areas, IT stakeholders may not have the ability to fully comprehend the rationale of client entities, and vice versa, which consequently damages the mutual understandings across stakeholder groups.

3.3 Research Model

Because of the problems of divergent interests and bounded rationality, stakeholders from the IT cooperative and client entities may have different expectations of appropriate IT behaviors, based on which IT stakeholders may not engage in appropriate IT-related activities expected by clients. When IT professional's behaviors dissatisfy or are disapproved by client entities, the operation of the IT cooperative becomes unsuccessful. Therefore, a misalignment of stakeholders' expectations of appropriate IT behaviors tends to lead to poorer performance of the IT cooperative. To explore how organizations can improve the alignment of stakeholders' expectations of appropriate IT behaviors, IT governance and organizing vision are considered.

As indicated in Figure 3.2, appropriately architected IT governance controls, coordinates, and communicates individual interests and interpretations across inter-organizational stakeholder groups, promoting common understandings. An organizing vision also provides a base across stakeholders to be used to shape shared cognitions through a community idea. Furthermore, with an alignment of stakeholders' expectations regarding the roles and responsibilities of the IT cooperative, the performance of the IT cooperative will be consequently improved. Detailed explanations of these arguments are provided in the following sections.

Figure 3.2 Research Model



3.4 Direct Impacts of IT Governance

IT governance is defined as "the decision rights and accountability framework to encourage desirable behavior in the use of IT" (Weill and Ross, 2004, p.8). Governance of IT occurs through a number of mechanisms, such as structures, processes, and procedures, with both a behavioral side and a normative side. On the behavioral side, IT governance defines the formal and informal relationship by assigning decision rights to individuals. On the normative side, IT governance provides rules and procedures to ensure the achievement of business objectives. This study focuses the behavioral side of IT governance, and explores the nature of IT governance that underlies the assignment of decision accountabilities to individual stakeholders. Particularly, the focus of this study is on the production and modification of stakeholders' cognitive structures regarding their expectations of appropriate IT behaviors as enabled by IT governance. Reasons for discrepancies of stakeholders' expectations will then be explored, taking into account the nature of IT governance.

Client entities establish requirements of common services to be provided, which translate into expectations of IT behaviors to be engaged in the IT cooperative. At the same time, IT stakeholders in the IT cooperative evolve their own expectations of appropriate IT behaviors. The expectations held by client entities and IT stakeholders are often misaligned due to the problems of divergent interests and bounded rationality. Under such circumstances, the oversight board of the IT cooperative serves as a supra-entity to resolve agency problems.

An *alignment* between client entities' expectations and IT stakeholders' expectations of appropriate IT behavior is necessary for an IT cooperative's success,

because when discrepancies of expectations exist, IT professionals may not engage in IT-related activities desired or approved by clients. An alignment of stakeholders' expectations may be facilitated through IT governance, as IT governance engage all stakeholder groups in interactions related to IT policies, decisions and activities. Through appropriately architected IT governance, IT activities are controlled and stakeholders across organizational boundaries communicate and coordinate individual cognitions. Involved in a decision-making group, various stakeholders exchange their conceptions of IT-related issues informally or formally. For example, through meetings and documents, desirable IT behaviors are communicated and stakeholders share opportunities to exchange individual understandings. This way, decision-making structures help stakeholders to better align their divergent interests and values. Therefore, the roles of IT governance structures is three-fold: a) IT governance imposes control over activities related to information and technology assets, to ensure the alignment between IT and business strategies; b) IT governance facilitates coordination between the IT cooperative and business entities, and directs individual efforts toward achieving collective objectives; c) IT governance enables information exchange of individual cognitions across stakeholder groups by engaging appropriate people in making the right decisions. Underlying these three roles is the effects of IT governance on stakeholders' cognitive structures that determine behavioral actions. In other words, the nature of IT governance resides in its control, coordination, and communication of the sense-making process across knowledge domains and across groups with divergent interests. In the following sections, the nature of IT governance will be discussed in detail.

3.4.1 The Role of Control

IT governance imposes control over information and technology assets and any activities related to IT, and the control aspects of IT governance can minimize divergent interests existing among any agency relationships (Jensen and Meckling, 1976). By separating and diffusing decision functions, IT governance limits the power of individual agents to expropriate resources for their own interests (Fama and Jensen, 1983). In the context of an IT cooperative, appropriately architected IT governance facilitates the separation of the management and control of important IT decisions and regulates stakeholder behaviors, thus mitigating divergent interests underlying stakeholders' shared understandings of desirable IT behaviors.

Both formal controls (i.e. outcome control and behavioral control) and informal controls (i.e. clan control and self control) are typically applied in appropriately architected IT governance, and these controls influence how information is shared and how knowledge is disseminated via mandating specific relationships between stakeholders (Turner and Makhija, 2006). In addition, these controls align both intrinsic and extrinsic interests of stakeholders and create incentives and disincentives for organizational members to behave in a manner consistent with enterprise goals and objectives.

As discussed earlier, there are two spheres of activities in which IT governance processes influence stakeholders' expectations of the roles and responsibilities of the IT cooperative: the IT governance council and the IT cooperative. It is expected that the relative influence of the controls will vary across these two contexts. Relative to the IT cooperative, the IT governance council is the controller while the IT cooperative is the controllee. As indicated by previous literature, outcome controls focus on the outputs

desired by the organization, and are more appropriate when behavior-related knowledge is limited and difficult to specify (Eisenhardt, 1989). In comparison, behavioral controls specify the appropriate behaviors employees must engage, and are preferable when the organization can reduce job domains into clearly specialized tasks or when outcomes are difficult to measure (Eisenhardt, 1985). Following Turner and Makhija (2006), stakeholder groups have tacit and diverse behavioral-related knowledge, because of their differences in background and specialized knowledge. Expected IT behaviors thus become difficult to specify and are ambiguous to be shared by stakeholders across knowledge domains, and information about the linkage between the actions individuals take and the outcomes they achieve is incomplete (Ouchi and Maguire, 1975). Under such circumstances, behavioral controls are inappropriate because the organization lacks a clear explanation of expected behaviors and a consistent understanding about which behaviors will lead to positive outcomes. In addition, behavioral controls rely on existing organizational knowledge, and are associated with multiple unshared interpretations of both behavioral- and outcome-related knowledge (Turner and Makhija, 2006). Without a common interpretation, stakeholders are unaware of what IT-related behaviors are expected by others.

As IT stakeholders (i.e. IT leadership and IT operational staff) are deeply engaged in IT-related activities, their perspectives are expected to be primarily shaped by knowledge gained through their interactions regarding these activities (Fishbein and Ajzen, 1975). When outcomes are made explicit to IT stakeholders, these outcomes are likely to frame individuals' perceptions of the expected IT cooperative roles and responsibilities (Turner and Makhija, 2006), particularly if these outcomes are associated

with reward and evaluation systems. Clearly stated outcomes should also motivate IT stakeholders to obtain a better understanding of expected IT behaviors for individual appraisal (Levinthal, 1988). Thus, outcome controls are expected to be more effective than behavior controls in achieving shared stakeholders' expectations, and will be more appropriate to be used by the IT governance council to enable control over the IT cooperative.

P1a: With regard to the control of the IT cooperative, outcome control will induce more alignment of stakeholders' expectations of desirable IT behaviors than behavior control.

In addition to formal controls, clan control could also be implemented to achieve an alignment of stakeholders' expectations of desirable IT behaviors. However, clan control will directly influence the IT governance council, not the IT cooperative. In the IT governance council, client stakeholders interact with IT stakeholders as peers to establish operation directions for the IT cooperative. Given that there are no hierarchical structure constraints on the interaction between IT stakeholders and client stakeholders, their perspectives regarding the roles and responsibilities of the IT cooperative are shaped by social mechanisms (i.e. clan controls) rather than by formal controls (i.e. outcome- and behavior-control). In other words, the extent to which stakeholders' expectations are influenced in the IT governance council greatly depends on how well individuals' values and beliefs are shared across stakeholder groups, rather than outcome or behavior specifications of IT-related activities.

Clan control is associated with more common interpretations of both behavior- and outcome-related knowledge (Ouchi, 1979). Through such controls, IT stakeholders

work together with client stakeholders to share group values, norms, and problem-solving approaches (Kirsch, 1996). For example, a business or IT manager from a client entity could work with one or more IT professionals from the IT cooperative to identify service requirements and to clarify the goals of client entities. Through this interaction, trust and commitment are established among clients and IT professionals, and common values, beliefs, and understandings are cultivated among stakeholders.

Generally speaking, clan control is more difficult to implement in an inter-organizational context, because socialization and shared objectives are harder to achieve between entities across organizational boundaries (Choudhury and Sabherwal, 2003). Furthermore, in short-run, values and norms are difficult to develop, and deep-level cognitions take time to be shaped or changed (Prahalad and Bettis, 1986), creating barriers for cultivating clans and shared interests. However, within the IT governance council of the IT cooperative, although stakeholders of client entities have different objectives with regard to the values of their own organizations, they share a common value at a higher level, which is to leverage the shared services provided by the IT cooperative to realize individual benefits. In order to exert control over each other to accomplish this overall objective, client stakeholders work as a clan in which there are no hierarchical differences in their managerial positions. Client stakeholders within this group are peers, who are trying to understand the needs of others so as to propose services based on mutual interests that will eventually benefit each individual entity.

Once implemented, clan control will be more effective in the long-run than behavioral control or outcome control, because clan control stimulates shared experiences, rituals promoting shared beliefs, and common interests based on inter-

personal trust among stakeholders within a clan (Eisenhardt, 1985). Given enough time to develop, the consequences of clan control involve the promulgation of common beliefs and the identification and reinforcement of acceptable behaviors (Kirsch, 1996). Therefore, within the IT governance council of the IT cooperative, the alignment of stakeholders' expectations through clan control will be more effective than that will be enabled by outcome or behavioral control.

> P1b: In the IT governance council of the IT cooperative, clan control will induce more alignment of stakeholders' expectations of desirable IT behaviors than either outcome control or behavioral control.

3.4.2 The Role of Coordination

Stakeholders from different knowledge domains often find it difficult to exchange their expectations of the roles and responsibilities of the IT cooperative, given the challenges associated with the tacit nature of knowledge (Polanyi, 1966) and absorptive capacity (Cohen and Levinthal, 1990). Based upon the knowledge-based view of the firm, stakeholder group across organizational boundaries overcome knowledge boundaries through coordination (Grant, 1996). One approach to achieve coordination is the use of boundary objects that are shareable across different contexts (Star, 1989). Another approach is the implementation of coordination structures, such as IT governance structures, to integrate specialized knowledge (Grant, 1996). IT governance facilitates the processes of *coordination*, through which stakeholders work together to systematically analyze relevant contexts, develop knowledge of another domain, and transform cognitive structures. By enforcing the accountabilities of appropriate people, knowledge embedded in practices is integrated via interpersonal coordination modes, so

that knowledge necessary for shared interpretations of desirable IT behaviors is ensured to be exchanged among knowledge holders. Through this process, IT stakeholders overcome cognitive constraints to obtain improved understanding of expected IT behaviors as defined by client entities. To this end, coordination creates the possibilities for stakeholder groups to understand specific community contexts at a deep level, thus enhancing a mutual understanding of expected behaviors of the IT cooperative. An alignment of stakeholders' expectations of appropriate IT behaviors, therefore, will be achieved.

In comparison to control mechanisms that correspond to the vertical structures of organizations, coordination emphasizes on horizontal mechanisms to remove the barriers of inter-organizational collaboration and to provide a lateral way of functioning (Brown, 1999). There are two major types of coordination, namely impersonal and personal coordination (Van De Ven and Delbecq, 1976). Impersonal coordination is enabled through rules and policies that allow for no two-way interactions among organizational members. Personal coordination, on the other hand, is implemented via integrator roles and interactive groups. Interactive groups include steering committees and standing committees that facilitate coordination between IT and non-IT stakeholders (Brown, 1999); integrator roles include cross-unit integrators and corporate IS oversight roles (Applegate, McFarlan and McKenney, 1996; Iacono, Subramani and Henderson, 1995). Through IT governance, interactions between stakeholders are structured through groups or integrator roles, so as to coordinate with business entities and to share their understandings of desirable IT behaviors expected by client entities. The characteristics of each type of coordination are summarized in Table 3.1.

Table 3.1 Coordination Mechanisms

Coordination Type	Characteristics
Impersonal	• Use pre-established rules and policies in the form of codified knowledge (Van De Ven and Delbecq, 1976). • Require minimal verbal communication (Galbraith, 1970). • Discourage the exchange of ideas and cognitions through a discourse. • Inappropriate for coordination activities requiring more flexibility in knowledge absorption.
Personal	• Encourage interpersonal interactions. • Are developed among people who trust each other (Newell and Swan, 2000). • Encourage shared understandings and common interpretations (Burt, 1992). • More appropriate for intense sharing of complex knowledge.

Similar to the effects of control, the effects of coordination also tend to be different in the two spheres of IT activities because of the nature of the interactions among these two stakeholder groups. In the IT governance council of the IT cooperative, IT and client stakeholders coming from different knowledge domains interact with each other and exchange individual perceptions. The lack of a mutual knowledge base creates potential barriers to mutual understandings and acceptance between IT and client stakeholders (Krauss and Fussell, 1990). Considering the characteristics of each coordination mechanism, in order for stakeholders across knowledge domains to have mutual understandings of the roles and responsibilities of the IT cooperative, they need to have flexibility in absorptive capacity in order to intensively share their cognitions, which may not always be explicit and tend to be complex. Under such circumstances, personal coordination (such as teams and integration roles, etc) is expected to be more effective compared to impersonal coordination (such as manuals and rules, etc) with regard to aligning client and IT stakeholders' expectations of desirable IT behaviors.

Compared to impersonal coordination, personal ties developed in personal coordination stimulate the development of shared understandings, making it easier for people being connected to exchange cognitive structures (Burt, 1992). Personal relationships developed through interpersonal networks tend to motivate stakeholders across various groups to share their cognitive structures voluntarily, and interactions based on trust allow the sharing of complex and large amounts of knowledge (Granovetter, 1973). In comparison, the ability of impersonal coordination in terms of enabling shared understandings is relatively low in the IT governance council, because impersonal coordination does not directly facilitate cognitive sharing across knowledge domains (Willem and Scarbrough, 2002). Given the tacit nature of knowledge, IT and client stakeholders' understandings of the roles and responsibilities of an IT cooperative are embedded in their own knowledge domains. Personal coordination creates the linkage of different knowledge domains through personal interactions, whereas such a linkage is implicit in the impersonal mode. Therefore, impersonal coordination is less capable of supporting intense sharing of individual interpretations amongst IT and client stakeholders, and consequently, an alignment of their expectations. Taken together, we suggest that:

> P2a: In the IT governance council of the IT cooperative, personal coordination will induce more alignment of stakeholders' expectations of desirable IT behaviors than impersonal coordination.

In comparison, stakeholders in the IT cooperative are all from the same IT knowledge domain and have the ability to value, assimilate, and apply the knowledge they receive from each other (Cohen and Levinthal, 1990). By speaking "the same

language", it is relatively easier for IT stakeholders to exchange and understand one another at a deeper cognitive level. Although the perceptions shared among IT stakeholders are still associated with a tacit nature, situating in the same professional contexts enables IT stakeholders to have more consistent understandings of each other's perspectives (Wenger and Snyder, 2000).

Under such circumstances, IT stakeholders exchanging their expectations of the roles and responsibilities of the IT cooperative through personal coordination mechanisms are subject to information overload (Meier, 1963), because they are given opportunities to share every single aspect of individual perspective, making it harder to align expectations. However, an alignment of stakeholders' expectations will be more likely through impersonal coordination mechanisms, through which information most directly related to expected roles and responsibilities of the IT cooperative is explicitly codified. Therefore, we suggest that based on a consistent understanding of explicit rules and policies, individual expectations of IT stakeholders will be shaped and aligned through concise and accurate codifications of tacit knowledge.

> P2b: With regard to the coordination within the IT cooperative, impersonal coordination will induce more alignment of stakeholders' expectations of desirable IT behaviors than personal coordination.

3.4.3 The Role of Communication

In addition to control and coordination, another major cause of misaligned stakeholders' anticipations of desirable IT behaviors is communication, which is critical in producing shared interpretations among organizational members (Ring and Van De Ven, 1994). Effective communication among key actors across organizational

boundaries provides better information about individuals' belief systems (Lind and Zmud, 1995). Communication may be improved by using information technologies or through enhanced interpersonal interactions. By engaging the right people in appropriate decisions, IT governance provides a means through which stakeholders across organizational boundaries, who may or may not share common understandings of the anticipated behaviors of the IT cooperative, can meet regularly. Thus, one of the roles of IT governance is to facilitate *communication*, which is the process of stakeholders transmitting information through a channel. Such information transmission allows stakeholders to exchange individual interpretations of desirable and understandable IT behaviors. Via intensive communication, client entities have the opportunity to explicitly explain individual expectations of the IT cooperative to IT stakeholders to help them understand client needs. Similarly, IT stakeholders communicate to clients about their interpretations of the expectation, so as to make sure that everyone is talking the same language. Effective communication through IT governance, therefore, helps reduce the misalignment of stakeholders' anticipations of desirable IT behaviors.

3.4.3.1 Communication Structure

The effects of communication structure on shared expectations of stakeholders will be different across the two spheres of activities (i.e. the IT governance council and the IT cooperative) in which IT governance plays out to shape stakeholders' perspectives. In the IT governance council, stakeholders across various groups in the absence of organizational hierarchies communicate with each other about desirable IT behaviors. The structure of such communication can be vertical and horizontal. As an oversight board is involved with the IT cooperative and the IT governance council, vertical

communication does transpire between senior executives and either IT professional or client entity representatives. In this vertical communication, the oversight board serves as a supra-entity to resolve the agency problems between client entities and IT stakeholders, to help align various stakeholders' expectations. However, in an inter-organizational environment, client stakeholders are members of different organizations, which are "functionally autonomous" (Gouldner, 1970). The oversight board thus has no "formal" authority over the client stakeholders across organizational boundaries (Choudhury and Sabherwal, 2003). Therefore, no nominal hierarchical structures are imposed onto the IT governance council, within which client entities requiring services from the IT cooperative may proactively modify external directives from the oversight board, as well as the behaviors and cognitions of other clients and IT stakeholders, in order to satisfy their requirements with regard to the services being provided by the IT cooperative..

In order to maximize self-interests, client stakeholders involved in the IT governance councils are expected to exert influence by establishing lateral relationships with other stakeholders involved with the IT cooperative through horizontal communication (Gresov and Stephens, 1993) within the IT governance. Such horizontal communication within the IT governance council amongst client stakeholders, amongst IT stakeholders, or between clients and IT stakeholders is expected to foster a greater awareness of others' views and, hence, better enabling each party to influence others. Given that there are no hierarchical structures among clients and IT stakeholders in the IT governance council, the effects of horizontal communication will be more significant in aligning expectations between clients and IT stakeholders in the IT governance council.

Through horizontal communication, client stakeholders and IT stakeholders are enabled to exchange perspectives on the roles and responsibilities of the IT cooperative as peers and their mutual understandings are likely to be achieved.

P3a: In the IT governance council, horizontal communication will induce more alignment of stakeholders' expectations of desirable IT behaviors than vertical communication.

However, for the IT cooperative, a hierarchical structure does exist as there are two groups of IT stakeholders in the IT cooperative: the IT leadership and the IT operational staff. The IT leadership works with client stakeholders in the IT governance council to understand clients' needs and requirements. Based on their understandings of the service requirements received from client entities, the IT leadership gives instructions to other IT operational personnel of the IT cooperative. In other words, the IT operational personnel are the subordinates, and their communication with the IT leadership is characterized as vertical. Such a hierarchical structure is the source of agency problems, leading to a barrier for IT stakeholders to achieve mutual understandings between the IT leadership and the IT operational staff (Jensen and Meckling, 1976). Under such circumstances, vertical communication is important in aligning expectations amongst IT stakeholders, so that the IT leadership and the IT operational personnel can accurately exchange their perceptions of the expected roles and responsibilities of the IT cooperative. Therefore, in the IT cooperative, the effects of vertical communication will be more significant than those of horizontal communication, as divergent cognitions are more likely for people separated by a hierarchical structure (Shapira, 2000).

P3b: In the IT cooperative, vertical communication will induce more alignment of stakeholders' expectations of desirable IT behaviors than horizontal communication.

3.4.3.2 Facets of Communication

Facets of communication (i.e. frequency, direction, modality, and content) are unequally helpful in aligning stakeholders' expectations, because the understanding of other people's cognitions significantly depends on the situation, context, and community in which cognitions are expressed (Cicourel, 1981). Communication modality that enables the transmission of rich social cues provides organization members with opportunities of sharing social contexts, and helps create a sense of shared interpretive meaning (Sproull and Kiesler, 1991; Zack, 1993). However, communicating partners who are experienced using a lean medium and who know each other well can also communicate richly via lean channels (Carlson and Zmud, 1999). Thus, communication modality does not directly address the issue of exchanging cognitive understandings across social contexts. Similarly, when stakeholders' expectations are communicated across knowledge domains, the content of communication does not simply lead to shared understandings either, because contents are situated in contexts as well and stakeholders cannot comprehensively capture contents without understanding contexts in the first place (Bechky, 2003). Therefore, communication modality and communication content are two facets that are less relevant to cognition sharing, whereas communication frequency and communication direction will be the primary focus of this section.

Communication frequency refers to the number of occurrences that a particular message is repeatedly transmitted within a given time period (Krone, Jablin and Putnam,

1987). Relative to IT governance, desirable IT behaviors communicated within IT governance are the contents of message. When desirable IT behaviors are communicated through greater frequencies, inter-organizational stakeholders will have greater exposure to these messages and will become more aware of expected IT behaviors. Also, the understanding of one stakeholder would become more visible to others (Becerra and Gupta, 2003). For example, through frequent communication, IT stakeholders become more aware of the needs of clients, and client entities become more conscious about the IT stakeholders' intentions with the IT cooperative. In this case, stakeholders can rely more heavily on the larger amount of information available to them about the IT cooperative's roles and responsibilities expected by others, which consequently, improves the alignment between stakeholders' expectations.

Furthermore, from a knowledge management perspective, frequent communication develops common definitions of situations and build consensus among communicating parties (Van De Ven and Walker, 1984). Such a process enables a gradual convergence of meanings and conceptions, and helps stakeholders from different knowledge domains better understand one another (Berger and Luckmann, 1966). Taken together, frequent communication of desirable IT behaviors is important in achieving mutual understandings and aligned cognitions between IT and business stakeholders.

P4a: Greater communication about desirable IT behaviors will induce more alignment of stakeholders' expectations of desirable IT behaviors.

Bi-directional communication enables a dynamic, two-way communication that helps one stakeholder group understand how the other groups interpret the information they receive. Through dynamic and bidirectional communication, the cognitive

differences between any two stakeholder groups involved with the IT cooperative will be identified and remedied before cognitions are transformed into actions, therefore, minimizing inappropriate behaviors that are not anticipated by client entities (Johnson and Lederer, 2005). Specifically, by interacting with IT stakeholders via two-way communication, client entities are given opportunities to enter the knowledge domains of IT stakeholders, so as to define desirable IT behaviors in a language that is more comprehensible to IT stakeholders to reduce information equivocality that is associated with the lack of convergence between individuals (Daft, Lengel and Trevino, 1987). In comparison, when communication across stakeholder groups is unidirectional, the information of desirable IT behaviors is pushed from one group to another, disallowing feedback of the comprehensibility of the message. Given the tacit nature of knowledge and the constraint of knowledge domains, IT stakeholders may misinterpret client intentions, resulting in a misalignment of stakeholders' expectations. Therefore, bidirectional communication of desirable IT behaviors comprises an appropriately architected IT governance structure that improves the alignment of stakeholders' anticipations.

> P4b: Bidirectional rather than unidirectional communication of desirable IT behaviors across stakeholder groups will induce more alignment of stakeholders' expectations of desirable IT behaviors.

3.5 Main Effect of the Organizing Vision

The impacts of IT governance on the alignment of stakeholders' expectations of desirable IT behaviors are further influenced by social constructions of shared meaning and paradigms, as "desirable behaviors embody the beliefs and culture of the

organization as defined and enacted through not only strategy but also corporate value statements, mission statements, business principles, rituals, and structures (Weill and Ross, 2004, p.6). Social construction and maintenance of shared cognition occur through an *organizing vision*, which is a focal community idea for appropriate IT behaviors to be engaged by stakeholders in the IT cooperative (Swanson and Ramiller, 1997).

From a knowledge management perspective, a misalignment of stakeholders' expectations is due to tacit knowledge, which is stored at a deep level of cognitive structure and is hard to codify. The transfer and exchange of such knowledge become more difficult in cross-functional situations, because knowledge is localized and embedded in practice that is specialized within a function (Lave, 1988). Thus, developing shared understandings across stakeholder groups is subject to the challenge of knowledge boundaries. Boundary objects are helpful in such a situation, because they are shared and shareable across different problem solving contexts via creating interpretive mechanisms across specific knowledge domains (Carlile, 2002). The organizing vision is served as a boundary object across stakeholder groups, given its feature of creating and maintaining shared community ideas. Working to establish a shared context that "sits in the middle" (Star, 1989, p.47), an organizing vision influences shared interpretations and shapes stakeholders' anticipations of desirable IT behaviors.

Stakeholders across organizational boundaries also have positive impact on the formulation and reproduction of the organizing vision. Through dynamic negotiation of the organizing vision, stakeholders across various groups make sense of the social definition of desirable IT behaviors. The extent to which stakeholders find the organizing vision meaningful includes four dimensions: interpretability, plausibility, importance, and

discontinuity (Ramiller and Swanson, 2003). Interpretability reflects the extent to which stakeholders find the organizing vision intelligible and informative in its associated public discourse. Plausibility addresses distortions in discourse and focuses on the organizing vision with misunderstanding. Importance implies the power of influencing or the quality of having evident value. The last dimension of the organizing vision's meaningfulness, discontinuity, refers to the conceptual departure the organizing vision poses and the difficulty in implementing it.

Stakeholders are more likely to accept and sustain the organizing vision when they find it more meaningful (i.e. more interpretable, more plausible, more important, and less discontinuous), under which circumstances the organizing vision will continue to accentuate to shape stakeholders' shared interpretations, as well as to be shaped by stakeholders' cognitions. This evolving process makes it possible for the organizing vision to continuously serve as a boundary object across functional boundaries to facilitate shared understandings of deep cognitive structures. Specifically, when an organizing vision is more interpretable, it is normally associated with a clearer and more consistent socially-constructed idea of desirable IT behaviors, which leads to fewer misunderstandings among distinct stakeholders (Weick, 1995). An interpretable organizing vision thus shapes stakeholders' individual understandings, resulting in consistent expectations of desirable IT behaviors.

P5a: The more interpretable the organizing vision, the greater the alignment of stakeholders' expectations of desirable IT behaviors.

Similar to interpretability, plausibility also addresses the quality of community discourse that formulates and sustains an organizing vision. Plausibility concerns

individual confusions about a community idea and the lack of knowledge, and is a key hurdle for stakeholders to produce shared cognitions (Ramiller and Swanson, 2003). When stakeholders have doubts about the reality or the credibility of an organizing vision, they are more likely to question the organizing vision with their individual interpretations, In this case, it is challenging for the organizing vision to be mutually accepted and individual expectations are unlikely to be aligned.

P5b: The more plausible the organizing vision, the greater the alignment of stakeholders' expectations of desirable IT behaviors.

Regarding the importance dimension, an organizing vision will lack the power of influencing and shaping shared interpretations if it is perceived to have no meaning in the business context. In other words, if the organizing vision does not create opportunities to deliver business and practical values, and it becomes irrelevant to stakeholders who are seeking for business success and will not be accepted by the community. Under such conditions, stakeholders will resist the organizing vision while stick to their individual cognitions related to desirable IT behaviors. An alignment of stakeholders' expectations thus becomes less likely.

P5c: The more important the organizing vision, the greater the alignment of stakeholders' expectations of desirable IT behaviors.

Lastly, if an organizing vision is quite disparate from stakeholders' original way of thinking and requires a huge paradigm shift (i.e. conceptual discontinuous), or if stakeholders perceive a lot difficulty entailed in implementing the organizing vision (i.e. structural discontinuous), individual stakeholders will become reluctant to accept the organizing vision, which potentially will incur high costs of implementation, as a

community idea. Without a mutually agreed-upon organizing vision, stakeholders' individual interpretations will be sustained, whereas common understandings will not be achieved.

P5d: The less discontinuous the organizing vision, the greater the alignment of stakeholders' expectations of desirable IT behaviors.

3.6 Outcomes of the IT Cooperative

According to the expectation-confirmation theory, stakeholders' evaluation of the IT cooperative's performance is based on their belief systems (Bhattacherjee, 2001). Client entities express their expectations and specify appropriate IT behaviors to be carried out by the IT cooperative. IT stakeholders have their own belief systems regarding IT behaviors that are appropriate. Based on their individual cognitive structures, stakeholders in the IT cooperative engage in IT-related activities that are consistent with their perceived desirable behaviors. As mentioned earlier, IT stakeholders' expectations of desirable IT behaviors may be misaligned with those of client entities due to the divergent objectives of different stakeholder groups and also due to the tacit nature of their specialized knowledge that induces cognitive limitations. Through communicating and coordinating cognitive structures across stakeholder groups, and through controlling agency relationships, appropriately architected IT governance facilitates the alignment of stakeholders' individual interpretations. Such facilitation will be enforced when social actors involved with the IT cooperative find an organizing vision meaningful.

Mutual understandings between IT and business stakeholders are beneficial in helping stakeholder understand the IT and business objectives of the IT cooperative

(Reich and Benbasat, 1996). Also, shared interpretations enable stakeholders from diverse areas to develop greater knowledge of each others' needs, and subsequently, greater ability to meet those needs (Johnson and Lederer, 2005). In other words, the sharing of knowledge is needed for clients and IT stakeholders to achieve superordinate goals that are beneficial to both stakeholder groups (Nelson and Cooprider, 1996). IT success, or improved performance of the IT cooperative, is thus achieved when IT objectives are effectively aligned with business objectives, and when IT needs and business needs are sufficiently addressed (Sabherwal and Kirs, 1994). With improved performance of the IT cooperative, clients become more satisfied with the services being provided by the IT cooperative. The services provided are also less disagreeable, or questionable, by those who request and receive the services from the IT cooperative.

P6: The greater the alignment of stakeholders' expectations of desirable IT behaviors, the greater the perceived performance of the IT cooperative.

3.7 A Process-Oriented View

So far, the research model is based on a factor approach that identifies potential predictors of the alignment of stakeholders' expectations and consequently the IT cooperative's performance. In this factor model, predictors are conceived as factors that vary in degree, and variation in predictors accounts for variation in the dependent variable. However, a factor model lacks the demonstration of how and why predictors and outcomes are associated, meaning that it does not address the causal connections between the variables (Newman and Robey, 1992). To resolve this issue, a complementary approach is the process model, which focuses on the dynamics of social changes and how and why certain outcomes are achieved (Van De Ven and Huber, 1990).

Furthermore, it is expected that the organizing vision and IT governance will both evolve over time, through IT governance-related interactions among stakeholders. Thus, the alignment of stakeholders' expectations is conceived as a sequence of events that occurs over time (Newman and Robey, 1992).

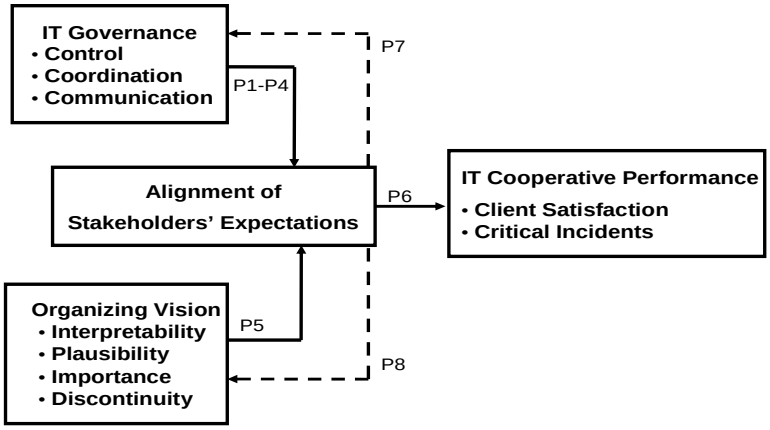
Via both a factor approach and a process approach, a more comprehensive explanation of the effects of IT governance and organizing vision is to be provided (see Figure 3.3). Over time, the extent to which stakeholders' expectations of desirable IT behaviors are aligned will have reciprocal impacts, and will be incorporated into the design of IT governance and the organizing vision. Specifically, each stakeholder group has particular requirements of the services to be provided by the IT cooperative. If one stakeholder group realizes that others have different expectations about the roles and responsibilities to be engaged within the IT cooperative, they will find ways to influence others to have their expectations met. One way stakeholders could do this is through leveraging the control, coordination, and communication aspects of IT governance. As discussed earlier, effective control, coordination, and communication facilitate mutual sharing of cognitive interpretations and resolve agency problems. Therefore, stakeholder groups with dominant expectations will attempt to change the mechanisms implemented within IT governance to make other stakeholders think alike. Thus, a misalignment of stakeholders' expectations tend to result in modifications in IT governance, along the dimensions of control, coordination, and communication, with particular stakeholders wishing to change others' mindset and push others to agree with their intentions with the IT cooperative.

P7: The extent to which stakeholders' expectations of desirable IT behaviors are aligned will reciprocally influence, over time, the control, coordination, and communication mechanisms of IT governance.

Another way that stakeholders could influence others' cognitions is through the reproduction of an organizing vision. Having realized the differences in their interpretations, stakeholders who have dominant interests in the IT cooperative and who are committed to realize their expectations will make interpretive effort to reframe and promote the organizing vision. Through this process stakeholders compete for "cognitive authority" (Gutting, 1984) over the content of the organizing vision, attempting to represent their own expectations and subsequently change other stakeholders' cognitions (Swanson and Ramiller, 1997). Thus, a misalignment of stakeholders' expectations has the potential to change the organizing vision as well.

P8: The extent to which stakeholders' expectations of desirable IT behaviors are aligned will reciprocally influence, over time, the meaningfulness (i.e. interpretability, plausibility, importance, and discontinuity) of the organizing vision.

Figure 3.3 A Process Model



Chapter IV: Research Methodology

4.1 Data Collection Method

In chapter 3, a research model is proposed to study how IT governance and an organizing vision induce the alignment of stakeholders' expectations of desirable IT behaviors to be engaged in an IT cooperative, which consequently improves the IT cooperative's performance. We suggest that appropriate IT behaviors are enabled by an alignment of stakeholders' understandings of expected roles and responsibilities. Looking through the lens of the collective mind theory and the knowledge-based view, we further suggest that the alignment of stakeholders' expectations is facilitated by IT governance (through effective communicating, coordinating, and controlling cognitive structures across stakeholder groups) and a meaningful organizing vision (along the dimension of interpretability, plausibility, importance, and discontinuity). Furthermore, a higher degree of alignment of stakeholders' expectations improves the performance of the IT cooperative.

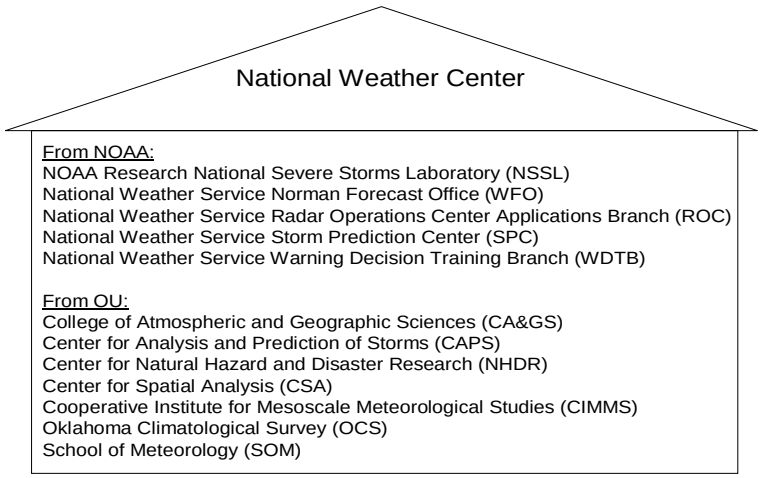
To comprehensively understand the nature of the relationships among research constructs, and to take into account of other factors that are currently unclear but have potential impacts on the research model, we propose a positivist qualitative method through a multiwave design (Yin, 1984). More specifically, given that the relationship between research constructs is dynamic and process-oriented, the research strategy adopts an action research aspect. The ideal domain of action research is associated with three distinctive characteristics: 1) the researcher is actively involved, and the research will potentially benefit both researcher and organization, 2) the knowledge obtained can be immediately applied, and 3) the research is a cyclical process (Baskerville and Wood-Harper, 1996). In order to justify the use of action research for this dissertation, we will

first provide descriptions of the target research site, followed by explanations regarding why action research is an appropriate method for testing the proposed research model at this site.

4.1.1 Research Site

The target research site is a new enterprise's IT cooperative that provides shared network infrastructure and services to a set of business entities. More specifically, a university and a federal organization have jointly funded and built a new facility on the university's research campus. The construction was completed in May 2006, and the users of the new building moved in at the beginning of August, 2006. This new facility is a unique confederation of federal and university organizations, and the new building is jointly occupied by both federal and university entities (Figure 4.1).

Figure 4.1 Occupant Organizations



The occupant organizations of the new building need to work cooperatively to manage site-wide IT resources including the backbone network, security, system

administration, joint use of network infrastructure and common applications, and environmental and emergency response issues. Meanwhile, each entity from the Federal Government and the University already had access to their own IT personnel support services. In addition, two operational federal entities have their own operational networks that are not part of the jointly managed IT infrastructure of the new building. The special operational requirements for separate networks creates "boundary conditions" where research resources owned by these two entities will be managed by them, while the new building's networks must be enabled to allow research collaborations between all federal entities and university entities. The challenge for the occupant organizations, therefore, is to contend with boundary conditions, to identify the IT services that are to be mutually operated and shared, and to justify an apportionment scheme for the charges for those services.

The necessity and desire for cooperation and collaboration has led the occupant entities to establish a Network IT Council (NITC) as the IT governance structure supporting the Network Operation Center (NOC) of the new building, which is the IT cooperative that provides shared network services to occupants and is responsible for the management and operations of the new building's IT network. From 2005 to 2006, the NITC met every other week for about a year, with the purpose of facilitating the negotiation process regarding the policies and associated governance processes for the IT network of the new building.

The NITC was solidified into a formal committee in May 2005. Membership of the NITC consists of representatives from five Federal Government occupant entities and six University occupant entities. Two co-chairs, one from the Federal Government and

one from the University, were designated for the NITC by the Council of Directors of the new building.

To summarize, the research site involves an inter-organizational IT cooperative (i.e. the NOC) that provides shared network services to client entities across two organizations (i.e. a federal organization and a university organization). Representatives from client entities constitute members of the NITC, which is the IT governance structure of the NOC. A Council of Directors serves as the oversight board of the NOC and is a supra-entity that resolves agency problems between client entities. Therefore at this research site, major stakeholders actively involved in the network operations are IT professionals working in the NOC and client entities requiring the services to be provided.

4.1.2 Research Characteristics

As mentioned earlier, client entities at the research site have access to their own IT personnel and IT support services. In order to achieve economies of scale and scope, certain services are to be centralized and shared among client entities. Given different networking needs of each entity, it is challenging for the NOC to define mutually-agreed services and to provide those services successfully. Therefore, stakeholders at the research site have the need to seek for an effective solution and to improve the performance of the IT cooperative. Meanwhile, having a theoretical model developed based on the literature, we (the researchers) need to test the applicability of our propositions to the real world, whereas this research site is a perfect match with the business context surrounding the research model. Thus, the research will potentially benefit both researcher and organization. Furthermore, the researchers will be actively

involved with the interactions among stakeholders at the research site, by attending meetings and sharing research results at various stages.

In line with the academic and practical needs for a systematic study, knowledge obtained from this dissertation can be immediately applied to the operations of the IT cooperative. For instance, if the current IT governance structure is not working effectively in achieving desirable IT behaviors, data collected from this dissertation will reveal the reasons of the deficiency and lead to a redesign of governance structures. Similarly, if data demonstrates that the inferior IT cooperative's performance is due to a lack of meaningful organizing vision, the existing organizing vision is also likely to be revised so as to improve organizational performance. Therefore, the research questions are relevant to the real world, and via action research, the empirical investigation of research questions will be closely tight into the real world, ensuring significant practical implications to be generated from study results.

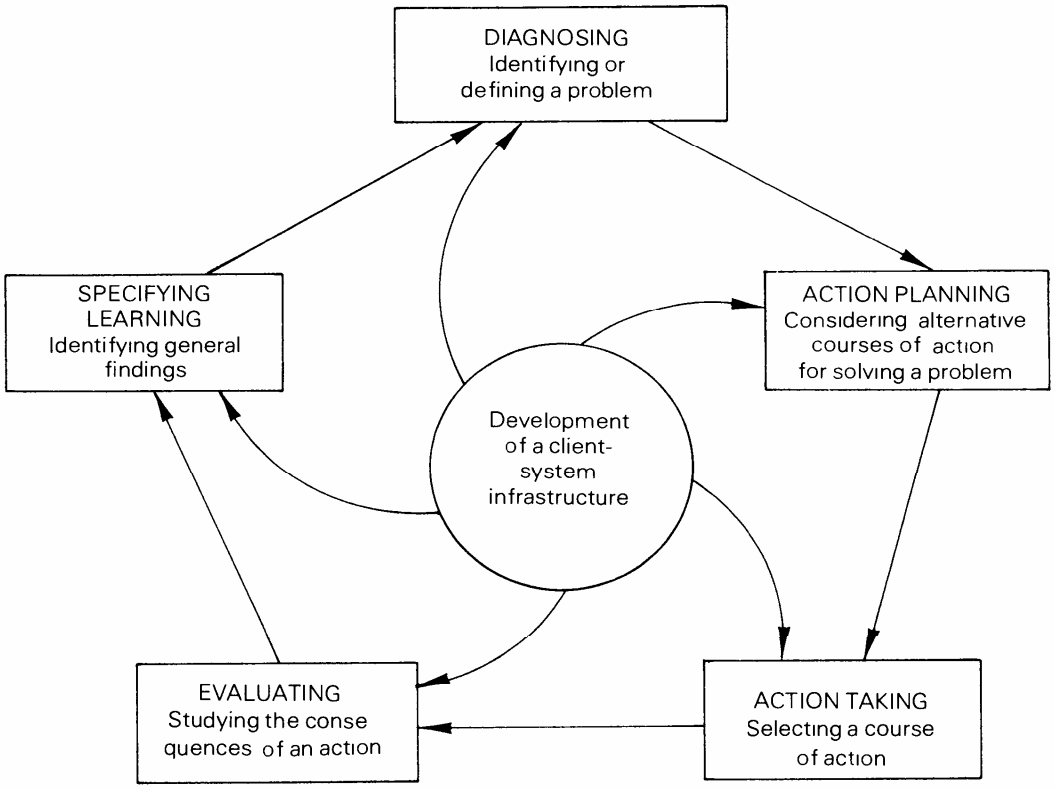
Building on this last point, the researchers will introduce methodical changes through interventions at the research site (as to be explained in the subsequent sections). In order to capture the changing relationships among research constructs induced by researchers' involvement, the research involves a cyclical process, and the same empirical procedures will be repetitive over time. Taken together, the research is related to three major characteristics, i.e. 1) active involvement of the research and potential benefit to both researcher and organization, 2) immediate application of knowledge obtained, and 3) a cyclical research process. These three characteristics are consistent with the conditions for conducting action research (Baskerville and Wood-Harper, 1996), indicating that action research is an appropriate method for this dissertation.

4.2 Action Research

The action research to be conducted in this study adopts a positivist and qualitative orientation, which is based on the ontology that objective physical and social world exists independent of humans and can be apprehended and measured through formal propositions and hypotheses testing (Orlikowski and Baroudi, 1991). The term "action research" originated in 1946, denoting a social research that "combined generation of theory with changing the social system through the researcher acting on or in the social system" (Susman and Evered, 1978, p.586). Researcher intervention is a primary approach through which the research tests a working hypothesis about the phenomenon of interest and acquires theoretical and practical knowledge about the phenomenon. In addition to developing knowledge in a real-world setting, action research also allows researchers to assist practitioners to apply knowledge by learning from the discrepancies between the hypothesized and actual changes (Mathiassen, 2002). Action research thus "… claims to contribute both to the practical concerns of people in an immediate problematic situation and to the goals of social science by joint collaboration within a mutually acceptable ethical framework…" (Rapoport, 1970, p.499).

Earlier design of action research involves a two-stage process: a diagnostic stage and a therapeutic stage (Blum, 1955). At the diagnostic stage, the researcher and research subjects conduct a collaborative analysis of the social situation and formulate hypotheses. At the therapeutic stage, changes are introduced into the social setting and the effects are studied. The process of action research has later been enriched and till present, one of the most widely adopted approaches has been Susman and Evered's (1978) canonical action research method that involves five phases (see Figure 4.2).

Figure 4.2 The Cyclical Process of Action Research
(Source: Susman and Evered, 1978)



The client-system infrastructure is the specification that constitutes the boundaries of the research domain and defines the responsibilities of the practitioners and the researchers to each other. Researchers and practitioners first jointly identify situated problems underlying the causes of the organization's desire for change and develop theoretical hypothesis to be used in the subsequent steps. Once problems are identified, actions that can improve or release the problem situation are specified, guided by the theoretical framework. Then, interventions specified in the action planning phase are implemented, causing certain changes to be made. After actions are taken, practitioners and researchers jointly evaluate the intervention, regarding whether the theoretical effects of the action are realized, and whether these effects relieve the problems. Learning outcomes are documented to serve as the starting point for a new cycle of inquiry. Where

changes are unsuccessful, hypotheses should be adjusted to modify the framework for the next iteration.

4.3 Research Design

Following Susman and Evered's cyclical action research design, the researcher was involved at the research site during the August 2005 – August 2006 time period to gain an understanding of the participating organizations and the actors involved. During this time, the researcher attended the meetings of the NITC as a non-interventionist observer and worked with one of the practitioners at the research site to identify the problems related to the operations of the NOC and the potential causes for these problems. The researcher then developed a theoretical framework primarily based on the existing literature and formulated working hypotheses. The researcher diagnosed that a critical issue was the alignment of distinct stakeholders' expectations of the role and responsibilities of the IT cooperative. Without mutual understandings and agreement, stakeholders from different entities tend to have inconsistent requirements of the shared services to be provided, consequently leading to poor performance of the IT cooperative. In order to improve the alignment of stakeholders' expectations, appropriately architected IT governance (that facilitates control, coordination, and communication) and a meaningful organizing vision should be in place. For detailed justification of these suggested actions, please refer to Chapter III.

Before taking the first-cycle of planned actions (i.e. diagnose), the current situation at the research site needs to be evaluated. A survey instrument has thus been developed to assess stakeholders' satisfaction with the present performance of the IT cooperative, as well as stakeholders' prevailing interpretations of the IT cooperative's

roles and responsibilities. The in-place organizing vision for the IT cooperative will be deduced from its formal mission statement, and stakeholders will be asked to evaluate its meaningfulness. Stakeholders will also be asked to assess the effectiveness of IT governance in terms of control, coordination, and communication.

Data analysis will then be conducted following this initial administration of the survey as a quantitative validation of the problem diagnosis. Based on the analysis, a few respondents will be contacted for a brief, unstructured interview so that the researcher can more fully grasp issues surfaced from the data. Results of the initial data analysis will be provided to the NITC, and the second step (i.e. action planning) of the first-cycle action research will be undertaken to suggest planned changes in IT governance and organizing vision. This may or may not result in the occurrence of the third step (i.e. actions taking) to or through the NITC governance structure, actions which may affect responses at subsequent data collection periods. In the meantime, the researcher will continue to observe the NITC's meetings to identify critical instances occurred as an objective measure of the IT cooperative's performance.

A period of time later (roughly one month), the fourth step (i.e. evaluating) of action research will be taken and the status of the research site will be evaluated for the second time using the survey instrument, as an assessment of the intervention by researchers and practitioners. Learning outcomes will be summarized to conclude the first action research cycle (i.e. specifying learning), to capture temporary understandings of the changing process.

Persisting or new problems will be diagnosed based on data collected from the second round of survey to be used as the starting point of the second-cycle action

research. The same process will be repeated to plan actions, take actions, evaluate changed situations, and specify learning. Similarly, the evaluation process at the second cycle will be the beginning of the third cycle, and data will be continuously collected at waves, with about a month between waves to continue the action research for three to four cycles.

In conclusion, at the beginning of the first action research cycle, we will retrieve an organizing vision (extended mission statement) of the IT cooperative. During this first time period, we will collect data through a survey instrument on a) stakeholders' evaluation of the effectiveness of current IT governance, b) stakeholders' assessment of the meaningfulness of the organizing vision, c) stakeholders' interpretations of the IT cooperative's roles and responsibilities, d) stakeholders' satisfaction with the IT cooperative, and e) critical events indicating problematic IT behaviors. Unstructured interviews will also be used to provide context to survey results. Then, at the end of the first action research cycle, the discrepancies among stakeholders' expectations of the IT cooperative's roles and responsibilities will be analyzed; summarized analysis results will be provided to the IT council. The same procedures will be repeated for another three or four cycles (depending on observed convergence and opportunities for learning), with interim results provided to the NITC.

It is expected that the organizing vision (extended mission statement) and the IT governance may both evolve based on the feedback made available to stakeholders, as well as through the IT governance-related interactions among stakeholders. These dynamic changes will allow us to understand the fundamental factors affecting shared understandings of the IT cooperative's roles and responsibilities, and consequently

desirable IT behaviors. By mapping the data from each period of time, we will observe the relationship patterns among the research constructs, and will obtain empirical validation of the research model.

4.4 Survey Instrument

Given that there are limited numbers of stakeholders involved at the research site, qualitative-oriented data collection and analysis methods are applied. Each one of the stakeholders will be asked to complete a brief survey over three to four periods of time, and patterns revealed in their responses will be identified and analyzed to draw empirical evidence of the research model. In order to obtain quick and accurate responses, survey questions are designed to directly address the nature underlying research constructs, based primarily on the definition of each construct. By and large, most existing instruments measuring control, coordination, communication, and the meaningfulness of an organizing vision are comprehensive survey questionnaires that include many items. These survey questionnaires would be appropriate to use if a large number of respondents were available (to allow both for the likelihood of non-response incidences and for psychometric examinations of the completed survey instruments). However, the target population at this research site involves less than twenty people. In order to increase the likelihood of high response rates and valid responses, single-item questions with behaviorally-anchored cues will be used in gathering respondent data. With fewer items, problems such as non-response and respondent fatigue are lessened. With behaviorally-anchored cues, the interpretation of the items by respondents and of the data by the researcher is made much clearer.

4.4.1 Control Instrument

Three modes of control (outcome, behavior, and clan) are discussed in this dissertation. Earlier studies of control conceptualized control as a unidimentional construct and measured it with a single question (e.g. Govindarajan and Fisher, 1990; Ouchi, 1978). Later works recognized the multidimentional nature of control and constructed composite measures (e.g. Kirsch, 1996). Following Krish (1996), we take into account the key conditions for each mode of control. Specifically, formal controls (outcome and behavior) are written and management-initiated, with outcome controls particularly focusing on the outcomes of tasks or the specific outputs desired by the organization (Eisenhardt, 1985), whereas behavior controls specifying the appropriate behaviors and processes that must be engaged in (Eisenhardt, 1985). To capture the extent to which formal controls are implemented, indications of pre-specified outcomes and behaviors are included. In addition, the linkage between rewards to produce desired outcomes and following prescribed behaviors is considered.

Compared to formal (outcome and behavior) controls, clan control facilitates shared values, beliefs, and understandings among organizational members (Ouchi, 1979). As summarized by Kirsch (1996), when clan control is implemented, individuals with shared values desire to work cooperatively in a group, and members exhibit strong commitment to the clan; task-related behaviors and outcomes are not pre-specified. Rather, clan identifies and reinforces acceptable behaviors, and organizational goals evolve with the clan's value set. Furthermore, rewards are based on acting in accordance with clan's values and attitudes. On the basis of the nature of clan control, a major indication of clan control therefore is the extent to which individual values are influenced and shaped by collective values.

4.4.2 Coordination Instrument

Coordination facilitates to achieve shared values and tasks, and solves the problems of knowledge integration (Kogut and Zander, 1996). Coordination among individuals may be understood through impersonal or personal coordination practices used by an organization. Impersonal coordination practices use pre-established plans and formal rules, requiring minimal verbal communication among organizational members (Van De Ven and Delbecq, 1976). In comparison, personal coordination practices involve group interactions and enable the sharing of explicit knowledge (Galbraith, 1973). In order to investigate whether impersonal or personal coordination mechanisms are implemented at the research site, we ask whether coordination tends to be based on pre-established rules or on interpersonal interactions (Kraut and Streeter, 1995).

4.4.3 Communication Instrument

Communication structure (vertical or horizontal) and two facets of communication process (frequency and direction) have been hypothesized to influence the alignment of stakeholders' expectation of the roles and responsibility of the IT cooperative. Communication structure may be captured by identifying the job positions of message senders and receivers, as vertical communication occurs in hierarchical relationships and horizontal communication occurs among peers (Thompson, 1967). Communication frequency is the amount of communication between organizational members, and communication direction refers to whether the message flow permits reciprocal communication between the sender and the receiver (Rogers and Agarwala-Rogers, 1976). Based on the definition of these dimensions, the relationships as defined in the organizational chart between the communication parties, and the communication amount and directionality are to be captured.

4.4.4. Organizing Vision Instrument

The research site has developed a formal mission statement outlining the goals of the IT cooperative. This formal mission statement will be used to deduct the organizing vision of the IT cooperative. To evaluate the meaningfulness of the organizing vision, four questions are adapted from Ramiller and Swanson's (2003) instrument to capture an organizing vision's interpretability, plausibility, importance, and discontinuity. Specifically, we evaluate to what extent the mission statement is understandable and realistic, and provides opportunities for delivering values to individual organizations. We also ask respondents' perceptions regarding the amount of changes that the mission statement requires to make in each client organization.

4.4.5 Instrument Capturing Dependent Variables

In order to capture the roles and responsibilities of the IT cooperative as expected by each stakeholder, we break down the potential services that the IT cooperative may provide, and ask client entities to select the ones that they think they would need from the IT cooperative. We will also ask IT professionals within the IT cooperative to identify those services that should be provided for each of the client entities in their perceptions. Answers from client entities and IT professional will be compared against each other to discover any discrepancies.

As the IT cooperative is a shared service provider, its performance depends on the extent to which this IT cooperative has addressed the needs of various clients. Before attempting to address any particular needs, the IT cooperative must have a clear understanding of client needs. Questions therefore will be asked to evaluate whether the IT cooperative understands the specific needs of each client entities, and whether the IT cooperative can effectively meet clients' expectations. Critical events occurring during

each data collection period will also be used as an objective measure of the IT cooperative's performance. Performance is better if the IT cooperative is associated with less critical events.

4.5 Data Analysis

Given that research constructs are measured using scale items, answers to each question will be indicated in numeric scores. Scores selected by respondents thus will be used for a quantitative-oriented investigation. Because of the small sample size, statistical techniques such as correlation analysis will be primarily relied on. Note that statistical tests such as correlation do not yield conclusion of causality. However, a process-oriented research design will indeed allow us to tease out the directionality of the effects of research variables.

Most measures are pretty straightforward except for the alignment of stakeholders' expectations. For this measure, services expected by stakeholders form client entities will be compared against services expected by IT professionals, and a score indicating the degree of alignment will be generated. Once the alignment level is obtained, each respondent's assessment of the efficacy of IT governance (in terms of control, coordination, and communication) and of the meaningfulness of the organizing vision (in terms of interpretability, plausibility, importance, and discontinuity) will be matched to the extent to which stakeholders' expectations are aligned to determine the contributing factors of improved alignment. The degree of an alignment of stakeholders' expectations will then be matched to respondents' evaluation of the IT cooperative's performance to test whether improved alignment leads to superior performance.

4.6 Instrument Reliability and Validity

Unlike quantitative research that involves measuring the degree to which some feature is present, qualitative-oriented research identifies the presence or absence of something. Although also empirical, qualitative research is associated with limited numbers of observations, making it difficult to statistically test measurement reliability and validity. However, the reliability and validity of qualitative measurements are as much needed, and can be ensured through appropriate methods.

Generally speaking, reliability refers to the extent to which a measurement procedure yields the same results however and wherever it is carried out, and validity is the extent to which what needs to be measured is actually being measured. It is possible to obtain perfect reliability with no validity at all, but perfect validity would assure perfect reliability. First, validity "is a fundamental problem of theory", and in qualitative studies, it is an issue of whether "the researcher sees what he or she thinks he or she sees" (Kirk and Miller, 1986, p.21). Specifically, an instrument is valid if a) it is closely linked to the phenomena under observation, b) there is substantial evidence that the theories correspond to observations, and c) observations match those generated by an alternative valid procedure. Consistent with the fist requirement, the survey questions designed for this study are based on the theoretical definitions of the research constructs to be measured, and are customized to the specific situations at the research site. The second requirement of validity may be checked once the study results are obtained, and will be addressed later in the discussion section. The survey questions, however, are inconvenient to be validated through another measurement given the nature of current study. But by continuously interacting with interviewees at the research site, we will be able to identify the discrepancies between the presumed meanings of the survey questions

and those understood by the interviewees, based on which the survey instrument will be refined and validated throughout the research period.

A measurement is reliable if a) a single method of observation continually yields unvarying outcomes, b) an observation is stable through time, or c) observations are similar within the same time period. The first type of reliability can be misleading however, if the measurement involves rehearsed information that leads to non-useful data. Relative to the nature of this dissertation, the second type of reliability is non-realistic because with researcher intervention, data would be expected to be different across substantial intervals of time. To test the third type of reliability, field notes can be used as a reliability check. Field notes denote the researcher's observations at the research site and help the reader place meaningful interpretations on the data by providing information about how data is collected. The unstructured interviews to be used in combination with the survey instrument may serve as the field notes and will help enhance the reliability of our study.

To summarize, instrument reliability and validity in qualitative research is as important and they are in quantitative research. The design of interview questions based on the theoretical definitions of research constructs, as well as a multi-wave and interventional design of the study, is helpful in improving instrument validity. To enhance instrument reliability, in addition to respondents' answers to survey questions, unstructured interviews will also be conduct so as to help both researchers and readers better interpret data and evaluate the reliability of the survey instrument.

Chapter V: Analysis Results

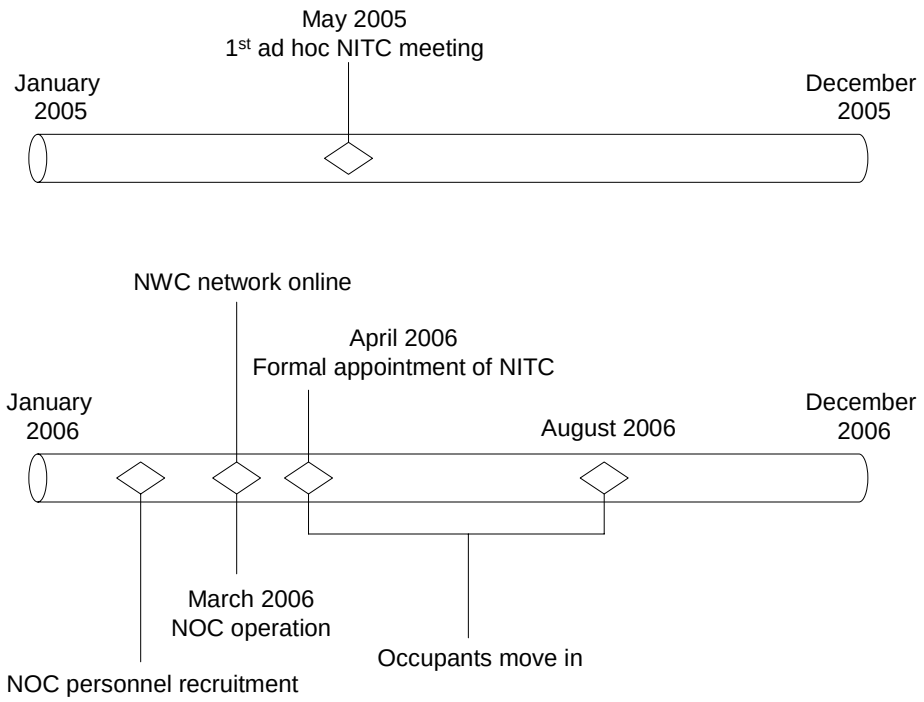
As mentioned in Chapter IV, the necessity and desire for research collaboration have led the occupant entities of the new facility (see Figure 4.1) to establish an Network IT Council (NITC) as the IT governance structure supporting the IT management of the new building. From May 2005 to April 2006, the NITC met every other week as an ad hoc committee, with the purpose of facilitating the negotiation process regarding the policies and associated governance processes for the IT network of the new building. The primary ongoing responsibilities of the NITC and the NOC were identified through these meetings.

NOC personnel were recruited early 2006, and the NOC started operating in March 2006. The Director of IT of OU Research Campus is the designated NOC head, working for the CIO of OU. The NOC is co-managed by an Operations Manager (an employee from OU) and an Information Technology Security Officer (ITSO) (an employee from NOAA). The NOC also has two network administrators, appointed by OU.

The network of the new building went online in late March 2006, and university and federal entities moved in between April and August 2006. Approved by the Council of Directors (COD), the NITC was formally appointed in late April 2006. Figure 5 displays a timeline of key events. Membership of the NITC include representatives of five occupant entities from NOAA and six occupant entities from OU (NHDR is excluded because of its small size). Two co-chairs, one from NOAA and one from OU, were designated for the NITC. Co-chairs of the NITC were selected from its membership by the COD, on the basis of a recommendation from the NITC. Ex-Officio members of

the NITC include all personnel from the NOC and they meet once per month to discuss network-related issues.

Figure 5 A Timeline of Key Events



NOAA has financed a portion of the funding for the construction of the building, and has agreed to provide cost sharing in the ongoing maintenance of the building and technology infrastructure. NOAA's federal contributions along with the University's contributions have formed the basis of the IT funding source of approximately 6.5 million dollars for the building. It is anticipated that this 6.5 million dollars will be utilized over the first 3 years of building usage to fund the IT infrastructure for ongoing collaborative research projects. A lease of the building is being drafted to decide the share of costs among occupant entities.

The data collection process for this dissertation started in early 2007 and lasted for six months. Data were collected through three waves of surveys, interviews, and

observations. Both quantitative and qualitative analyses were conducted. In this chapter, the results of the data analysis are presented. Findings from each cycle of action research that are relevant to research constructs (i.e. IT governance, organizing vision, stakeholders' expectation alignment, and the IT cooperative's performance) are explained in the first three sections. Section four presents the major relationships observed between research constructs.

5.1 First Cycle of Action Research

Starting from January 2007, the NITC changed their bi-weekly meeting to monthly. After receiving the IRB approval, we made a presentation at the NITC meeting in early February and gave a brief explanation of this dissertation, to inform the NITC and the NOC members about the research and encourage them to get involved. Informed Consent Forms were distributed to 19 potential participants at the end of the meeting, and 16 forms were returned to the researcher with signatures. 3 NITC members decided not to participate due to personal reasons.

In late February, we started our first round of data collection by sending surveys to those NITC and NOC members who signed the Informed Consent Form. We formatted the surveys in electronic forms and emailed them to the target respondents, requesting them to download the file and fill the survey upon their agreement to respond. In total, surveys were sent to 11 NITC members (7 from OU and 4 from NOAA) and 5 NOC members. Follow-up emails and phone calls were initiated to increase the response rate. After a month, 6 NITC members (4 from the OU entities and 2 from the NOAA entities) and 3 NOC members returned their completed surveys, resulting in a 56.25% response rate.

5.1.1 Survey Results

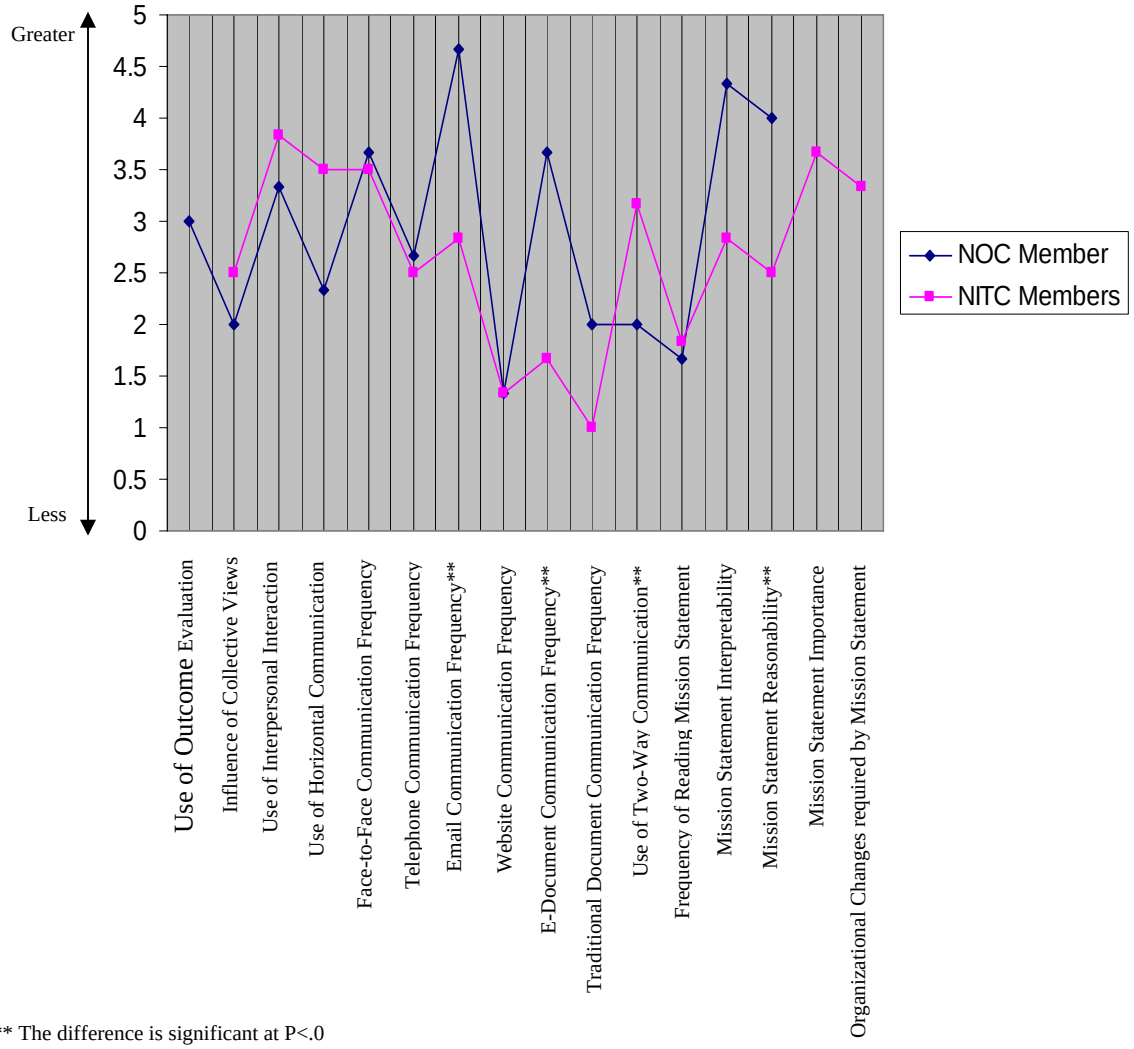
5.1.1.1 IT Governance and Organizing Vision

Different versions of the survey were used for the NITC members, the NOC managers, and other NOC members, with slight modifications of the questions to make them applicable to the target subjects. One part of the survey instrument was designed to capture a) stakeholders' evaluation of the effectiveness of the current IT governance structure (in terms of control, coordination, and communication), and b) stakeholders' assessment of the meaningfulness of the organizing vision (as reflected in the mission statement of the NOC). Single-itemed questions with behaviorally-anchored cues were used for all survey questions. Scores for each item were directly indicated by the number representing each behaviorally-anchored cue. Figures 5.1.1a and 5.1.1b summarize the means and the standard deviations for all items in category (a) and (b) as responded by the NOC and the NITC members, with larger number indicating greater degrees of each variable. Responses reflect the perceptions of the NOC and the NITC members. The major differences between the responses from the NOC and the NITC members were summarized in Table 5.1.1.

Table 5.1.1 Differences between the NITC and the NOC Members

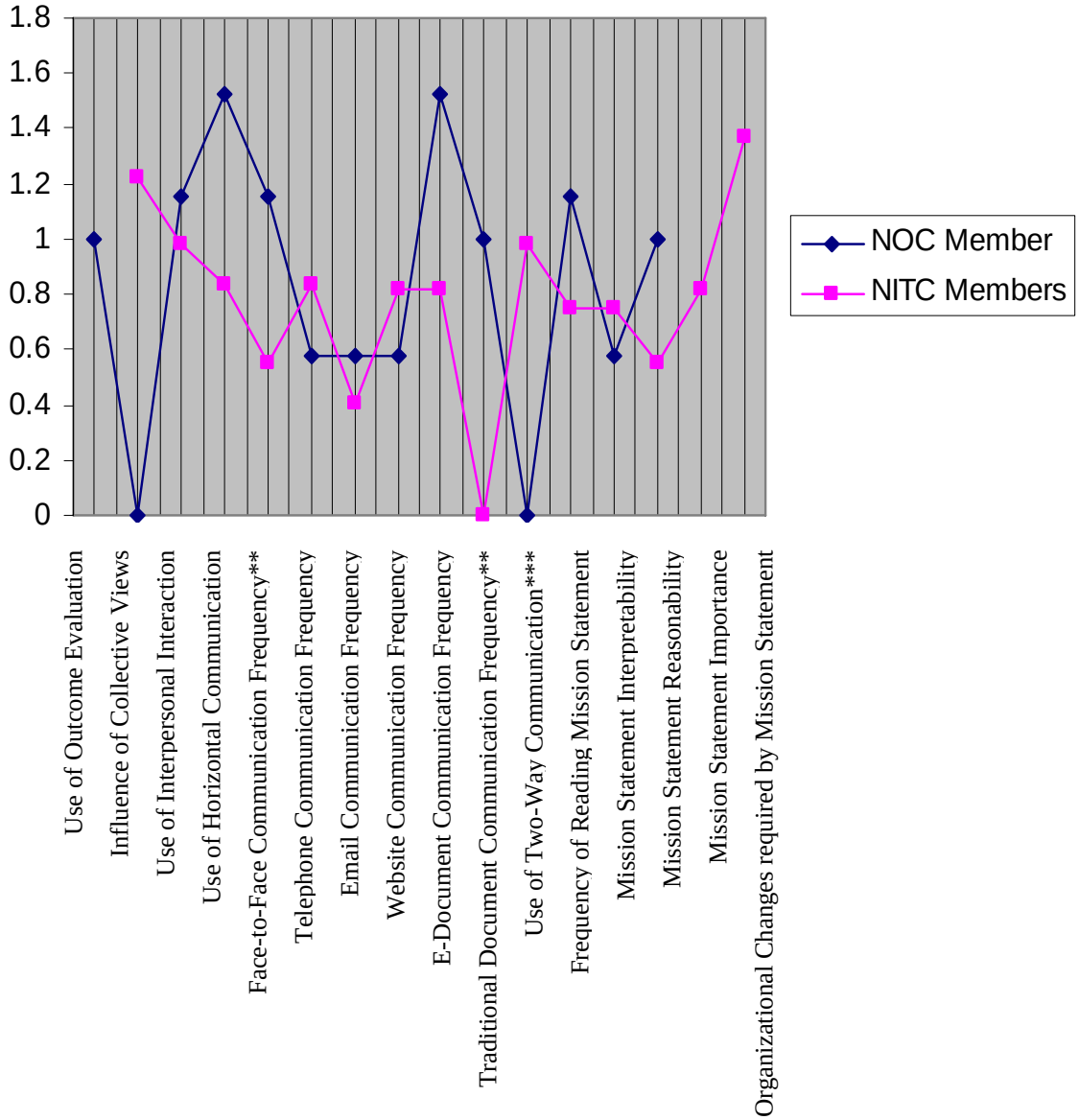
Construct	NITC	NOC
Mode of Control	Clan control	Process and outcome control
Coordination mechanism	Personal coordination	Both impersonal and personal coordination
Communication structure	Horizontal communication	Vertical communication
Communication frequency	Less communication	Greater communication
Communication direction	Two-way	One-way.
Organizing vision	Not perceived to be very meaningful.	Perceived to be more interpretable and realistic

Figure 5.1.1a: Mean Comparison between NITC and NOC Members



** The difference is significant at P<.0

Figure 5.1.1b: Comparison of Standard Deviations (Between NITC and NOC Members)



*** The difference is significant at P<.01
** The difference is significant at P<.05

Regarding the standard deviations, the Levene's test for equality of variances demonstrated that the variances of the NITC members' responses were significantly different from the variances of the NOC members' responses for the following items: 1) the frequency of communication through face-to-face (significant at $p<.05$), 2) the frequency of communication through non-electronic document (significant at $p<.05$), and 3) the use of two-way communication (significant at $p<.01$). The results indicated that the NOC members had greater differences of opinion amongst themselves than did the NITC members about how frequently they used communication through face-to-face and non-electronic document, whereas the NITC members had greater differences of opinion amongst themselves than did the NOC members regarding the use of two-way communication.

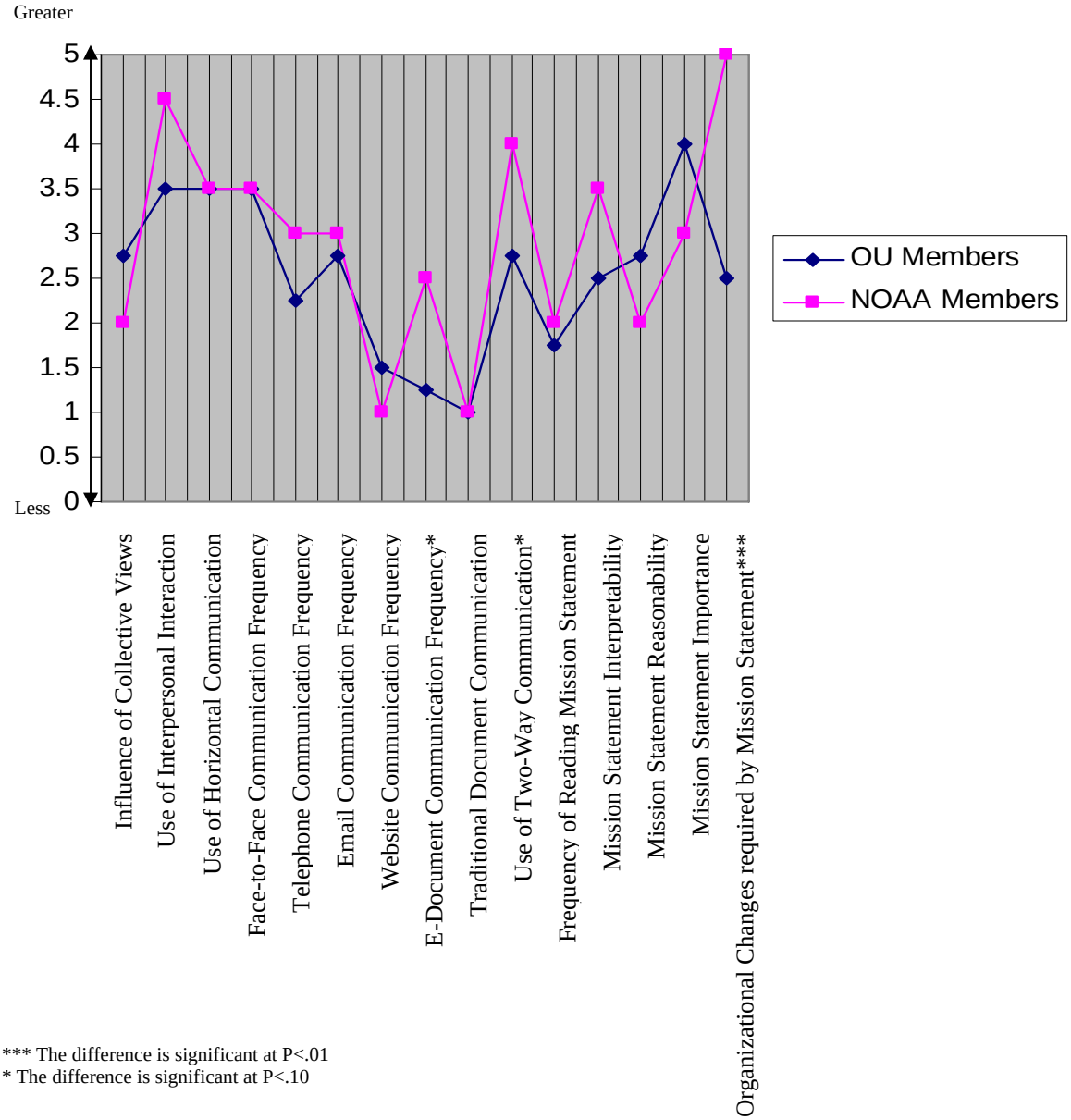
We also explored the differences between the OU and the NOAA members regarding IT governance and the organizing vision, as presented by figures 5.1.2a and 5.1.2b. Here, the major differences between the OU and the NOAA members were summarized in Table 5.1.2.

Table 5.1.2 Differences between the OU and the NOAA Members

Construct	OU	NOAA
Mode of Control	More clan control	Less clan control
Coordination mechanism	Less personal coordination	More personal coordination
Communication structure	Horizontal communication	Vertical communication
Communication frequency	Less communication	Greater communication
Communication direction	More one-way	More two-way
Organizing vision	Perceived to be less interpretable, but more realistic and more important	Perceived to require more organizational change

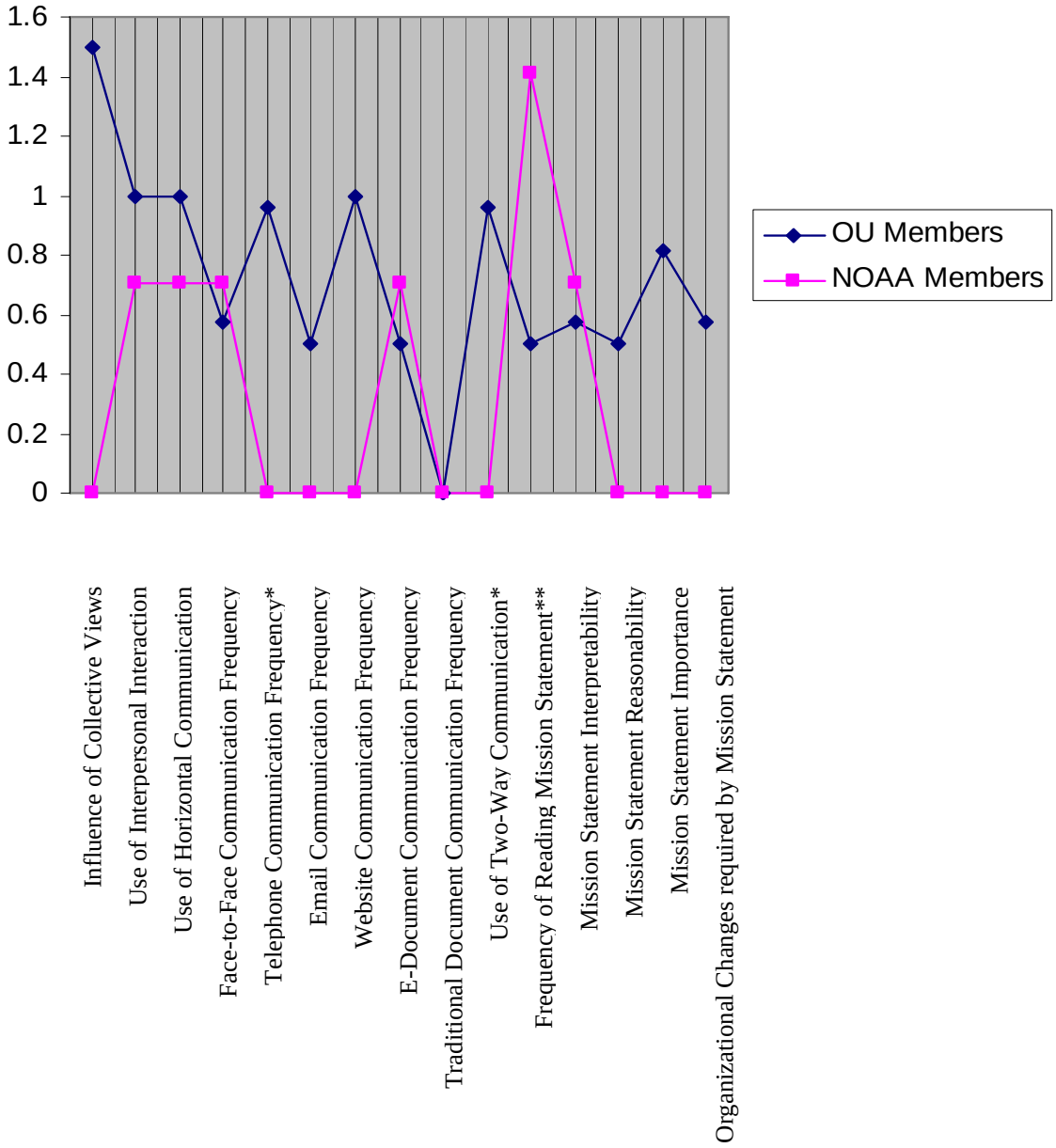
Regarding the standard deviations, the OU members had greater differences of opinion amongst themselves than did the NOOA members about how frequently they used telephone communication (significant at p<.10) and two-way communication (significant at p<.10), whereas the NOOA members had greater differences of opinion amongst themselves than did the OU members regarding how often they read the mission statement of the NOC (significant at p<.05).

Figure 5.1.2a Mean Comparison between OU and NOAA Members



*** The difference is significant at P<.01
* The difference is significant at P<.10

Figure 5.1.2b Comparison of Standard Deviations (Between OU and NOAA Members)



** The difference is significant at P<.05
* The difference is significant at P<.0

In the following sections, we will summarize the major differences between various groups of stakeholders in terms of the control, coordination, and communication aspects of IT governance, as well as the meaningfulness of the organizing vision.

5.1.1.1.1 The Control Aspect of IT Governance

Based on the responses from the NOC members, the evaluation of the performance of the NOC was not only based on whether the NOC followed pre-specified procedures, but also based on whether the NOC achieved pre-established outcomes. This result indicated that in terms of the control of the IT cooperative (i.e. the NOC), both process control and outcome control were implemented. Furthermore, the expectations of the NOC members regarding the roles and responsibilities of the NOC were mostly based on personal views, whereas the expectations of the NITC members were shaped by the collective views of other NITC members. The influence of collective views implied that clan control was in place in the IT governance council (i.e. the NITC). Particularly, the use of clan control was perceived primarily by the OU members.

On the basis of the taxonomy of mechanistic and organic controls, during the first wave of study, mechanistic controls were prevalent in the NOC, given the reliance on procedures and routines. Yet, there seemed to be more organic controls in the NITC than in the NOC, because the behaviors of the stakeholders in the NITC were more socially influenced and the control structures were more flexible.

5.1.1.1.2 The Coordination Aspect of IT Governance

When NOC-related activities needed to be coordinated, the NITC members (particularly the NOAA members) suggested that coordination tended to occur mostly through interpersonal interactions, whereas the NOC members reported that coordination

occurred through both pre-established policies and interpersonal interactions. The finding indicated that personal coordination was used in the IT governance council regarding NOC-related activities, while both impersonal and personal coordination were in place in the IT cooperative.

5.1.1.1.3 The Communication Aspect of IT Governance

In terms of the communication structure, the NOC members communicated mostly with their supervisors and subordinates, whereas the NITC members (both from OU and NOAA) communicated mostly with other NITC members. Such a result suggested that vertical communication was primarily relied on in the IT cooperative, while horizontal communication was more common in the IT governance council.

Regarding the communication frequency, in general, the NOC members communicated more frequently about the roles and responsibilities of the NOC than did the NITC members. Therefore, there was greater communication of the roles and responsibilities of the NOC in the IT cooperative than in the IT governance council. A comparison amongst the NITC members revealed that the NOOA members communicated more frequently about the roles and responsibilities of the NOC than did the OU members.

Lastly, regarding the roles and responsibilities of the NOC, the NITC members (particularly the NOAA members) tended to use more two-way communication, whereas the NOC members relied mostly on one-way communication. This result suggested that two-way communication was more common in the IT governance council than in the IT cooperative.

5.1.1.1.4 The Meaningfulness of the Organizing Vision

The findings about the four dimensions (i.e. interpretability, reasonability, importance, and discontinuity) of the meaningfulness of the organizing vision were mixed. On the interpretability dimension, the NOC members found the mission statement of the NOC to be more understandable than did the NITC members (particularly the OU members). On the reasonability dimension, again, the NOC members found the mission statement to be more realistic than did the NITC members. A comparison between the OU members and the NOAA members demonstrated that the OU members perceived the mission statement of the NOC to be more realistic than did the NOAA members. Therefore, in terms of the first two dimensions of the meaningfulness of the organizing vision, stakeholders in the IT cooperative tended to perceive the organizing vision to be more meaningful than did those in the IT governance council.

The last two dimensions were only compared between the OU and the NOAA members, because they were irrelevant to the stakeholders in the IT cooperative. Generally speaking, the OU members found the mission statement of the NOC to be more important to their organizations, and the NOAA members felt that their organizations had to make substantial changes in order to fully leverage the services specified by the mission statement.

5.1.1.2 The Roles and Responsibilities of the NOC

In this section, we will first look at the expectations of the NITC and the NOC members regarding the roles and responsibilities of the NOC. Then, stakeholders' expectations will be compared within the NITC and within the NOC, as well as between the NITC and the NOC, to examine the extent to which expectations are aligned in

different stakeholder groups. Lastly, a summary of the findings regarding the roles and responsibilities of the NOC will be provided.

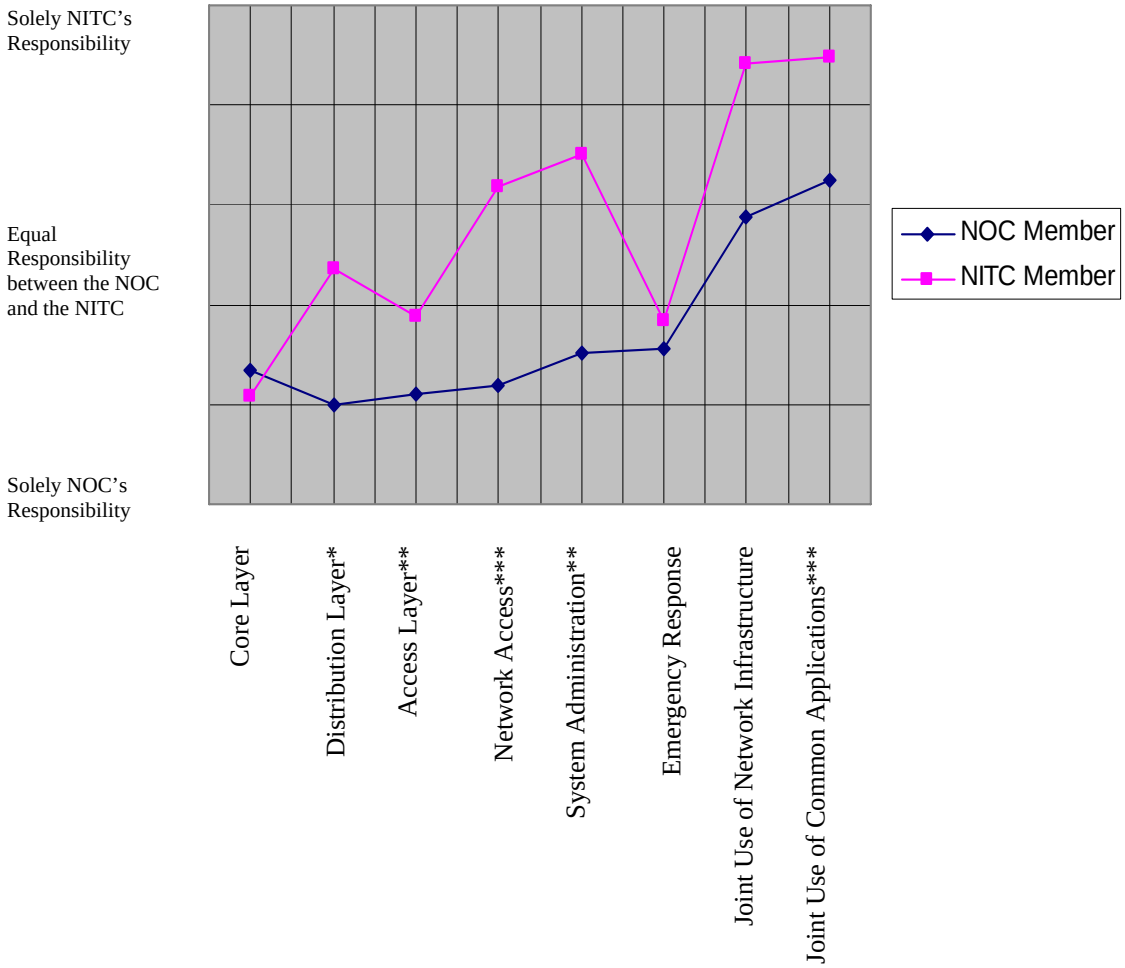
5.1.1.2.1 Expectation Alignment

To capture stakeholders' expectations of the roles and responsibilities of the NOC, a list of network services, classified into eight major groups, was provided and the respondents were asked to indicate whether each service should be offered by the NOC or the NITC. Figures 5.1.3a and 5.1.3b present the means and the standard deviations for each group of the services as responded by the NOC and the NITC members. Generally speaking, both the NOC and the NITC felt that they should take more control of most network responsibilities. Specifically, the major differences between the responses from the NOC and the NITC members' were the following:

- The NITC members felt that responsibilities of most services under the distribution layer (significant at $p<.10$) and the access layer (significant at $p<.05$) of the network should be equally shared between the NITC and the NOC, whereas the NOC members felt that they should take more control of these responsibilities.
- The NITC members thought that most network access (significant at $p<.01$) and system administration (significant at $p<.05$) services should be mostly the NITC's responsibilities, while the NOC members thought that these services should be mostly the NOC's responsibilities.
- The NITC members also felt that the NITC should be mostly, if not solely, responsible for joint use of network infrastructure and joint use of common applications (significant at $p<.01$), whereas the NOC members thought that these responsibilities should be equally shared between the NITC and the NOC.

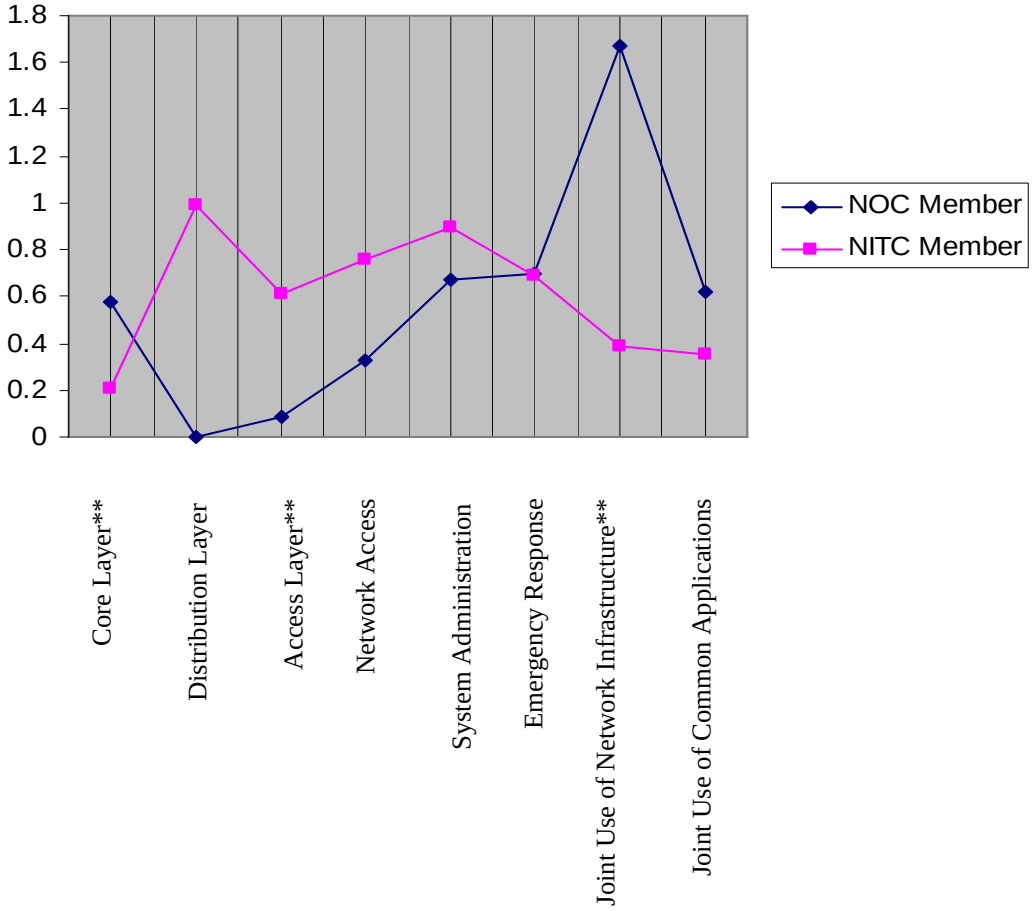
Regarding the standard deviations, the NOC members had greater differences of opinion amongst themselves than did the NITC members (significant at p<.05) about who should be mostly responsible for the core layer of the network and joint use of network infrastructure. On the other hand, the NITC members had greater differences of opinion amongst themselves than did the NOC members regarding who should provide services under the access layer.

Figure 5.1.3a Mean Comparison between NITC and NOC Members



*** The difference is significant at p<.01
** The difference is significant at p<.05
* The difference is significant at p<.10

Figure 5.1.3b Comparison of Standard Deviations (Between NITC and NOC Members)



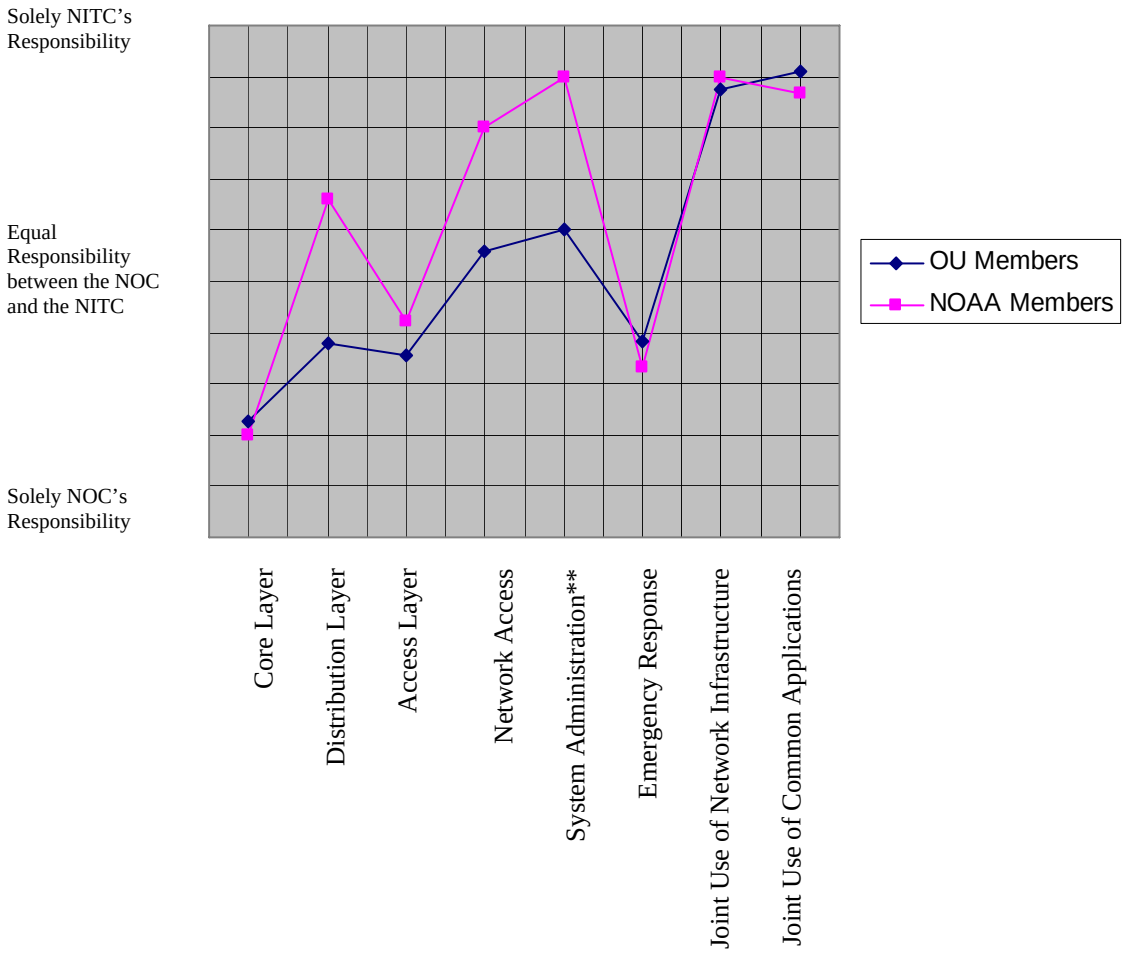
** The difference is significant at p<.05

Again, we separated the responses for the OU and the NOAA members, and compared the means and standard deviations as represented in figures 5.1.4a and 5.1.4b. Here, we noticed that in general, the OU members were more willing to cede control to the NOC. Particularly:

- The NOAA members felt that responsibilities of most services under the distribution layer, network access, and system administration (significant at $p<.05$) should be more of the NITC's responsibility, whereas the OU members thought that they should be equally shared between the NITC and the NOC.
- Compared to the OU members, the NOAA members felt that the NITC should be more responsible for joint use of network infrastructure, but less responsible for joint use of common applications.

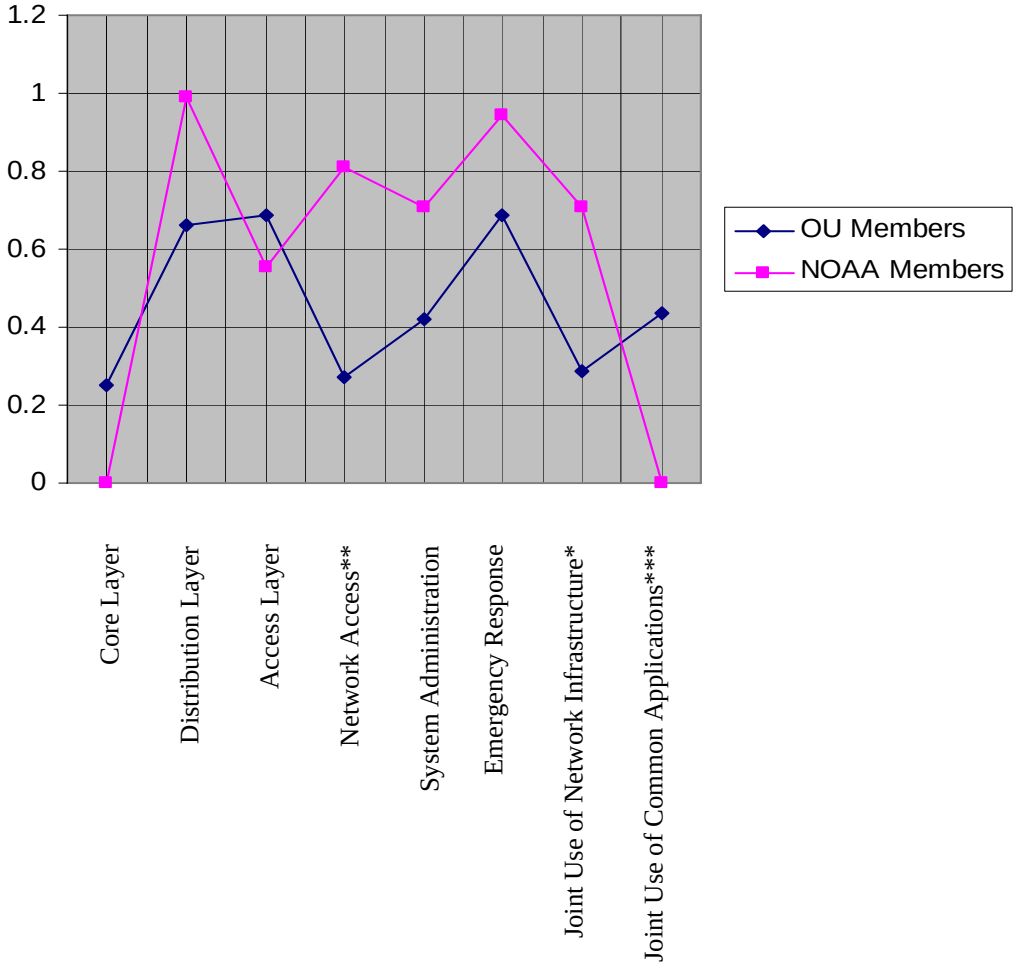
Regarding the standard deviations, the variances of the OU members' responses were significantly different from the variances of the NOOA members' responses regarding the following network services: 1) network access (significant at $p<.05$), 2) joint use of network infrastructures (significant at $p<.10$), and 3) joint use of common applications (significant at $p<.01$). These results implied that the NOAA members had greater differences of opinion amongst themselves than did the OU members about who should be responsible network access services and joint us of network infrastructure, whereas the OU members had greater differences of opinion amongst themselves than did the NOAA members regarding who should be responsible for joint use of common applications.

Figure 5.1.4a Mean Comparison between OU and NOAA Members



** The difference is significant at p<.05

Figure 5.1.4b Comparison of Standard Deviations (Between OU and NOAA Members



*** The difference is significant at P<.01
** The difference is significant at P<.05
* The difference is significant at P<.10

5.1.1.2.2 Misalignment Scores

Given that the items capturing the expectation alignment of multiple stakeholders included expectations related to multiple services (i.e. eight categories), we first calculated an average expectation score of the NOC for each category of services based on the expectations of all the NOC members. We then did an absolute comparison between this average score and the score indicated by each NOC member to calculate an individual misalignment score within the NOC for each category of services. Next, we summed up these individual misalignment scores for all eight categories of services to derive an overall misalignment score within the NOC for each NOC member who responded the survey, with higher number indicating greater degrees of misalignment between a particular NOC member and the rest NOC members.

Similarly, we also calculated an average expectation score of the NITC for each category of services based on the expectation of all the NITC members. An absolute difference between the NITC's average expectation score and the score indicated by each NITC member was calculated to derive an individual misalignment score within the NITC for each category of services. Then, a summation of all the individual misalignment scores for all eight categories of services was calculated for each NITC members as an indication of an overall misalignment score within the NITC, with higher number indicating greater degrees of misalignment between a particular NITC member and the rest NITC members.

To identify the expectation misalignment between the NITC members and the NOC members, we compared the expectation scores indicated by individual NOC members for each service to the NITC's average expectation score. These scores were added together for all services to represent the misalignment between a particular NOC

member and all the NITC members, with higher scores implying higher degrees of misalignment between the NOC and the NITC.

The expectation scores indicated by individual NITC members for each service were also compared to the NOC's average expectation score, and the summation of the differences for all services were used to indicate the misalignment between a particular NITC member and all the NOC members.

This way, two misalignment scores were derived for each survey respondent: a) a score representing expectation misalignment *within* the NITC or the NOC, and b) a score representing expectation misalignment *between* the NITC and the NOC. The misalignment scores for both the NITC and the NOC members are presented in Table 5.1.3a. T-tests were conducted to examine differences regarding the two within misalignments as well as regarding the within and between misalignment for both the NOC and NITC. Results indicated no differences with the two within misalignments but significant misalignments with the within and between misalignments for both the NOC (at $p<.10$) and NITC (at $p<.01$) (Table 5.1.3b), implying that the alignment issue was more problematic for stakeholders from different operational domains (i.e. between clients and IT professionals).

Table 5.1.3a Misalignment Scores

	NITC	**NOC**
Misalignment Within	29.87	20.22
Misalignment Between	59.78	61.11

Table 5.1.3b T-Test Statistics

Respondents	Comparison	Mean Difference	t	df	Sig. (2-tailed)
	Misalignment Within NITC – Misalignment Within NOC	9.64	-1.513	7	.174
NITC	Misalignment Within – Misalignment Between	-29.91	-4.792	5	.005
NOC	Misalignment Within – Misalignment Between	-40.89	-3.835	2	.062

5.1.1.2.3 Summary

To summarize, both the NITC and the NOC members wished to maintain more control over most network services. Within the NITC, the OU members were more willing to cede control to the NOC as compared to the NOAA members. When we examined the expectation misalignment in detail, it was noted the expectation misalignment between the stakeholders in the IT governance council and those in the IT cooperative is more problematic than the expectation misalignment within either of these two groups.

5.1.1.3 The Performance of the NOC

We examined the mean value reported for the performance of the NOC, we noticed that the average scores of the two performance items were all 2.5, which may be interpreted as: a) the extent to which the NOC personnel understood the NITC members' specific needs was between minimal and reasonable, and b) the extent to which the NOC had provided services that met the NITC members' expectations was between minimal and reasonable as well. The overall rating of the performance of the IT cooperative was fairly low, suggesting that the current services provided by the NOC were unsatisfactory.

5.1.2 Critical Events

Critical events are primarily represented by disagreement or inconsistencies amongst the NITC and the NOC members regarding the roles and responsibilities of the

NOC. Critical events were collected in two ways: a) from the open-ended questions in the survey, and b) from observations at the regular NITC meetings and the email communications between the NTIC and the NOC members. During the first time period of the study, after respondents emailed back their completed surveys, we screened their responses. A critical event was identified if a respondent indicated an extremely positive/negative comment in the open-ended questions in the survey. In addition, we also observed at the regular meetings held by the NITC as well as the email communication between the members to collect data about critical events that indicated stakeholders' questioning about the roles and responsibilities of the NOC. From the NITC meetings and the emails exchanged, a critical event was identified when any of the following categories was observed: 1) the NITC members' expression of inadequate services provided by the NOC, 2) the NITC members' expression of dissatisfaction with the services provided by the NOC, 3) the NITC members' identification of major errors in the services provided by the NOC, 4) the NITC members' identification of NOC's failure in providing the services requested, 5) the NOC members' identification of the services requested as being beyond their responsibilities, and 6) the NITC members' refusal of the services to be offered by the NOC.

5.1.2.1 Email Communications

Given that the trouble ticket tracking system has not been implemented yet, the documented communication between the NITC and the NOC regarding any changes, requests, and solutions was mainly based on emails. From January 1 2007 to April 2 (the date on which the first wave of the study results were provided to the NITC and NOC leadership), there were 45 email exchanges in total, 32 from the NOC and 13 from the

NITC. These emails primarily involved notification of network-related issues, including major power outage, network maintenance, switch changes, loss of network connection, and telephone or AV configuration, etc. Critical events were not identified from these emails.

5.1.2.2 Observations at the NITC Meetings

Before starting the data collection, we first sent a research proposal to the NITC and the NOC leadership in late October 2006. Interestingly, at the NITC's meeting in early November, the NOC prepared a written response to the items listed on the agenda for this meeting. This was a new action that was never performed before.

Starting from January 2007, the NITC meeting was changed from bi-weekly to monthly. Three critical events were identified at the meetings in March.

- At their meeting in March, the NITC and the NOC members had an argument. As a representing voice of the NITC, one NITC member addressed that port security was no longer being used, whereas the NOC was using another tool to limit the number of the MAC addresses that could access a port. Due to this fact, the NITC expressed that *notification of network changes were not satisfactory*, and they requested that they should be notified before a tool or a configuration change was introduced to the network. The NITC members also pointed out that according to the NITC charter, the ITSO had to be informed about any changes made to the network. However, the NOC did not seem to be doing that. To respond, the NOC asked for granularity, i.e. what level of information was needed. Also, the NOC mentioned that the NITC should define the granularity control, as well as the change control and policies.

- The NITC members decided to have another meeting (NITC-member only) in the following week to define, as requested by the NOC, the level of granularity that they were concerned about, as well as to discuss change control policies and protocols.

5.1.2.3 Survey Comments

Four NITC members indicated some negative comments regarding their interactions with the NOC over the three weeks prior to their answering to the survey. Their comments were documented below:

> A). "I believe I alone among the NITC members am a working scientist rather than a sysadmin, though because of my unit's computer support situation, I've basically had to learn to sysadmin duties to keep my research group's (well, my supervisor's group) linux/unix machines up and running. The NOC continues to try to push people onto the internal network, though some of the reprequisites have not been met (Aventail working, internal DNS, firewall issues, etc.). Some of us are not willing to give up our working machines to take this jump without any evidence that they've been able to get similar services working in a timely manner on the internal network. It's very disappointing that all of these processes worked very smoothly when the departments were in Sarkeys, yet the GCN/RCS support structure has been subordinated to the NOC."
>
> B). "We, on the federal side, only require, for instance, hardware and operating system maintenance on the firewall. We will make the policies and control the NAT addressing. There are other issues also. The mission of the NOC is not accurate when it is addressing the federal systems. There are two federal units that are completely in control of themselves without any intervention of the NOC at all. The NSSL controls their own DNS, web servers and load balancers, email and just about everything else. In my opinion the mission should be revised, but that is a political place I don't want to go. There will be lots of feelings hurt and egos bruised when that happens. Two of the issues presented are not anyone's responsibility except for the facilities manager. These are UPS and emergency power off. These are handled by the building automation system and the NOC should never interfere with these. I would think, however, that everyone with an effected system would respond."
>
> C). "I've been very disappointed with the lack of communication from the NOC. I have expressed my concerns to them several times, but the still don't seem to think it is important to let the NITC members know when they are going to make changes that may affect our part of the network. There seems to be a "you don't need to know everything we are doing" attitude in the NOC."

D). “It seems to me that certain services that need to be up and running are not. The one is outside/remote access to desk computers. Some of this may be due to not fully having the entire network up and running prior to the folks moving into the building. It is hard to operate when NITC groups are dealing with the day-to-day business of getting work done to then need to troubleshoot the NOC's problems as well. They know the needs, make it work, then notify the customers.”

These survey comments pointed to several issues related to the operations of the NOC: 1) the NOC had not yet make sure that the network was reliable, 2) the NOC had not met the prerequisites of certain network services before other actions were carried out, 3) the mission statement of the NOC lacked accuracy, and 4) the communication between the NITC and the NOC seemed problematic.

5.1.3 Interview Results

The analyses of the survey instrument demonstrated some surprising results, and the critical events revealed unsatisfactory attitude that the NITC had toward the NOC. To provide context to survey results, as well as to account for factors that are currently unclear but may have had impacts on the research model, we interviewed two NOC members (one manager and one co-chair) and two NITC members (one co-chair and one member) to explore the study at a deeper level. Interviews were recorded and transcribed, and each interview lasted from 12 minutes to roughly an hour. From the interviews, the following issues emerged.

5.1.3.1 Major Points Made by Interviewees

We first examined the transcripts for each individual interviewee, and identified the following major points.

Interviewee 1 (NITC Manager):

- Personal views were influenced quite a bit by other NITC members.

- NOC-related activities were mostly coordinated through interpersonal interactions, but it was also necessary to have rules and policies to create transparency and ensure consistent behaviors.
- Face-to-face communication occurred less frequently with the NOC members than with the NITC members due to the lack of trust. On the other hand, face-to-face communication made the communicator feel more comfortable and attached to the other communicating party, and it provided a chance to get a better sense of how important a problem was to someone.
- The mission statement of the NOC originally drove the formation of the NOC. However, in a situation where two entities "do not want to give up control over their spaces, and their spaces are not going to overlap, the mission statement becomes innocuous and it becomes ambiguous." Ambiguity led people to think that "this does not read as a partnership. It reads as a way to comfortably design a wall that is going to zigzag between the various levels of IT". However, "each service for each problem tends to have a granularity of it, so that it is not necessarily the same cutoff point in each service".
- The mission statement was very important. It should be something that fosters the idea of community, and it should determine the boundaries of control.
- The major reason for the disagreement between the NITC and the NOC members regarding the roles and responsibilities of the NOC was granularity. "Certain groups have certain requirements or different levels of expertise within their units". It should be the role of the NOC to find the grey area and define a base

level of service. The NITC members had done a reasonably good job reaching consensus within the NITC, but not with the NOC.

- The disagreement between the NITC and the NOC members might be minimized when partnership developed between the NITC and the NOC.

Interviewee 2 (NITC Member):

- A package of network services was being offered of the NOC. However, each entity should have the freedom in terms of which services they wish to use.
- It was more convenient to discuss issues with other people face-to-face, as it was easy to misinterpret things on emails.
- Coordination through personal interactions helped build interpersonal relationship, which helped people work together and get the job done.
- Communication between the NITC members was quite effective. However, some information seemed to be hidden by the NOC, and OU-IT seemed to have a controlling attitude.
- The purpose of the mission statement was to enable the creation of the NOC from a political perspective, and to clarify what would be offered by the NOC. However, the development of the mission statement did not involve individual entities and was too broadly stated. Therefore, the mission statement did not appear to be meaningful to those entities.
- Policies were needed to document changes made to the building network.
- Different expectations held by the NITC members regarding the roles and responsibilities of the NOC were primarily due to their different network needs.

Interviewee 3 (NOC Manager):

- The NOC charter was the only document that exists to coordinate NOC-related activities.
- Although there lacked a document on how the NOC should execute a task, face-to-face and email communications between the NITC and the NOC were fairly effective.
- The mission statement represented the goals and the vision of the NOC, and was very important for the NOC.
- In order to achieve a consensus between the NITC and the NOC, the NOC needed to compromise, and the NITC needed to overcome the fear of lack of control. Also, trust needed to develop through ongoing interactions and success by the NOC.

Interviewee 4 (NOC Co-Chair):

- Loosely defined MOA gave latitude for the NOC, but it also introduced opportunity for misinterpretation.
- Non-feedback communication from the NITC created barriers for understanding.
- A configuration management tool at the right granularity might be the best choice.
- Good relationships needed to be developed between the NITC and the NOC for effective operation of the NOC.
- Continuing communication would help achieve a consensus between the NITC and the NOC.

5.1.3.2 Cross-Interviewee Analysis

We will now compare the interview comments across interviewees, in terms of various issues such as IT governance, the organizing vision, and the performance of the NOC.

5.1.3.2.1 Control of the IT Cooperative

Our first observation was that although the survey results indicated that outcome control tended to minimize expectation misalignment across stakeholder groups, there was however not a formal evaluation system currently in place as a control mechanism of the performance of the IT cooperative. One of the interviewees expressed that client entities of the NOC had been recently asked by the higher level to come up with a list of issues that had arisen since their move into the building, but all interviewees reported that no evaluation system had been officially implemented.

As explained by one interviewee who is a NITC member, the reason for the lacking of an appropriate performance evaluation system was the following:

> "Especially with those members of the NOC, we have been friends with them in the past. This is part of why it is difficult to bring up these issues and try to push them and to say we need this information."

This was also what we have observed at NITC meetings. Under such circumstances, the NITC members and the NOC members were able to develop good relationships and get along with each other. But on the other hand, "working as friends" made it difficult for the NITC members to discuss problematic issues with the NOC and to push them to get things done.

Via the development of friendship, or socialization, amongst the NITC and the NOC members, clan control may be under way. Such control is informal and focuses on creating shared interests by grouping those with common goals and objectives. It is

ineffective, however, in minimizing divergent interests held by various stakeholder groups (Ouchi, 1980). The NITC members and the NOC members coming from different operational domains have different interests in the roles and responsibilities of the NOC. Simply interacting as friends will be unlikely to help them think and act "on the same page". Rather, a much more formal control mechanism is necessary. Considering that stakeholders across knowledge domains have asymmetric information regarding the procedures leading to certain outcomes, outcome control is preferable and should be implemented, as outcome control provides measures and rewards to motivate individual stakeholders to align their personal goals and objectives with the others.

5.1.3.2.2 Control in the IT Governance Council

In the IT governance council, most NITC stakeholders reported that their expectations regarding the appropriate services to be provided by the NOC were influenced by the collective views of other NITC members to some extent. When we talked to two NITC members in depth, we were informed that there were two major reasons for this. One was that the research mission of a particular client entity often crossed into boundaries of other entities. Therefore, IT services required by one entity might be beneficial to the others as well, given that researchers from different entities may have mutual research needs to be supported by similar network services. With these understandings in mind, client representatives from each entity tended to listen more to others and were open towards other entities' needs.

The second reason was that client entities also recognized the differences in the way that each entity operated. Specifically, given that clients consist of both the university and the government entities, some services provided to the university may be

undesirable for the federal government. However, the goal of the IT cooperative was to have one Service Level Agreement (SLA) with all client entities. In order for this goal to be achieved, clients needed to understand that a package of services would have to be offered. Although clients did not have to use all the services being offered, they did need to accept the whole package and share the costs of those services that came with the package. With the recognition of the requirement for a single SLA, client representatives were also encouraged to be more wiling to listen to the needs of the other entities.

Our exploration of the control issues implied that clan control was carried out in the IT governance council, as individual stakeholders' expectations were shaped by collective views to certain extent. However, clan control had not yet become prevalent in the IT governance council and some client entities were still emphasizing on their individual needs and expenses, without sufficient acceptance of collective requirements. As indicated by the following comments provided by one interviewee, this was a major barrier for achieving agreement amongst stakeholder groups:

> "We are coming from different places…the university has certain requirements but we all have different users. There are different expectations placed upon each of us. Therefore, our expectations for the next level are going to be different. As far as what is provided, I hope much of the NITC members take the same approach as I do and say it is good to provide all those services even if I am not using all of them. I hope they do not mind the fact that there is a cost there whether you are using all the services or not. I know a lot of people prefer to go line by line and save a nickel here, a dime there, and a penny there. When you spend $3000 dollar on a computer and even you are working hard from 5 to 5, you are still sitting there from 5 to 8 doing nothing. You cannot get two-thirds of the time back so there is always an expense just having the overall service there. I think we all agree that having the NOC here is beneficial. I hope everybody can see that even they are not taking advantage of every service, somebody is and therefore that helps for justifying the NOC here, then it is a good thing…I think it will make it a lot easier to achieve an agreement within the NITC."

5.1.3.2.3 Coordination of NOC-Related Activities

Regarding the coordination amongst stakeholders, interviewees from the NOC suggested that in the IT cooperative, NOC-related activities were mostly coordinated through interpersonal interactions, but also through pre-established rules and procedures, including the NOC charter based on the Memorandum of Agreement. These rules and procedures loosely defined some of the tasks that the NOC needed to perform.

> "It is a very broad statement of what the responsibilities are for the NOC. There aren't any specific responsibilities and this leads to a lot of misunderstandings. On the one hand, having a very broad tasking for the NOC is good because it gives some latitude. But on the other hand, in introduces opportunity without a written risk of you will do this, you will not do that, and that gives a lot of room for misunderstanding…So if we had a line by line, however many lines there was, you will do this, it will probably be better. But at the same time, it would be restricting us from being able to be flexible to do things for people that we probably will do anyway."

As indicated above, impersonal coordination through formal document was implemented, which was consistent with our proposition that it is because stakeholders in the IT cooperative are all from the same knowledge domain and have the ability to understand each other. However, impersonal coordination in the IT cooperative was based on loosely defined rules and procedures, leaving rooms for misinterpretations. Although not directly revealed by the data, we suspected that in the IT cooperative, impersonal coordination through well-defined rules and procedures would work better, as compared to loosely-defined rules and procedures, in improving the alignment of stakeholders' expectations.

In the IT governance council, personal coordination was relied on more heavily. One interviewee from the NITC suggested that he felt that simply sending in requests through impersonal methods such as emails was not helpful in getting the job done. Rather, he preferred to work with one or more of the NOC members in person because "it

is much easier to stop at their cubicle than sending an email all the time". Another interviewee also commented that:

> "Frequently when I need something done, rather than sending emails back and force, I walk down there and I like having them (NOC members) in the building so that I can do that. It makes it convenient, and I find I work better in general talking to people face-to-face."

Just as we expected, this interviewee further suggested that with such interpersonal coordination, misunderstandings or misinterpretations derived from different knowledge domains might be minimized.

> "I am an IT person and I am one of their base users. I found it many times if I went down and talk to somebody, first of all, if you are talking about something you do not know very much about while you are talking to someone knowledgeable, you pick up small pieces of information. You might understand better why they want to do things certain way."

However, it seemed that the alignment of stakeholders' expectations could not be achieved simply through interpersonal coordination, whereas impersonal coordination was equally important. Currently, there were ad hoc procedures on how to coordinate certain NOC-related activities, but there lacked a formal policy. As one interviewee put it:

> "My view is that you need the road before you can set the laws how to drive the road. That is where a lot of frustrations are coming in. We were slowly starting to get road up and running. Now we want to know how fast can we drive? Are we allowed to make a right turn on the red? Will I get a left-turn arrow at the stop light?...There is nothing firmly established in it. From the OU side, we are governed from the different side of road than the federal side, mostly of which falls under OU IT policies. But where are these policies? They are either a draft form or do not get written until after. A policy is supposed to help make consistency, and a lot of times we do not see that consistency…. Usually the case is that when you are a small group, not having things written down all the time is not necessarily a bad thing. It is probably a good thing. It is probably a better thing. But as the organization grows and the umbrella grows, more and more people start to interplay then it becomes more important to have something written down."

Through interpersonal coordination, stakeholders from different knowledge domains were enabled to exchange tacit knowledge to have a better understanding of the perspectives of the others. However, interpersonal coordination will be effective only when both parties are willing to exchange their cognitions at a deep level. Due to various reasons, stakeholders from one group may feel reluctant to share with the other groups how they really think. Under such circumstances, a pre-established policy will help the stakeholders lacking necessary information to understand why certain information is hidden, or how to get work done with the lack of certain information. Currently, only ad hoc or loosely defined documents (e.g. MOA) are available, leaving room for misinterpretations. A formal policy that specifies and justifies the rules and procedures regarding how to get the work done is necessary. As indicated in the comments below, impersonal documentation played a role of creating transparency amongst multiple stakeholder groups.

> "There has to be certain level of transparency. There has to be no hidden agendas…You have to be open about what your policies are and why you want to things certain ways."

5.1.3.2.4 Communication Issues

Survey respondents reported that they used a number of channels, such as face-to-face, email, telephone, and document, to communicate with their supervisors, peers, and subordinates. Based on their descriptions, the communication in terms of the NOC-related activities might be characterized as high frequency. However, throughout the interviews, most interviewees continued to complain that communication was still a problem, especially between the NITC and the NOC members. Although frequent communication was expected to be effective in helping stakeholders exchange individual perceptions, it was indeed ineffective in the current situation. We explored this issue

with several interviewees and found out that the problem lied with the lack of a two-way communication. For instance, one interviewee from the NOC said that:

> "I give the NITC members quite a bit of information, like for instance, when the University needs to have their third Sunday's maintenance, or we have to do some emergency work. I rarely get any feedback from them that was useful, that was helpful, or that they forwarded on to their staff, or if they didn't forward it on to their staff. So it's hard to know how good that information is, how useful it is for them. But it's something that I know could be useful. I am a bit frustrated that I don't get any more feedback from them. There are many times that we don't get the feedback that we might otherwise feel like we get, and that's kind of related to this, it's like I go to visit someone and found out through another channel that they have an issue that they never brought up with me. Such a non-feedback communication creates barriers for us to understand the other party."

Once we explored this issue with interviewees from the NITC, we realized that the reason for this non-feedback communication had something to do with a lack of trust between the NITC and the NOC members, which could be attributed to the historical evolvement of the NOC. This was explained well by one interviewee:

> "From what I understand, OU IT did not want to have a work operation center in the building. They've got IT staff on campus. 'Just another building,' they said, 'that we can manage it from here.' But we need an operational unit in there. We can't be dependent upon OU IT that is a mile or two miles away and only accessible by phone. We need people on the spot."

The NOC was established with the hope that it was going to be protective of the NITC members and service the NITC members. However, once the NOC was put into place, the NITC members started to feel that the NOC was actually a way for OU-IT to "put their people in the building", and "they are an arm of OU-IT, and they wear OU-IT label". With such realization, resentment arose amongst the NITC members toward the NOC, and they became less willing to have open communication with the NOC.

The second reason for the lacking of trust between the NITC and the NOC members was the performance of the NOC. According to one NITC member:

> "Too many promises made by too many people that this stuff is going to be up and running but it is not, and we do not see that progress is made… Now people are going to close up and protect themselves."

Apparently, the NOC missed several deadlines to deliver certain services. Such poor performance frustrated client entities and discouraged them to keep communicating their needs with the NOC. Without continuing communication, the NITC and the NOC members are likely to have more disagreement regarding the roles and responsibilities of the NOC.

The communication problems have revealed a trust issue at a deeper level. Trust is critical especially in an inter-organizational context. Just as indicated by a NOC manager:

> "Ultimately that any consensus achieved is going to involve two things: compromise from the NOC first, the second is the overcoming the fear of lack of control by the NITC, and those are the two things that have to be achieved. So in order to do that, you have to build trust. That is the first and the most important critical thing by far, is building trust between these two groups. Trust can be developed by ongoing interactions, successes by the NOC, success in terms of the NOC and the NITC collaborating on things."

In conclusion, the NITC and the NOC members used a variety of channels, such as face-to-face, email, telephone, and document, to communicate NOC-related activities. Despite frequent information exchange, communication problems still existed especially between the NITC and the NOC. Themes surfaced from the interviews pointed to two issues: failure to communicate and lack of feedback. Specifically, one of the communicating parties might have failed to inform the other part when certain issues came up, or failed to explain why certain actions were carried out. Also, feedback might have been neglected, disallowing the other party to know whether a solution to a particular problem was effective.

5.1.3.2.5 Mission Statement

To capture the effects of an organizing vision, we used several survey items to surface the meaningfulness of the existing mission statement. Through interviews, we further explored the effects of the mission statement with the following findings.

First, the mission statement (a.k.a. Memorandum of Agreement – MOA) was developed by two members of the NOC, and superiors from OU-IT and NOAA before the NOC was a formal entity. There were two initial purposes of the mission statement:

> "One was to enable the creation of the NOC not from a building perspective but from political perspective above the building. So we would have something that made enough sense to let the people in Washington D.C. and the people in the president office at OU see there is an actual need and possible funding sources that this could actually happen. The other was to attempt to clarify to the people in the building what would be offered by the NOC"

Client entities from the OU side did not get actively involved in the formulating process of the mission statement. However, representatives from these entities were fighting for more decision rights, and they argued that:

> "My understanding from the NICT members even before the mission statement was put together was that things will be offered as a service. But it would be up to each individual group what service they would take part in. Now I feel like that the NOC was just trying to just take it and say that 'we are doing this, you don't have a choice'. I am trying to fight back and say I have to be part of the decision."

> "I think the memorandum agreement is that type of thing like a document helps define the boundary and the boundary actually wonders. Each unit should be able to dictate what services and what level of support that boundary exists."

Second, the mission statement was designed to be a general statement, because:

> "The mission statement represents what the goals of the NOC are and what the visions of the NOC are. In it should be very high level terms like we desire to provide good service, we desire to meet our customers' needs, we desire to be customer-oriented."

The NITC members suggested that:

> "The mission statement has been rendered almost pointless because it is too ambiguous and too broadly stated…there are too many vague things that open up too many holes. This is part of what we are seeing now and we need to go back and address that."

> "The memorandum agreement is to try to define a middle ground. But the problem is that the middle ground is not black and white. The end result is that no one fully understands it at the work level. The higher-up feels really good and it feels like that they are still in control. The people that have to implement it and work on the guidelines were scratching their heads because it really doesn't define anything."

The mission statement of the NOC as specified in the MOA helped get the NOC established, but needed update or modifications as the NOC continued to evolve. As we observed, most NITC members did not perceive the MOA to be understandable or realistic. Yet the mission statement of the NOC has a major influence on whether the NITC member will share similar thoughts with the NOC regarding the roles and responsibilities of the NOC. Therefore, it might be compulsory for the NITC and the NOC members to have on-going discussions about the MOA and to make necessary changes along the way.

5.1.3.3 Summary of the Interviews

To summarize, the following themes emerged from the first wave of the study based on the interviews with study objects.

Performance Evaluation: The performance of the NOC was not formally evaluated in any way. Given that the NITC members and the NOC members come from different operational domains and have divergent interests and objectives, the absence of an evaluation systems of the NOC's performance might become a barrier for the NITC and the NOC members to achieve mutual understandings of the roles and responsibilities of the NOC, resulting in greater expectation misalignment between the NITC and the NOC.

Service Level Agreement: The goal of the NOC was to have one Service Level Agreement (SLA) with all client entities. From the NOC's perspective, having multiple SLAs with multiple groups was the easiest thing to achieve in the short-run, but was difficult to execute in the long-term relationship. To implement a single SLA with multiple clients required client entities to understand that a package of services would have to be offered. Although clients did not have to use all the services being offered, they did need to accept the whole package and share the costs of that package of the services. It also required client representatives to be more wiling to listen to the needs of other entities. Given that some clients might feel reluctant to pay for the services that they did not actually use, it became challenging for a single SLA to be negotiated and agreed.

Policies and Procedures: Interpersonal interactions were heavily relied on to coordinate NOC-related activities. Through personal coordination, stakeholders had better understandings of the problems at hand, and misinterpretations derived from different knowledge domains could be minimized. However, besides interpersonal coordination, only ad hoc or loosely defined documents (e.g. MOA) regarding how to get things done were available. Yet, a loosely define document left room for misinterpretations and led to misunderstandings between the NITC and the NOC. In comparison, formal rules and procedures, which specifies in detail what are allowed or disallowed under the policy of the university and the federal government, may help justify certain actions taken by either the NITC or the NOC and create transparency amongst multiple stakeholder groups.

Inter-Organizational Communication: The NITC and the NOC members used a variety of channels, such as face-to-face, email, telephone, and document, to communicate the roles and responsibilities of the NOC. Despite frequent information exchange, communication problems still existed especially between the NITC and the NOC. Themes surfaced from the interviews pointed to two issues: failure to communicate and a lack of feedback. Specifically, one of the communicating parties might have failed to inform the other party when certain issues came up, or failed to explain why certain actions were carried out. Also, feedback might have been neglected to let the other party know whether a solution to a particular problem was effective. The NOC is currently configuring a trouble ticket tracking system. Once implemented, it should help with tracking requests, issues, and changes, and hopefully will resolve some of the communication problems.

Mission Statement of the NOC: The mission statement of the NOC as specified in the MOA helped get the NOC established, but had not been revised or clarified since it was first started. Most NITC members did not perceive the MOA to be understandable or realistic. In other words, the NITC members did not find the mission statement very useful. Yet a major role of the mission statement of the NOC is to shape individual perspectives held by stakeholders from multiple groups and to create a community understanding of the roles and responsibilities of the NOC.

5.1.4. Feedback of the Study Results

5.1.4.1 Council of Directors Meeting

Issues emerged from the first wave of data collection were summarized in a report, and was delivered to the NITC and the NOC leadership. One week following the delivery of the report, the co-chairs of the NOC called for a meeting to meet with the co-

chairs of the NITC as a group to discuss how they could improve the NOC's performance. One issue they put emphasis on was the communication between the NITC and the NOC. The leadership felt that in order for trust to be built amongst the NITC and the NOC members, actions should be taken to improve the inter-organizational communication. The leadership also felt that the mission statement of the NOC should be revised, given the NITC members and the NOC members had different interpretations of the mission statement. However, it was also addressed that the mission statement was an issue at a higher-level, and should involve the Council of Directors (COD).

The report was passed on by the NITC co-chair to the Dean of the College of Atmospheric and Geographic Sciences, who is one of the co-chairs of the COD. A copy was also sent to another member of the COD, who is funding this study. On April 10, the COD held a meeting and the primary researcher was able to attend as an observer. The Dean of the College of Atmospheric and Geographic Sciences asked the researcher to briefly explain our study to the COD and to give an overview of the report put together based on the first-round data collection. Afterwards, a COD member pointed out that the communication at different levels seemed to be an issue. The Dean of the College of Atmospheric and Geographic Sciences also made a comment that the MOA should probably need to be revisited.

Before this COD meeting, we had some difficulties in getting the NOC's manager to comment on the report. It seems that he felt insecure with the patterns revealed by the report and thought that the report would be used by the NITC as a way to blame the NOC. At the COD meeting, the CIO of OU-IT was also presented. The primary researcher was informed that the CIO only showed up at the very first COD meeting

before this one. However, there was no “finger pointing” at the COD meeting, and most comments made about the report were reasonably objective.

After the COD meeting, one of the NITC co-chairs sat down with one of the COD members to follow up on his view on the report. He reported that the major issues currently facing the NOC and the NITC were communication and trust-building. Furthermore, he pointed out that it was now probably the time for the COD to jump in to not only revisit the MOA, but also be more supportive of the NOC so that the NOC could be less dependent on OU-IT but more responsive to the users to truly serve for the benefits of all the entities in the NWC building.

5.1.4.2 Monthly NITC Meeting

Following the COD meeting, the regular NITC meeting was held the next day. Different from the previous meetings, the NOC manager started to report the progress of those items on his whiteboard to inform the NITC members how things were going. The NITC members agreed to leave this report as a standard item on the agenda and have it done at every NITC meeting from now on.

One of the NITC co-chairs also communicated to the NITC members about issues surfaced at the COD meeting, and commented on the report we produced for the NITC and the NOC leadership. He emphasized the importance of this report and called for a meeting in one or two weeks amongst the NITC members to discuss the report. He also called for suggestions on how to improve the MOA.

5.1.4.3 Additional NITC Meeting

Another NITC meeting was held one week after the regular NITC meeting to discuss the report we delivered to the leadership. 2 NOC members and 9 NITC members

(7 from OU and 2 from NOAA) attended this meeting. The meeting started with a brief discussion of the report, and the Q&A on the results presented. Then some members suggested that they needed to start with the big picture by addressing the grey areas of the MOA and what should be clearly stated. Along with this topic, the members realized that in order to specify the grey areas, they had to do it service by service. And that led to the discussion of SLA.

Both sides agreed that whatever services to be provided by the NOC should be covered by what the NITC members were now paying. However, whether that money should be used in the areas where it was most needed became an issue. One NITC member from OU directly communicated with the NOC leadership that they only expected the NOC to serve as a Network Service Provider and to make sure that the network for the whole building was up and running all the time. All the other services (such as web servers etc) were extended services and could be taken care of by certain NITC groups. However, another NITC member pointed out that communication/information had to go along with the core services. Therefore, it was necessary for the NITC members to write up a document to specify what the NOC was supposed to do. This document could be used to facilitate the communication with people outside the NITC and the NOC (e.g. OU IT).

No conclusion was drawn at the end of the meeting. However, this meeting provided an opportunity for the NITC and the NOC members to directly communicate their expectations of the NOC, and it initiated a conversation between the NITC and the NOC to identify their differences regarding the expectations of the roles and responsibilities of the NOC.

5.1.4.4 Actions to be taken

Having provided our findings to the NITC and the NOC leadership, the leadership decided that actions were mostly needed in two major areas: communication between the NITC and the NOC, and the mission statement of the NOC. It was desired that communication to be improved at different levels. Also, in order to clearly define the roles and the responsibilities of the NOC and to cultivate trust between the NITC and the NOC, a need for revising the mission statement was identified by the leadership.

5.1.5 Summary of the First Wave of the Study

To summarize, through surveys, interviews, and observations, we found that organic controls (e.g. clan controls) were implemented in the IT governance council, while mechanistic controls (e.g. both process control and outcome control) were in place in the IT cooperative. However, there was not a formal control mechanism in terms of the performance of the IT cooperative.

In terms of the coordination of NOC-related activities, personal coordination was used in the IT governance council, while both impersonal and personal coordination was in place in the IT cooperative. Yet, only ad-hoc or loosely defined document existed and there lacked formal policies and procedures regarding what services should be provided and how those services should be provided.

In terms of communication, vertical communication was more common in the IT cooperative, while horizontal communication was heavily relied on in the IT governance council. Greater communication was observed in the IT cooperative than in the IT governance council. In addition, two-way communication was more common in the IT governance council than in the IT cooperative. On another note, there were two major

issues with the communication between different stakeholder groups: failure to communicate and a lack of feedback.

Regarding the organizing vision, stakeholders in the IT governance council did not find the mission statement of the NOC very useful, because the mission statement lacked accuracy to some extent. A revision of the mission statement seemed necessary to keep it consistent with the actual situation of NOC-related operations. Particularly, it might be worth exploring whether it was feasible for the IT cooperative to have one single service level agreement with all the entities in the national weather building.

Lastly, expectation misalignment between the stakeholders in the IT governance council and those in the IT cooperative was more problematic than the expectation misalignment within either of these two groups. Furthermore, the performance of the IT cooperative was not yet satisfactory.

5.2 Second Cycle Action Research

Surveys were sent out again to 12 NITC and 5 NOC members in mid-April for our second round of data collection. Similarly to the first round of data collection, we formatted the surveys in electronic forms and emailed them to the target respondents, requesting them to download the file and fill the survey upon their agreement to respond. One NITC member from NOAA opted out of the study due to his time constraint. One NITC member from OU did not respond because his unit has not yet moved into the new building. On the NOC side, an operational staff and the NOC ITSO did not respond; they were less participative in the NITC meetings. Emails and phone calls were made to follow up the responses. After three weeks, 10 NITC members (7 from OU and 3 from NOAA) and 3 NOC members returned their completed surveys, resulting in a 76.47% response rate.

5.2.1 Survey Results

5.2.1.1 IT Governance and Organizing Vision

Figures 5.2.1a and 5.2.1b summarize the means and the standard deviations for all the items in the first two categories as responded by the NOC and the NITC members, with larger number indicating greater degrees of each variable.

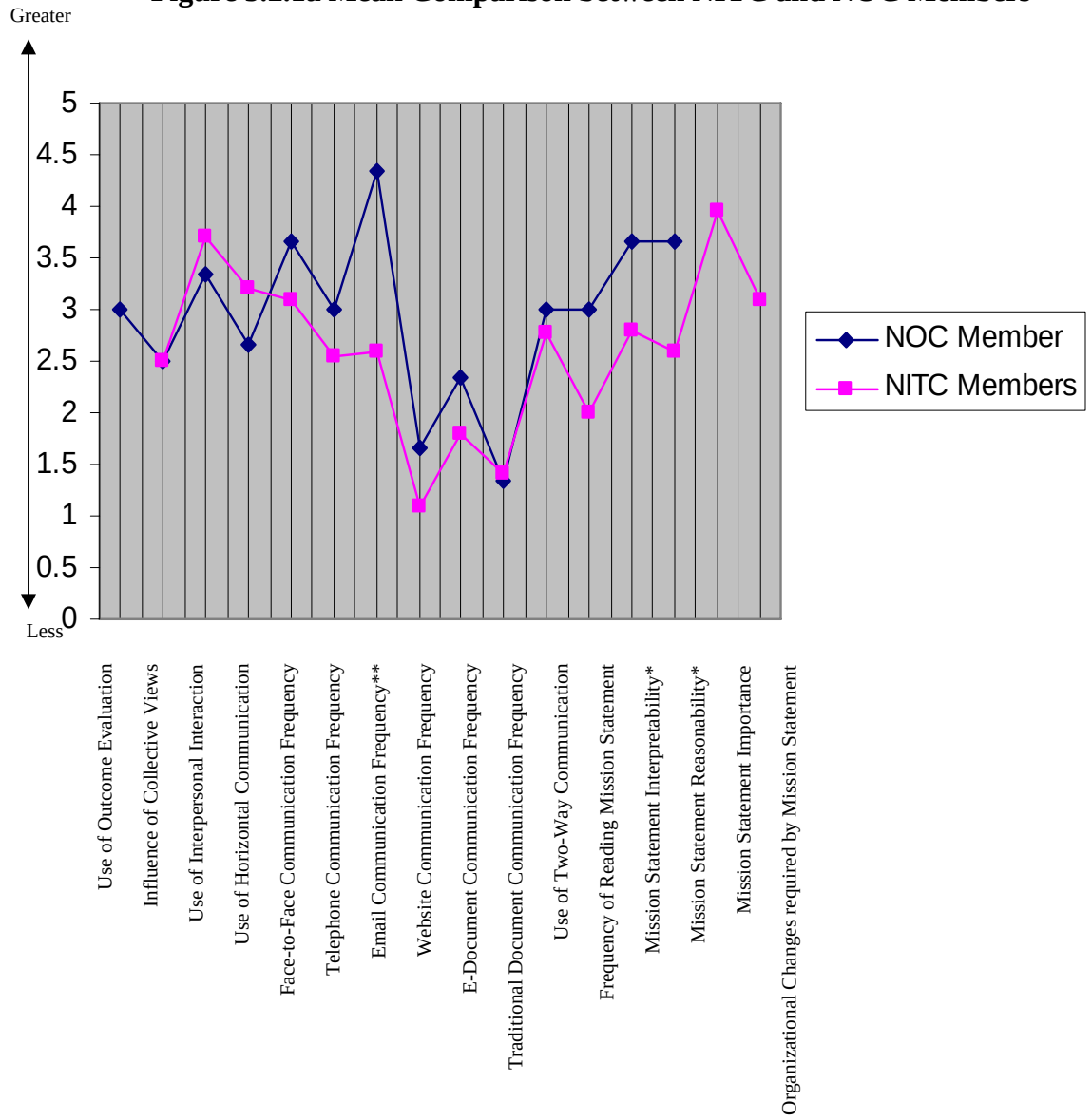
All the responses reflect the perceptions of the NOC and the NITC members. Table 5.2.1 represents the major differences between the responses from the NOC and the NITC members.

Table 5.2.1 Differences between the NITC and the NOC Members

Construct	NITC	NOC
Mode of Control	Individual views	• Process and outcome control • Individual views
Coordination mechanism	Personal coordination	Personal coordination
Communication structure	Horizontal communication	Vertical communication
Communication frequency	Less frequency	Greater communication
Communication direction	One-way	Both one-way and two-way
Organizing vision	Not perceived to be very meaningful.	Perceived to be more interpretable and realistic

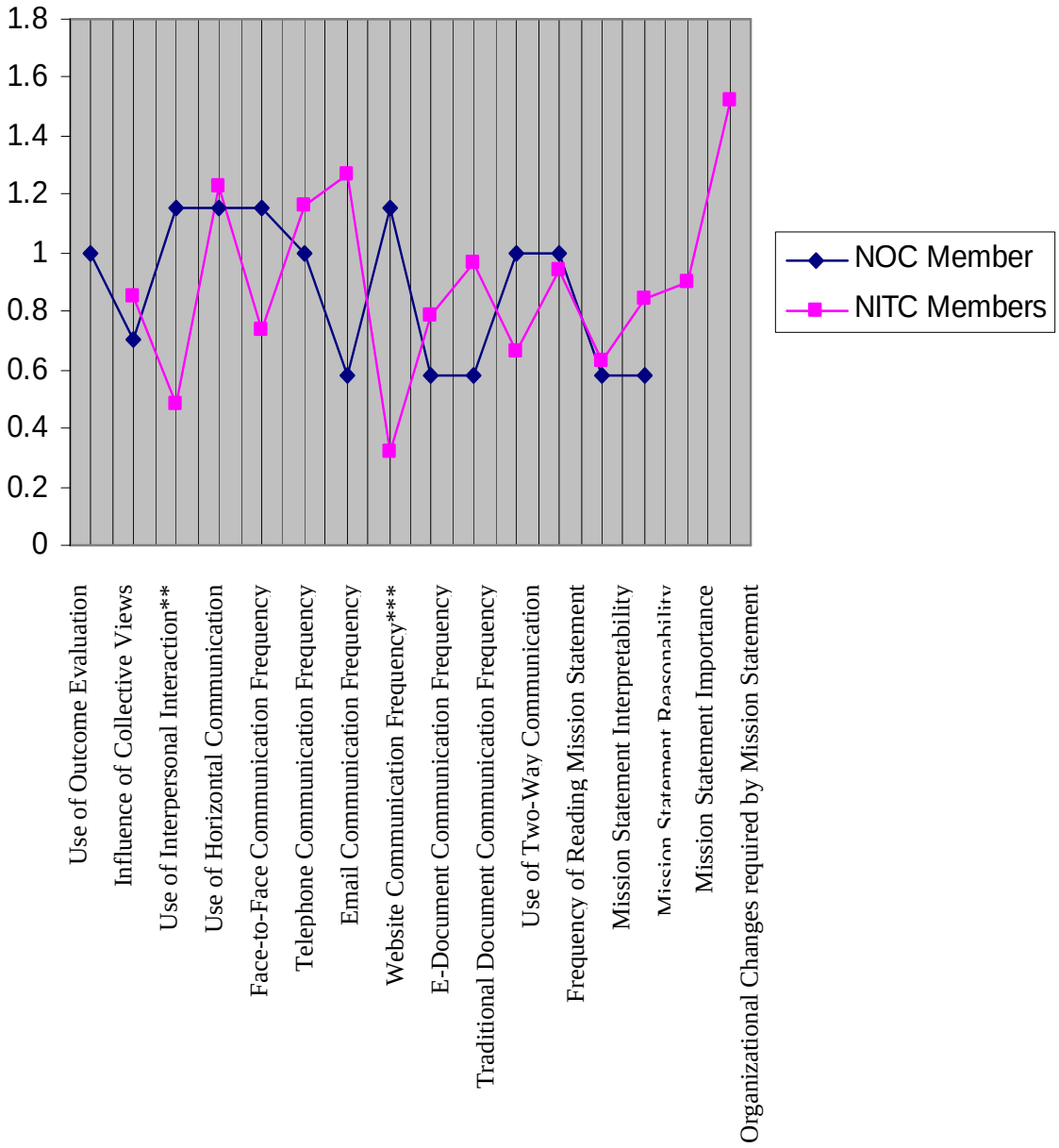
The variances of the NITC members' responses were significantly different from the variances of the NOC members' responses for the following items: 1) the use of interpersonal coordination (significant at $p<.05$), and 2) the use of web-based communication (significant at $p<.05$). The figure suggests that the NOC members had greater differences of opinion amongst themselves than did the NITC members regarding the use of interpersonal coordination and web-based communication.

Figure 5.2.1a Mean Comparison between NITC and NOC Members



** The difference is significant at P<.05
* The difference is significant at P<.10

Figure 5.2.1b Comparison of Standard Deviations
(Between NITC and NOC Members)



*** The difference is significant at P<.01
** The difference is significant at P<.05

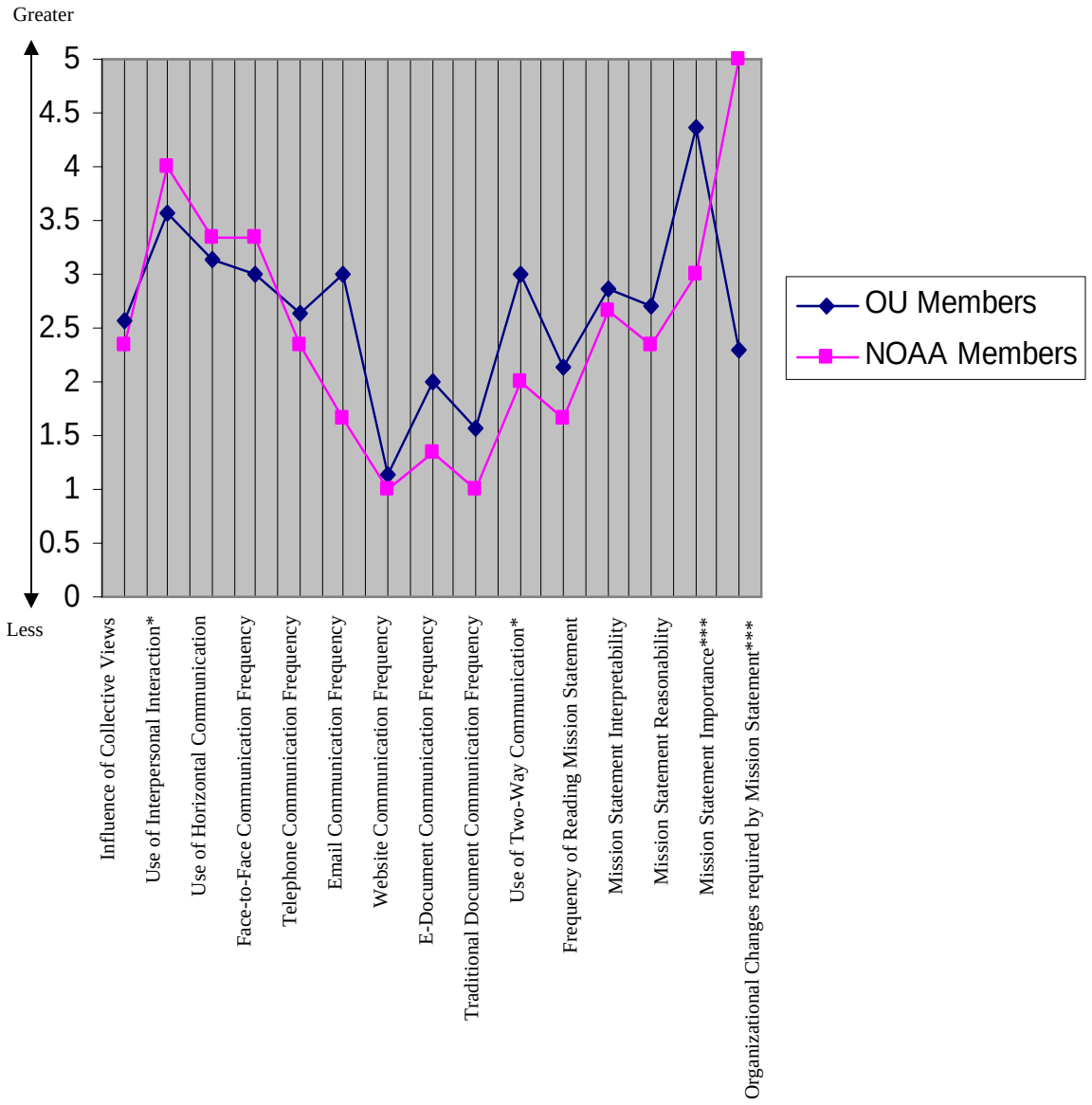
We also explored the differences between the OU and the NOAA members, as presented by figures 5.2.2a and 5.2.2b. The major differences between the OU and the NOAA members are displayed in Table 5.2.2.

Table 5.2.2 Differences between the OU and the NOAA Members

Construct	OU	NOAA
Mode of Control	Less clan control	More clan control
Coordination mechanism	Less personal coordination	More personal coordination
Communication structure	Less horizontal communication	More horizontal communication
Communication frequency	Greater communication	Less communication
Communication direction	More two-way	More one-way
Organizing vision	Perceived to be more meaningful	Perceived to be less interpretable, realistic, and important, and requiring more organizational changes

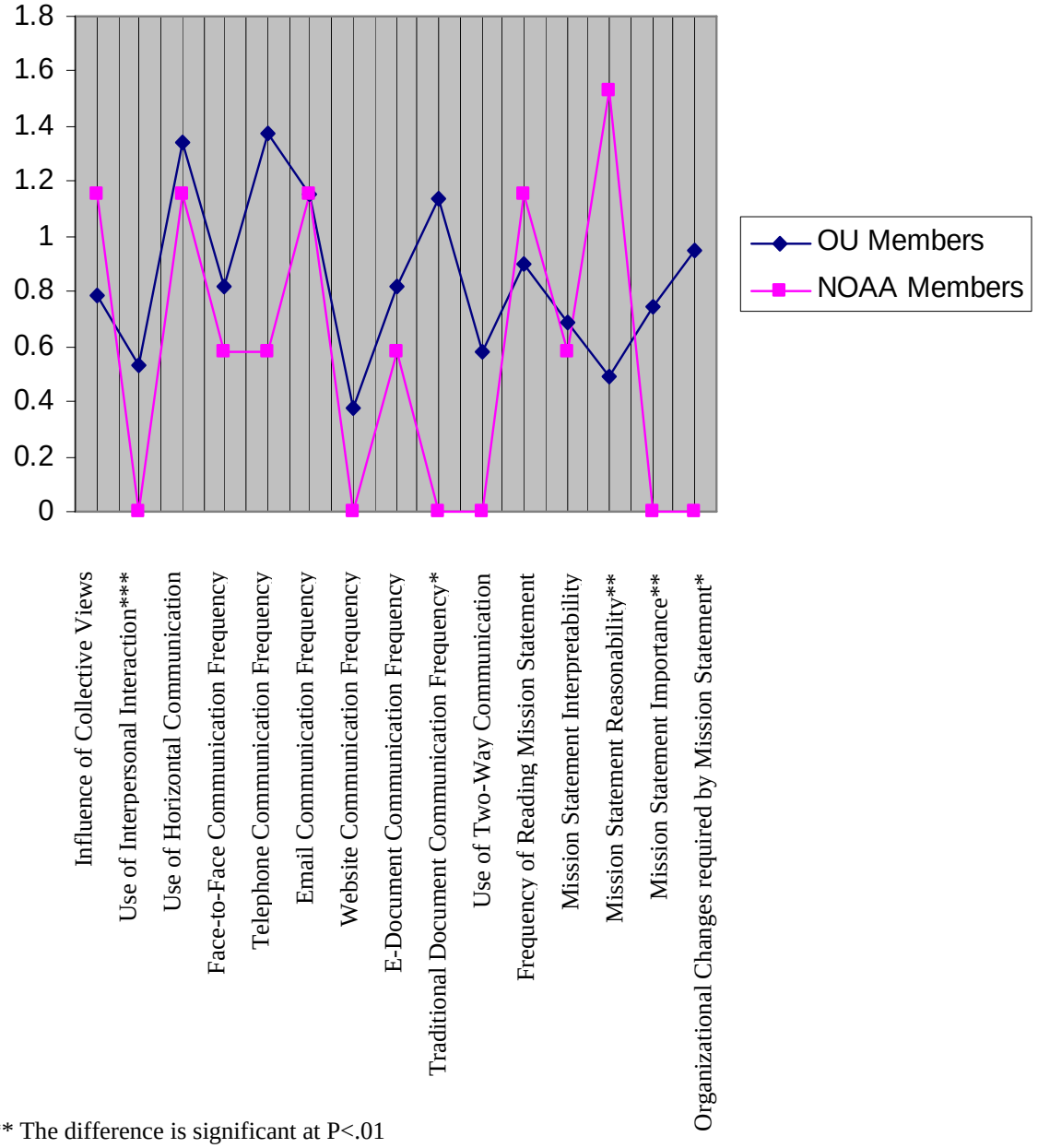
Regarding the standard deviations, the OU members had greater differences of opinion amongst themselves than did the NOAA members regarding the use of interpersonal coordination (significant at $p<.01$), the frequency of communication through non-electronic document (significant at $p<.10$), the importance of the mission statement of the NOC (significant at $p<.05$), the extent to which the mission statement requires organizational changes (significant at $p<.10$). On the other hand, the NOOA members had greater differences of opinion amongst themselves than did the OU members about the reasonability of the mission statement (significant at $p<.05$).

Figure 5.2.2a Mean Comparison of between OU and NOAA Members



*** The difference is significant at p<.01
* The difference is significant at p<.10

Figure 5.2.2b Comparison of Standard Deviations
(Between OU and NOAA Members)



*** The difference is significant at P<.01
** The difference is significant at P<.05
* The difference is significant at P<.10

In the following sections, we will summarize the major differences between various groups of stakeholders in terms of the control, coordination, and communication aspects of IT governance, as well as the meaningfulness of the organizing vision.

5.2.1.1.1 The Control Aspect of IT Governance

Based on the responses from the NOC members, the evaluation of the performance of the NOC was equally based on following pre-specified procedures and outcomes, indicating that both process control and outcome control were implemented for the IT cooperative (i.e. the NOC). Furthermore, both the NITC and the NOC members reported that their expectations regarding the roles and responsibilities of the NOC were mostly based on personal views. This finding implied that clan control was not heavily relied on in either the IT governance council (i.e. the NITC) or the IT cooperative.

From the perspectives of mechanistic and organic controls, mechanistic controls (e.g. outcome and procedure controls) were continuously used in the NOC during the second wave of study. On the other hand, organic controls were not relied on so much in either the NITC or the NOC, given that stakeholders from both groups were less responsive to the collective views of other people than to individual perspectives.

5.2.1.1.2 The Coordination Aspect of IT Governance

When NOC-related activities needed to be coordinated, both the NITC members (particularly the NOAA members) and the NOC members suggested that coordination tended to occur mostly through interpersonal interactions. The result indicated that personal coordination was used in both the IT governance council and the IT cooperative regarding NOC-related activities.

5.2.1.1.3 The Communication Aspect of IT Governance

In terms of the communication structure, the NOC members communicated mostly with their supervisors and subordinates, whereas the NITC members (both from OU and NOAA) communicated mostly with other NITC members. Such a result suggested that vertical communication was primarily relied on in the IT cooperative, while horizontal communication was more common in the IT governance council.

Regarding the communication frequency, in general, the NOC members communicated more frequently through various channels about the roles and responsibilities of the NOC than did the NITC members. Therefore, there was greater communication in the IT cooperative than in the IT governance council. A comparison amongst the NITC members revealed that the OU members generally communicated more frequently about the roles and responsibilities of the NOC than did the NOAA members.

Lastly, regarding the roles and responsibilities of the NOC, the NITC members (particularly the NOAA members) tended to use more one-way communication, whereas the NOC members relied equally on one-way and two-way communication. This result suggested that two-way communication was more common in the IT cooperative than in the IT governance council.

5.2.1.1.4 The Meaningfulness of the Organizing Vision

The findings about the four dimensions (i.e. interpretability, reasonability, importance, and discontinuity) of the meaningfulness of the organizing vision demonstrated that the NOC members found the mission statement of the NOC to be more understandable and more realistic, while the NITC members (particularly the NOAA members) had harder time in interpreting the mission statement or finding it reasonable.

Therefore, in terms of the first two dimensions of the meaningfulness of the organizing vision, stakeholders in the IT cooperative tended to perceive the organizing vision to be more meaningful than did those in the IT governance council.

The last two dimensions were only compared between the OU and the NOAA members, because they were irrelevant to the stakeholders in the IT cooperative. Generally speaking, the OU members found the mission statement of the NOC to be more important to their organizations, while the NOAA members felt that their organizations had to make substantial changes in order to fully leverage the services specified by the mission statement.

5.2.1.2 The Roles and Responsibilities of the NOC

In this section, we will first look at the expectations of the NITC and the NOC members regarding the roles and responsibilities of the NOC. Then, stakeholders' expectations will be compared within the NITC and within the NOC, as well as between the NITC and the NOC, to examine the extent to which expectations are aligned in different stakeholder groups. Lastly, a summary of the findings regarding the roles and responsibilities of the NOC will be provided.

5.2.1.2.1 Expectation Alignment

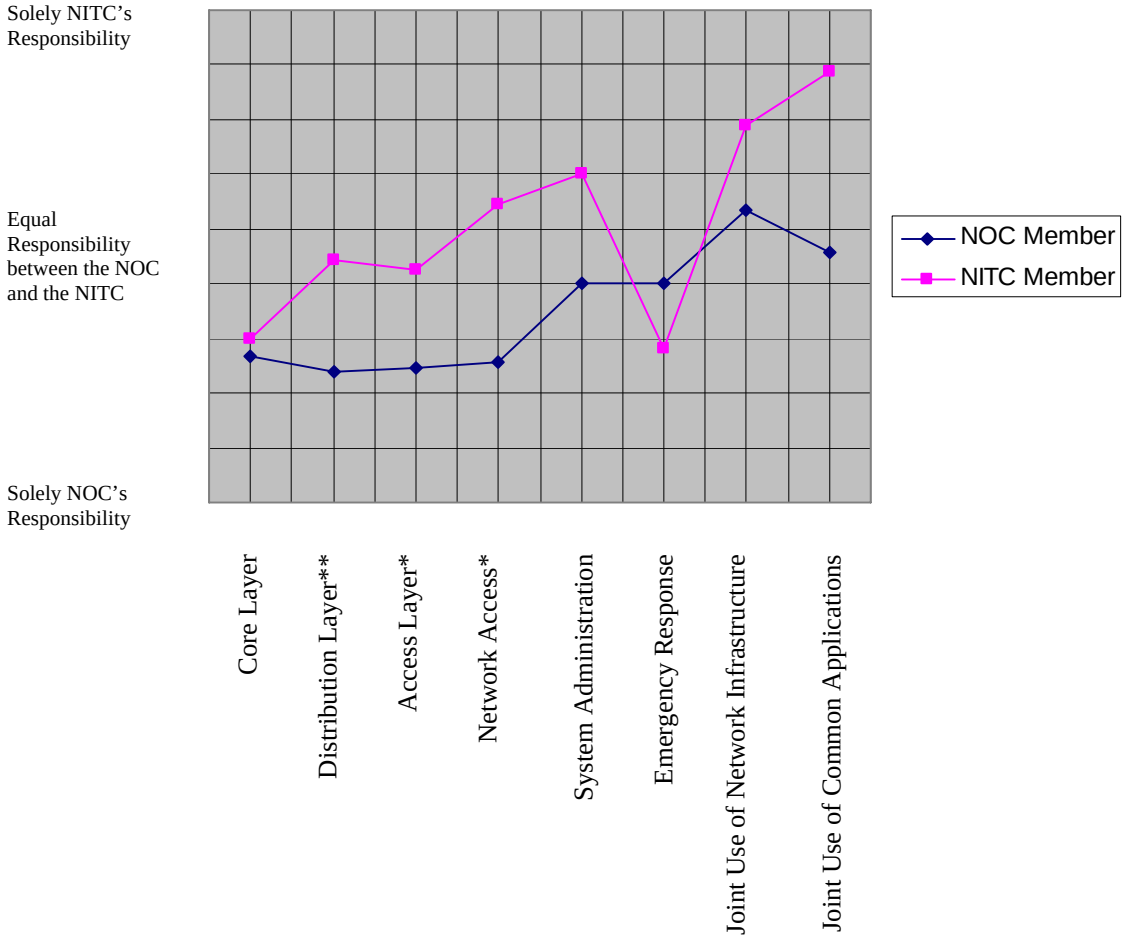
Like what we did in the first wave of data collection, a list of network services, classified into eight major groups, was provided to capture stakeholders' expectations of the roles and responsibilities of the NOC and the respondents were asked to indicate who should be expected to offer each service (e.g. by the NOC, or by the NITC). Figures 5.2.3a and 5.2.3b present the means and the standard deviations for each group of the services as responded by the NOC and the NITC members. We found that except for the

core layer of the network, the NITC and the NOC members had quite different opinions about who should provide the other seven groups of services. The major differences between the responses from the NOC and the NITC members' were the following:

- The NITC members felt that responsibilities of most services under the distribution layer (significant at $p<.05$) and the access layer (significant at $p<.10$) of the network should be equally shared between the NITC and the NOC, whereas the NOC members felt that they should be mostly responsible for these services.
- The NITC members thought that network accesses should be mostly the NITC's responsibilities, while the NOC members thought that it should be mostly the NOC's responsibilities (significant at $p<.10$).
- The NITC members thought that most system administrations, joint use of network infrastructure, and joint use of common applications should be more of the NITC's responsibilities, while the NOC members felt that these responsibilities should be equally shared between the NITC and the NOC.
- The NITC members thought that most emergency responses should be more of the NOC's responsibilities, while the NOC members felt that these responsibilities should be equally shared between the NITC and the NOC.

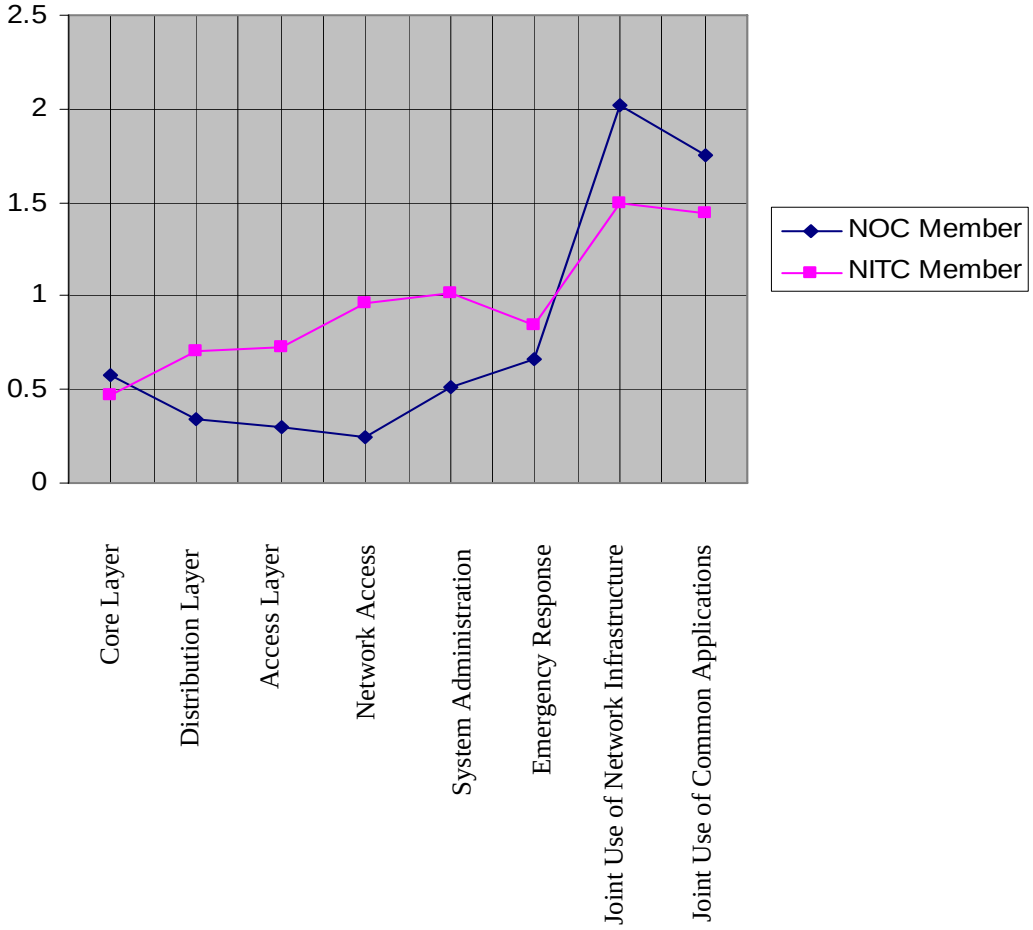
Regarding the standard deviations, the variances of the NITC members' responses were not significantly different from the variances of the NOC members' responses.

Figure 5.2.3a Mean Comparison between NITC and NOC Members



** The difference is significant at p<.05
* The difference is significant at p<.10

Figure 5.2.3b Comparison of Standard Deviations (Between NITC and NOC Members)



Again, we separated the responses for the OU and the NOAA members, and compared the means and standard deviations as represented in figures 5.2.4a and 5.2.4b. Here, we notice that generally, the OU members were willing to cede more control to the NOC than were the NOAA members, except for the last three categories of the services in the graph. Particularly, in terms of emergency response, joint use of network infrastructure, and joint use of common applications, the NOAA members were more willing to cede responsibility to the NOC, whereas the OU members wished to maintain more control over such network services. A conjecture possibly explaining this paradox is that the NOAA members might not be looking at the NOC for providing high-value services, while the OU members were. Thus, the NOAA members might be more willing to have the NOC manage these services compared to the OU members. Specifically:

- The OU members felt that responsibilities of most services under the distribution layer and the access layer of the network should be more of the NOC's responsibilities, whereas the NOAA members felt that they should be equally shared between the NITC and the NOC.
- The OU members thought that most services of network accesses and system administration should be equally shared between the NITC and the NOC, while the NOAA members thought that they should be more of the NITC's responsibilities.
- The OU members felt that the NITC should be more responsible for joint use of network infrastructure and joint use of common applications; the NOAA members thought that these responsibilities should be equally shared between the NITC and the NOC.

Regarding the standard deviations, the variances of the OU members' responses were significantly different from the variances of the NOOA members' responses regarding the following network services: 1) system administration (significant at p<.10), 2) joint use of network infrastructure (significant at p<.05), and 3) joint use of common applications (significant at p<.05). Specifically, the NOAA members had greater differences of opinion amongst themselves than did the OU members regarding who should be responsible system administration, joint us of network infrastructure, and joint use of common applications.

Figure 5.2.4a Mean Comparison between OU and NOAA Members

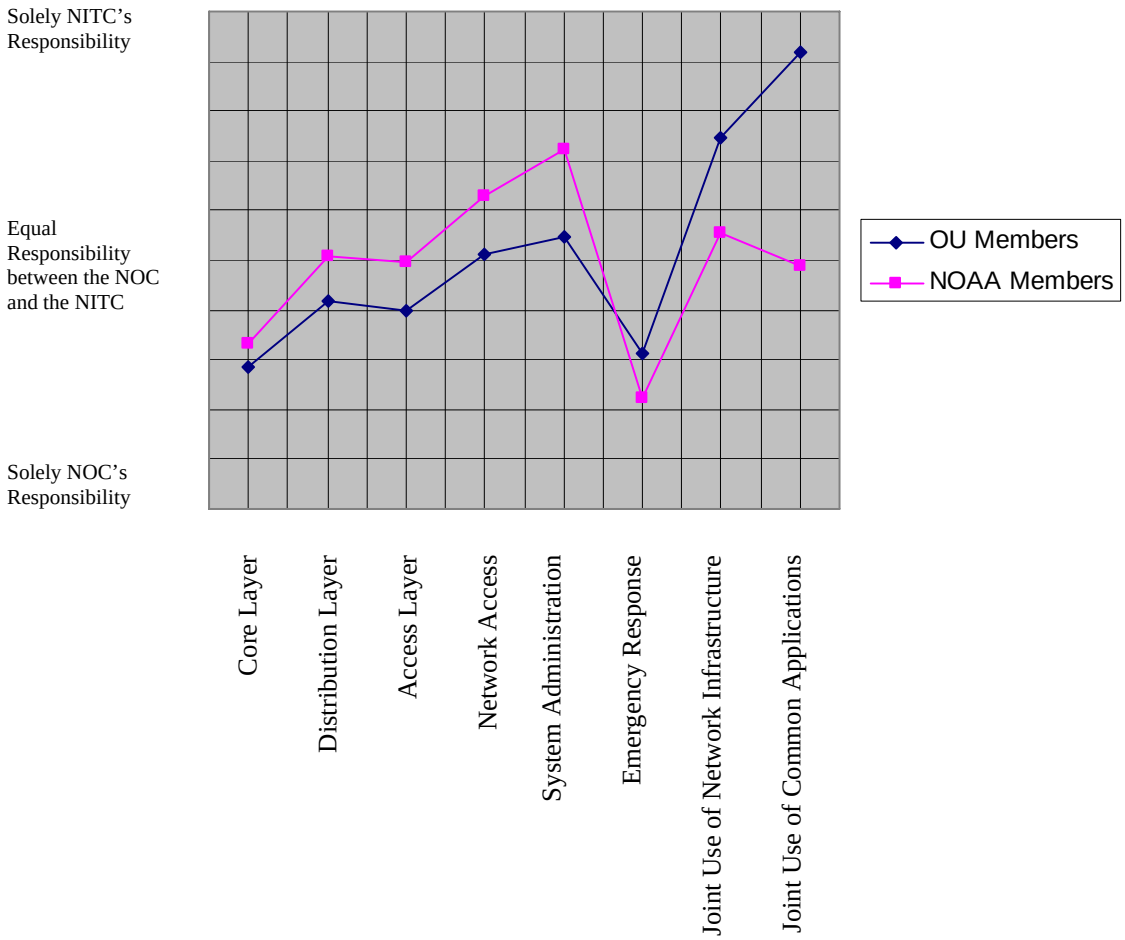
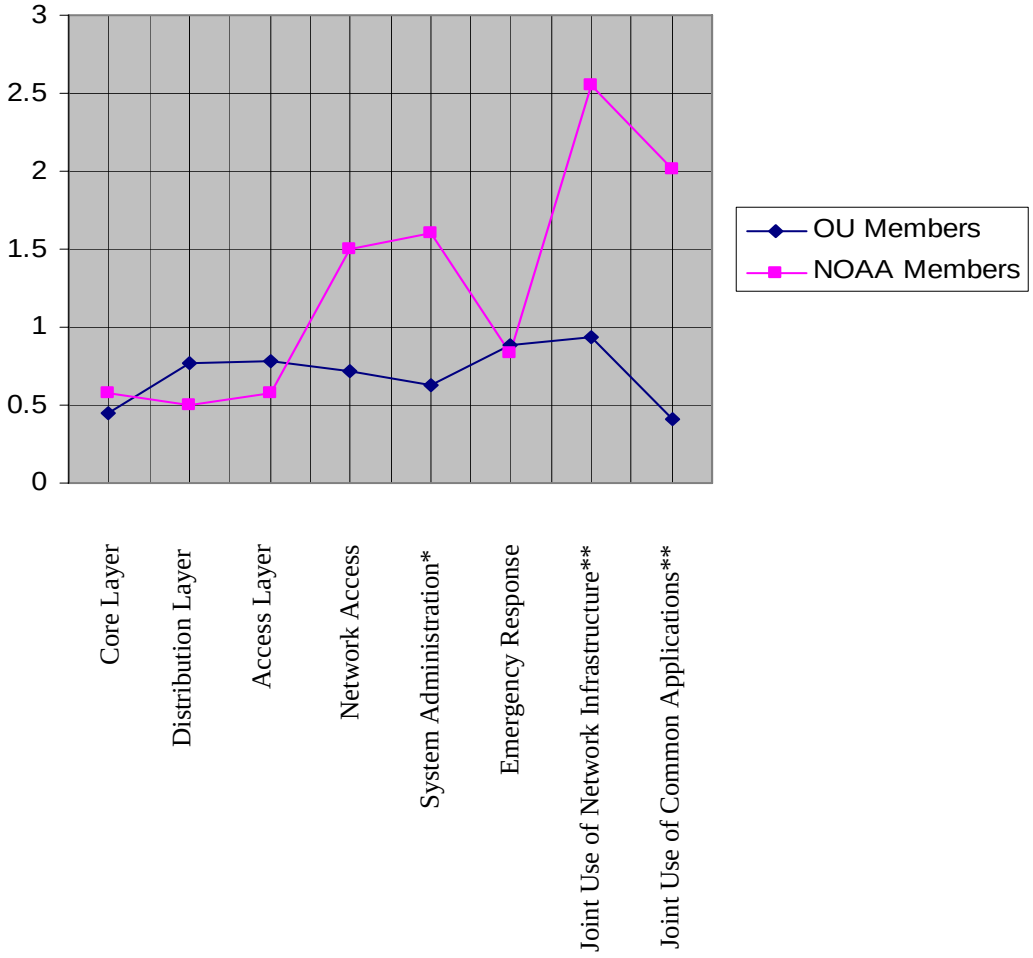


Figure 5.2.4b Comparison of Standard Deviations (Between OU and NOAA Members



** The difference is significant at p<.05
* The difference is significant at p<.10

5.2.1.2.2 Misalignment Scores

Overall misalignment of expectations amongst the NOC members and amongst the NITC members was calculated, with higher scores indicating greater degrees of misalignment within the NITC or the NOC. Expectation misalignment between the NITC and the NOC members was also calculated for each individual who responded the survey, with higher scores implying higher degrees of misalignment between the NITC and the NOC. This way, we derived two misalignment scores for each survey respondent: a) a score representing expectation misalignment *within* the NITC or the NOC, and b) a score representing expectation misalignment *between* the NITC and the NOC (Table 5.2.3a).

Table 5.2.3a Misalignment Scores

	NITC	NOC
Misalignment Within	35.71	22.00
Misalignment Between	53.12	50.78

T-tests were conducted to examine differences regarding the two within misalignments as well as regarding the within and between misalignment for both the NOC and NITC. Results indicated that misalignment within the NITC was significantly higher than misalignment within the NOC (at $p<.10$), indicating that the NITC members had more differences of opinion amongst themselves than did the NOC members. Results also indicated significant misalignments between misalignments for both the NOC (at $p<.01$) and NITC (at $p<.05$) (Table 5.2.3b), implying that the alignment issue was more problematic for stakeholders from different operational domains (i.e. between clients and IT professionals).

Table 5.2.3b T-Test Statistics

Respondents	Comparison	Mean Difference	t	df	Sig. (2-tailed)
	Misalignment Within NITC – Misalignment Within NOC	13.71	-2.174	11	.052
NITC	Misalignment Within – Misalignment Between	-17.40	-3.529	9	.006
NOC	Misalignment Within – Misalignment Between	-28.73	-7.284	2	.018

5.2.1.2.3 Summary

To summarize, both the NITC and the NOC members wished to maintain more control over most network services. Within the NITC, the OU members were more willing to cede control to the NOC as compared to the NOAA members except for emergency response, joint use of network infrastructure, and joint use of common applications. When we examined the expectation misalignment in detail, it was noted that stakeholders in the IT governance council had greater disagreement regarding the roles and responsibilities of the NOC than did stakeholders in the IT cooperative. Furthermore, the expectation misalignment between the stakeholders in the IT governance council and those in the IT cooperative was more problematic than the expectation misalignment within either of these two groups.

5.2.1.3 The Performance of the NOC

When we examined the mean values reported for the performance of the NOC, we noticed that both scores were still moderately low (2.5 and 2.6), which could be interpreted as: a) the extent to which the NOC personnel understood the NITC members' specific needs was between minimal and reasonable, and b) the extent to which the NOC had provided services that met the NITC members' expectations was between minimal and reasonable as well.

5.2.2 Critical Events

5.2.2.1 Email Communications

The communication between the NITC and the NOC regarding any changes, requests, and solutions remained to occur mainly through email, due to the lack of a trouble ticket tracking system. The primary researcher had been added onto the email list and received all the emails exchanged. From April 3 2007(after the first-wave results were provided to the NITC and the NOC leadership) to May 9 (the date on which the second-wave survey was concluded), there were 61 email exchanges in total, 50 from the NOC and 11 from the NITC. Most emails served the purpose of notifying network-related issues. From these emails, two critical events were observed.

1). Early April, a NITC member asked the NOC about the Aventail accounts to the students because one student affiliated with CIMMS wanted to do Windows remote desktop. However, this issue was not followed up and it was inquired again late April.

2). Early April, another NITC member complained to the NOC that the NSSL bay area's network was down because one fiber was being tested on the NWC's network. However, no advanced warning of this maintenance was ever given, and the NSSL was a little upset about it.

5.2.2.2 Observations at the NITC Meetings

There was one change at the regular NITC meeting after the first-round results were provided to the NITC and the NOC leadership. As the first thing of every meeting now, the members would go over the items on the whiteboard of the NOC manager as a way to track how things were generally going. Specifically, the NOC manager would report which tasks had been completed, and what stages the remaining tasks were at. The

NITC members would ask questions and discuss with the NOC members if they had concerns about any particular issues.

5 guests from Hawaii joined the NITC meeting in May. Currently, 7 NOAA branches are spread over the islands of Hawaii. The NOAA wish to consolidate all these sites into one building. The guests are the IT staff and they intended to learn from the NWC's NOC operation. Questions were asked to the NITC and the NOC members, in terms of how they planed for moving into the new building, how they managed their budget, etc. When the question of "what would you do differently" was raised, the NOC manager commented that "we could have done a better job having a unified voice". He further explained that given the unique three-group (i.e. the OU entities, the NOAA entities, and OU-IT) situation, it was challenging that different groups all wanted different things.

5.2.2.3 Survey Comments

Two NITC members provided comments through their survey responses regarding their interactions with the NOC over the past three weeks. Their comments were documented below:

> A). "The NOC continues to be receptive when personnel from my department approach them face to face. They also typically respond in short order to email inquiries. However, we continue to see a lack of follow-through on needed fixes and changes. It happens to me that they get involved in other projects and many times forget to check to see if an issue had been resolved. This is critical for building customer confidence."

This person also expressed his feelings about the mission statement of the NOC:

> "I feel that the mission statement could be clarified by enumerating the highest priority areas of responsibility of the NOC, which are, in my opinion, maintaining highly-available redundant network connections into NWC, response to outages, and maintenance of the network switching infrastructure. This could potentially give the NOC a more solid mandate with which to approach the numerous other projects in which they could potentially be involved."

Another NITC member commented:

> B). "I don't think that there is any respect for the individual units from the NOC's perspective. It appears that the NOC has rules and self proclaimed "policies" and that's it. Two of the NOAA entities and the NOC met to discuss their so-called "security policies" and we had the NOAA CIRT called to verify that the "policies" used by the NOC were incorrect. They are still unwilling to satisfy our needs and are more intent on compromise so it won't look like they are losing an argument. I talked to a member from the OU side of the NITC and he agrees that the NOC is looking out for the NOC, not for the customer. That's sad since they are supposed to be our watchdogs and a buffer to the OU IT environment. The NOAA NOC person has even discovered that the other NOC personnel are not doing what he has directed and has done things without consulting him first. This is against the agreement."

This respondent also made comments on the mission statement of the NOC:

> "The mission statement needs to be completely rewritten with input from the NOAA CIRT as well as the individual organizations. Currently and into the foreseeable future, the NOAA units will maintain their own services and servers that provide them. The NOC, to the federal entities, is only required to keep the network up and operational 24/7 and to maintain phone services. The mission statement was, in my opinion, voided when the SPC and the Forecast Office declared that they would have completely separate cable plants and the network infrastructures. They have even installed their own phone lines since the OU telephones are not reliable."

These survey comments pointed to several issues related to the operations of the NOC: 1) the NOC might have been occupied with too much work, and insufficient attention was given to those tasks with high priority, 2) policies and procedures should be established to specify how actions should be carried out, especially for those services with network security concerns, and 3) the mission statement of the NOC should be revised due to its lack of accuracy.

5.2.3 Interview Results

To provide context to the survey results and the critical events surfaced during the second wave of the study, we interviewed one NOC manager and three NITC members (one co-chair and two members). Interviews were recorded and transcribed, and each

interview lasted from 9 minutes to 35 minutes. From the interviews, the following issues emerged.

5.2.3.1 Major Points Made by the Interviewees

We first examined the transcripts for each individual interviewee, and identified the following major points.

Interviewee 1 (NITC Co-Chair):

- Each organization had been requested to designate someone as the point of contact with the NOC and to use email as a coordination effort to get things done.
- More face-to-face meetings had been held and more emails were being used. Yet still more communications were needed between the NITC and the NOC to help keep the NITC members informed.
- The current mission statement was pretty worthless as it was written a long time ago without knowing how the new building would actually be operated. Some part of the mission statement was completely wrong and it needed to be reworded to be more consistent with the actual situation.
- Change control policies should be put in place. The NOC did their job without taking into account how it was going to affect other entities. “There needs to be a coordinated sequence that needs to happen before anything happens to the network.”
- The services provided by the NOC were not satisfying because the NOC did not seem to understand the basic needs of its customers. Rather, the NOC tended to take many things for granted.

- The attitude of the NOC should be more service-oriented. Instead of treating its customers as students, the NOC needed to understand that the network could not go down otherwise it would affect a lot of people and cause big problems.
- Important decision made by the NOC should involve all entities. The NOC should not impose or demand the NITC entities to follow their decisions.

Interviewee 2 (NITC Member):

- There were more meetings and conversations about the roles and responsibilities of the NOC during the past three weeks.
- A mailing list had been used to coordinate NOC-related issues. However, a better procedure was needed to figure out what to do to solve a problem and who to contact.
- Issues falling into the responsibilities of the NOC were decreasing, and the NITC members had fewer questions. Yet, the clarification of the roles and responsibilities of the NOC still required good communication.
- The mission statement of the NOC did not tell much, leaving lots of room for imagination. "It is not particularly motivating or empowering. Rather, it is pretty vague." It might worth to revisit the mission statement to make sure that everyone is on the same page.
- It was going to be difficult to achieve consensus between the NITC and the NOC members regarding what services should be provided by the NOC, given different units had different needs. Members involved should not try to achieve consensus, because some services may make sense for some departments but not for others.

The NOC should focus on its primary task, which is to ensure the network is up running all the time, before trying to handle other tasks.

- In terms of the outcomes of the NOC, the NOC was not 100% there yet regarding network reliability. The NOC could be more open to non-proprietary solutions, and be more flexible with network needs.
- The NOC should be totally customer-focused and service-oriented. They should understand the criticality of the network given the nature of the research needs.
- There were other political issues with the NOC. But technically they were doing okay.

Interviewee 3 (NITC Member):

- Our unit had developed a good working relationship with several other OU entities based on our past experiences. We interacted quite frequently, and some of our individual perceptions were shaped by collective views of others.
- In addition to personal interactions, some basic contact rules existed to coordinate NOC-related activities, such as rules for handling emergency situations.
- The communication with the supervisors about the NOC had been minimal. But there were some communications with colleagues.
- The whole mission statement was rather ill-posed. The NOC, as an organizational entity, was an unnecessary layer of bureaucracy and abstraction. It had not accomplished a lot.
- The NOC should play as a partner, and they should be supportive to our network needs.

- The actual duty and the scope of the NOC needed to be written down in the mission statement. Primarily, the NOC should serve as an Internet Service Provider (ISP), by keeping all the entities connected but providing minimal services of other types.
- Before the NOC pushes all the entities to move into the internal network, prerequisites have to be met. However, many things were still not working, which severely hampered our faith in the NOC.

Interviewee 4 (NOC Manager):

- The NITC members and the NOC members had misunderstandings of the terms used in the survey, and that was the major issue resulting in the differences in their responses. The definitions of each service should be resolved, yet nobody ever clarified those terms to make sure our understandings of those services matched up.
- The NOC should serve as an ISP. But there was no need to make changes in the mission statement of the NOC, because it was intended to be broad.
- To complement the mission statement, there should be a set of policies and procedures, governing how those two groups should interact. Yet each group was waiting for the other group to complete those policies and procedures.
- The NITC meetings held several weeks ago was helpful as it forced on the issue of "what is this saying".
- There was very little trust between all these organizations, so "there is not a desire to get together and share".

5.2.3.2 Cross-Interviewee Analysis

We will now compare the interview comments across interviewees, in terms of various issues such as IT governance, the organizing vision, and the performance of the NOC.

5.2.3.2.1 Control of the IT cooperative

Inconsistent with the theory, the survey results indicated that clan control starts to play a role in the IT cooperative (i.e. the NOC). This might be due to the lack of a formal control structure of the IT cooperative, resulting in a heavy reliance on informal (i.e. clan) control, which became the only way for stakeholders to exchange individual perspectives. The relationship between the use of clan control and the expectation misalignment between the NITC and the NOC implied that when perspectives were shared informally across multiple stakeholder groups, it helped achieve mutual understandings to some extent. Yet, as one NOC member explained, the differences in the multiple knowledge domains created barriers to achieve a greater degree of shared understanding, and this issue may not be resolved through informal clan control.

> "Misunderstanding of definitions was a big issue. Those terms in the question need to be resolved so that we are all working from the same terms. Once those are resolved, I think it will be a much more fruitful conversation attempting to address where some of those responsibilities lie."

5.2.3.2.2 Control in the IT Governance Council

The NITC members reported that their perceptions of the roles and responsibilities of the NOC were shaped by collective views of other NITC members to some extent. Therefore, clan control was in place in the IT governance council. For instance, one of the interviewees indicated that the NITC members had more meetings and conversations, through which individual perspectives were influenced. As explained by another interviewee, the NITC members developed good working relationships,

through which conversations were frequently initiated and ideas exchanged. This is consistent with what we found in the first wave of the study.

> "We had this relationship with the various groups, and RCS, which was then GCN, basically administering the building IT infrastructure. We developed a very good working relationship with this group. And then I've made acquaintances, particularly with Mark, so I talk to him very frequently about some of these issues."

5.2.3.2.3 Coordination of NOC-Related Activities

Regarding the coordination amongst stakeholders, interviewees suggested that NOC-related activities were coordinated through both interpersonal interactions and pre-established rules and procedures. From the first wave of the study, the NOC charter (the MOA) was identified as one of the pre-established rules and procedures implemented within the IT cooperative, yet policies and procedures were lacking amongst multiple stakeholder groups. Results from this round of study indicated that certain rules and procedures started to emerge regarding NOC-related activities. For example, one interviewee reported that:

> "It was requested earlier on that we use email basically as a coordination effort to get ports activated, just things get done. Each organization has a person that is the point of contact between that organization and the NOC. So if somebody comes to me and say they want a port activated, it's up to me to coordinate that with the NOC. I am not sure if that's an official written policy or not, but that's what we've been using. I consider that a policy."

Another interviewee also echoed that:

> "By pre-established rules, I guess I'm thinking some of the basic contact rules. Rules for handling emergencies and situations. If I get a connection that's dead here, or some issue, sending emails to NOC and the NITC, that's kind of what I have in mind there."

However, these contacting rules were not formally written. A repeating theme here was that formal policies and procedures were still lacking, as revealed by the comments below. However, impersonal coordination was important for stakeholders

from various groups who lacked trust and were less willing to share information with each other.

> "We need a better procedure, when there are problems, to figure out what to do to solve a problem and who to contact."… "My biggest concern at now is change control policies. It seems they do things by the seat of pants, without thinking about how it's going to affect every entity that's connected at this service, or switch, or whatever they do. There needs to be a coordinated sequence that needs to happen before anything happens to the network. They need to check with all the entities. There is a change control policy definitely needs to be put in place. That's by biggest concern."

> "Policies and procedures will establish a clear delineation over who is supposed to be doing what. The line will be drawn, each person each group will have their own stand box, and that's the stand box they are playing."

> "What was always scheduled to come next but has not yet was a set of policies and procedures to govern how those two groups interact. And that is why we have all the confusion. The NOC is waiting for the NITC to complete those things, and the NITC is waiting for the NOC to complete those things."

In the IT governance council, personal coordination was still heavily relied on. The NITC members found it easy to coordinate network issues this way.

> "We have a lot of interpersonal interactions with the NOC. It is a lot easier sometimes to actually talk to somebody face to face and get an answer."

> "Sometimes I'll just email the NOC members. That's the way I've been basically interactive with the NOC. With the NITC, sometimes I'll just go and, because I am on more of an informal personal level with some of the IT, some of the NITC people, I'll just go talk to them, just go pass them in the office. That's what I use, that's the way I've been operating to try to get things done."

Based on the interviewees' comments on the coordination of NOC-related activities, it seemed that policies and procedures that were more specific should be established to define what should be done and how those jobs should be done. Government entities must conform to specific policies on various issues; OU entities also needed to abide by certain policies, e.g., in conducting life-critical research. When network services were reconfigured, changed, or unavailable, it had to be ensured that

none of these actions violated government rules or disturbed any critical on-going research. For this matter, it was important that all the NITC and the NOC members have consistent policies and procedures specifying the NOC's roles and responsibilities in detail and how network-related activities should be carried out under different conditions. However, who should make these policies and procedures remained unclear, as either the NITC or the NOC may be expecting the other party to take the first step.

5.2.3.2.4 Communication Issues

Having learned the results from the first wave of the study, most interviewees conclude that communication was a major problem between NITC and NOC members. As one interviewee explained:

> "Major issues between the NITC and the NOC members are mostly communications. The NITC members in the building need to know what's going on, things that the NOC doing behind the scenes they don't tell us about. That's mainly everybody's concern. Things that happen, all of sudden our phones are reboot. We said "what happened to the phone"? "Oh we did something." you need to tell us these things. That's the problem."

Again, the reason for such communication problems could be the lack of trust:

> "It's going to take this group a long time to work it out, because there is very little trust between all these organizations. So there is not a desire to get together and share. So these things take a long time to evolve."

Although communication remained as a problem, it was being improved over the last several weeks as reported by one interviewee:

> "We've had several smaller face-to-face meetings, there's been more and more correspondence, more and more emails being used. I have seen an increased effort to give us warnings when things are happening. It's working."

Good communication will help create information transparency. It may also help achieve mutual understanding amongst stakeholders. As put by one interviewee, "we are

still figuring out what are the roles and responsibilities of the NOC, and this issue requires good communication."

To summarize, the first wave of the study pointed to two issues of communication: failure to communicate and a lack of feedback. During the second wave of study, several interviewees and survey respondents commented that the communication between the NITC and the NOC members had improved dramatically, and there had involved increased efforts particularly from the NOC side. There were more correspondences. More emails and face-to-face interactions had been used. However, there was still room for better communication, specifically regarding the roles and responsibilities of the NOC.

5.2.3.2.5 Mission Statement

After the first wave of the study, most NITC members had started to realize that the mission statement of the NOC was fairly problematic. The reason for the lack of the meaningfulness of the mission statement was because it had not been updated with the current operational situation, and its establishment did not involve relevant people.

> "The mission statement is pretty worthless. It was written a long time ago before we moved into the building, and we had no idea how everything was going to work in here. A lot of people made decisions that probably shouldn't have been making decisions. They didn't have an idea of what was going to be like when all the different people get together. People didn't understand network issues. It's just people in D.C. with suites on say yes let's make it happen, let's do this.…We were more under the impression that they were actually going to work with us, not put up walls and say this is the way it's going to be. So once we got in here and realized what their attitude was, things started changing. Now we've been here for nearly a year, it needs to be completely re-written."

The major issue was with the DNS. The NOC members took the mission statement at face value, and they did not feel that it was necessary to make changes of the mission statement. However, the mission statement did not clearly reflect operational

situation of two NOAA entities, the SPC and the Forecast Office. These two entities had completely separate networks, and the only service they needed from the NOC was the telephones. The NOC understood the DNS was a challenging issue. But drawing upon the mission statement, the NOC members made the following comments:

> "One of the topics and questions is going to be DNS. Courtney has always run DNS for his college, and NOAA has always run DNS for themselves. In the MOA, it states that the NOC will run DNS, rather than having to call two people, Courtney and the NOC, it will be easier to just call one group have the change made once. That's one thing that'll benefit."

This idea might be implementable for the OU entities but contradicted the needs of the NOAA entities. A NOAA member particularly addressed that:

> "It's been thrown at my face a few times, that it says in there that the NOC will control the DNS, the web servers, and all that. That's not going ever to happen. So that was written without any consultation with other federal units. There is just no way that the OU or government entities is going to let the university run their services. A lot of it needs to be reworded, it'll say if desired, if required, or if needed maybe. But none of those are in there. It just says we will do this, we will do that. It's cut and dry, it shouldn't be that way…The mission statement was worded completely wrong that says that the NOC will manage these services. I don't agree with that. None of our federal entities do."

The university entities also seemed to have problems with the current mission statement. One interviewee expressed that the mission statement should focus on addressing what the NOC was devoted to do and be a statement of taking responsibilities. Interviewees from both the university side and the federal side felt it necessary to make changes in the mission statement, to make sure everyone was in the same boat. But interestingly, the interviewee from the NOC did not perceive the mission statement to be an issue.

In conclusion, a number of the NITC members felt that the mission statement needed to be revisited. As reported, one major issue with the current mission statement of the NOC was its lack of accuracy. Particularly, it did not address the boundary

conditions of several NOAA entities, who maintained their own operational networks. The mission statement was established before the function of the new building. After the OU and the NOAA entities moved into the building and started to actually share network resources, the situation of the network usage had changed from what was initially depicted in the mission statement. Also, the mission statement was perceived to be too general. Although both the NITC and the NOC members agreed that the mission statement should be stated at a high level and should involve general terms, some members suggested that the mission statement should do a better job in defining the scope of the NOC's responsibilities and should be more open to accommodate different needs of multiple organizational entities.

5.2.3.2.6 General Roles of the NOC

As reflected by the interviews, as well as observed by the researcher, the NITC and the NOC started to achieve an agreement on the general roles of the NOC. The following comment represented the expectation of the NITC members:

> "We view the NOC as basically an ISP, who gives physical connections and keeps up the network hardware, physical connections running to your wall into the outside world, and then to just leave you alone."

This perspective was communicated directly with the NOC at the last NITC meeting, and the NOC seemed to start to agree with it. However, one NOC interviewee pointed out that the NITC and the NOC members had different definitions of the network services that were supposed to be provided by an ISP, and that was a major issue for misunderstandings.

> "The first thing that needs to happen is that everyone needs to understand the terms that we are all discussing…I'd be curious to see what would happen to the survey results if we went back did the exact same survey again after everyone was using the same terms. Because I suspect that a lot of people, because all we said in that meeting was that we needed to define terms. That was fine, but nobody ever

> circled back around and say this is the definition we are using, is everybody comfortable with these. So there is still a lot of opportunity for misunderstanding."

Most NITC and NOC members agreed that the NOC should play a role of an Internet Service Provider (ISP), and to ensure the network is up running 24/7. Particularly given the needs for research collaboration between the OU and the NOAA entities, the NOC is a key component in providing a fast, reliable, scalable, and secure network that can work with changes in research needs. However, there are different levels of services involved in the roles of an ISP. It seems that there were still discrepancies between the NITC and the NOC at the granularity of services. In other words, questions remained about what services should be included into the responsibilities of the NOC and whether the same services should be provided to different entities.

5.2.3.2.7 Performance of the NOC

Given the low scores reported by the NITC members for the two items capturing the NOC's performance, we explored with our interviewees to uncover the issues underlying these negative responses. Several problems surfaced, and we could categorize them as the problems with reliability, responsiveness, and flexibility. The NITC members reported many issues with the NOC's reliability as presented below.

> "There are some outages, power and phone in particular. I had to reboot my phone 2 or 3 times after I moved in here. I understand it is the technology, but the NOC is not 100% there yet regarding reliability."

> "They've been pushing to move us off and everybody into their internal building network. And they still try to do that. But we have a certain list of prerequisite that have to be checked off before we can do that. And they haven't been done. They haven't done them and yet we still feel kind of this pressure to move over."

In terms of responsiveness, the following issues were brought up as an example:

> "One of our grad students, he wants to do this Windows, not Mac, Windows desktop from home. That has to get through this Aventail, so they have to get him an Aventail account. And I've passed it to Gary and Peter for a couple of weeks now, I think Gary is on vacation, he tried to put it off to Peter. The guy still doesn't have an account. There are two ways to do it: I can go complain to them, which I may end up doing; or the easy way is just to come on 192, which is not the way they want to go but it would get the job done. It's not a very important issue, maybe 4000 on the list of important issues, but it's something this guy has been waiting for months now… I just haven't got any response for this."

Regarding flexibility, the NITC members reported that:

> "OU prefers proprietary solutions. I think it's a wrong approach. It doesn't fit with people's computers if they are not using Windows operating systems. We are not in the 90s and it is not the case anymore that they can simply provide Windows solution and nothing else matters. For example, the projectors in our conference rooms can rise or be lowered through the control of computers. But this adjustment cannot be done with Mac. So OU IT should be more open to open source solutions… In terms of network security, I am going to do things they did not expect me to do. I need it to work and to be easy to do, but do not want to get permissions to do it. For instance, I need to plug computer in another room but may not be able to do it because of the firewall setup."

To improve the situation, the NITC members suggested that the NOC should change their attitude and be more service-oriented.

> "First by the NOC asking instead of demanding on certain things. Just getting all of the entities involved when decisions and things are made. Several times, OU has thrown the word policy out. It's policy, but it's not because they can't show us something in writing. Somebody signs and say this is policy. They have backed down several times when we called them and they said okay, it's best practices. The government doesn't work by best practices. We work by policies. It's in writing. That's the way it is... The attitude of the NOC should be more we are the customer, they need to do what's the best for us and we dictate. Right now, it seems they are acting, they are treating us as students basically. Students don't have any control of what happens. If the network goes down, oh well the network goes down. But they need to understand if the network goes down, it affects a lot of people there, but it can't affect. So that's a big issue."

Also, the NOC should focus on their primary responsibility, which was to keep the network up running before taking on other tasks.

> "In some aspects, they are not A students, but B minus or C. I'd rather let them focus on "A", or just let me do it. With 3 people taking care of the building, they

> are pretty stretch. The more services they provide, the more spread they'll be. It's not easy. So they should either do it really well, or not do it at all."

Similar to the results from the first wave of the study, the NITC members consistently expressed that there was room for the NOC to improve its performance. When explored in detail, the following areas were identified and a better job in these areas may help improve the NITC members' satisfaction with the services provided by the NOC.

- Reliability – Network reliability is critical to many entities. Because of some technical issues, there have been power and phone outages in the building. Minimization of such problems is necessary. Also, if there has to be any power or phone outages, the NITC members request to be notified ahead of time.
- Responsiveness – The NITC members complained that sometimes their requests are not responded to in a timely manner.
- Flexibility – Currently, Windows-based technologies are well supported by the NOC. However, other operating systems (e.g. Mac) are widely used by entities of the NITC. Openness of the NOC to non-proprietary technologies will be appreciated. In addition, the NITC members also wish to have more flexibility in terms of network connectivity and usage.

5.2.3.2.8 Inter-organizational Research Collaboration

One of the objectives of providing a shared network infrastructure for government and university entities is to encourage research collaboration and interaction. In order to understand the roles and responsibilities of the NOC along these lines, we conducted additional interviews with three NITC members (two from OU and one from NOAA) and one NOC member (manager) in mid May. We first explored the current research collaborations between the NOAA and the OU entities and learned that being in the same building made it much easier to collaborate.

> "One project we are doing together is the Spring storm season. That involves university groups, NOAA groups, the National underrail, and supercomputer up in Pittsburg supercomputer center. Before a shared network, that would have been difficult, because they are mass datasets. Since we are just transferring them around the building, they don't actually go out onto the network. They can stay internal in the building. So it's much easier to transfer large datasets."

Yet more progress could be made in this respect. Particularly, it seemed that the NOAA entities had more collaborations amongst themselves right now than with the OU entities as commented by a NITC member:

> "The physical location has definitely been a benefit because of the speed, it's easy to set up the collaborative resources necessary to make something happen. And we do have that working downstairs. I'm not sure if there's any OU computers down there, but it has those weather test bed, we can have Forecast Office and Storm Prediction Center and NSSL computers all in the same room collaborating with each other. But they are still under separate virtual systems. That helps a lot. And we've also set up links between Storm Prediction Center and our network direct connections, so they can get data without going through the firewall from us, that kind of collaboration, which it helps being in the same building because then we don't have to worry about setting up the VPN and all those stuff."

However, the collaboration between the NOAA and the OU entities was going slow, because of the restrictions of government security policies. As a NITC member from NOAA commented:

> "We've done a little collaboration. We have a few ports in some OU offices that are on our network, and it seems to work just fine. There is a little bit trust that has to be established between the users to make sure they don't leave their computers unlocked when they are gone so somebody can access it, things like that. It's worked well. It's just hard when you talk about collaboration between government and state, there has to be a line of separation there. It's easier for us federal to go into the OU network to get things than it is for them to come into our network to get things."

Two members from OU also pointed out that being in the same building helped with potential collaborations. However, government rules had to be complied with before much collaboration could take place.

> "In terms of collaboration, I see slow growth. I think just being down here physically collocated is a great help. I don't know right now that has any grand implications by as far as the network infrastructure goes. But I would just hope that the university side is not going to become overly restricted, or you know all those NOAA rules pushed on us…We are still kind of in the feeling out each other stage. I think maybe in a year or so, people will have more long-term chance to collaborate, in detail on various research projects,"

An example of this situation was given by one of the interviewees:

> "We are running into a problem now on the north base, where we have our own machine, which is going to connect one of the radars. But it is going to be partially on the NOAA network a little bit. Now they want to jump over to OU's network. They are talking about doing security clearances and checks for the people who are going to log in their machines."

In order to enable research collaboration between two entities with different culture:

> "Expectations have to be set up at the very beginning what's going to occur with that data, and more importantly what is not going to occur with that data. Whether that data is to be shared publicly, whether that data is to be sent offsite somewhere."

Also because of the security restrictions of the government, although the NOAA and the OU entities were placed onto the same network infrastructure, their actual systems were virtually separated. As a NOAA member put it:

> "The objective of research collaboration is good. But there still has to be physical separation for security purposes. So in that sense of the word, there is really no single network. It's still each individual network. It's still its own separate entities. I don't know about the OU side of things, maybe they have some common network infrastructure where they can put departments on, the government is still physically separated. So there won't be any OU machines on the federal network. I guess on the collaboration between the different units at OU, the single network is probably a good idea because they don't have the same security requirements as the federal side does. But the single network between federal and OU really doesn't appear as a single network since all the firewalls and things in place."

However, interviewees from both the NITC and the NOC agreed that research collaboration enabled by a shared network infrastructure might be beneficial, from the perspectives of the high speed and the ease of access.

> "Although virtually separated, a common network infrastructure does provide for quick access. If somebody from OU units wants data from a federal computer, or vice versa, either way, it is nice we are all in the same building and we don't have to go outside. The speed is very fast because it doesn't have to traverse to any outside network to get there. So that's a benefit. And the ease of it…it's easy to

> just assign a machine to a specific virtual network or a VLAN and have the data move very easily between those."

In order to allow the benefit of a shared network, all interviewees agreed that "the NOC is a key component to it since they are in charge of the physical network switching itself", and "it is their main purpose to have created the network infrastructure, and to implement the various security policies". The NOC manager also felt that:

> "The NOC is solely responsible. Both groups have machines and servers that they want to transfer data between. The NOC is the one that puts the holes in the firewall and arrange the circuits between the two computers."

The functionalities that were most important for future research collaborations include "a fast, reliable, scalable, and secure network with the ability to work with change". In addition to the technical functionalities, two interviewees also mentioned transparency and uniformity on both (NOAA and OU) sides.

> "To me, what's valuable is uniformity on both sides. I know NOAA people have much more security restrictions, but if you have data on some box, or you are running simulation on some computer, both sides who are ever working at it needs to be able to access the data or get on the computer. If there are differences in security policies from one side to another, to make the research most easily done, all of that bureaucratic…I'm not saying it's unworthy…but all those rules and all of that needs to be transparent, as transparent as possible, if that's at all possible. So there is uniformity for whoever is trying to get access to that data. That helps a lot actually."

Whether or not the objective of research collaboration between the OU and the NOAA entities may be accomplished greatly depends on the job of the NOC. Most NITC members expected the relationship between the NITC and the NOC to be based on partnership. In order to achieve partnership, the NOC should share a mutual understanding of the basic needs of the client entities, and address those needs effectively. Additionally, more attention needs to be given to cultivating and sustaining trust between the NITC and the NOC.

5.2.3.3 Summary of the Interviews

To sum up, the following themes emerged from the second round of interviews.

Communication: The first wave of the study pointed to two issues of communication: failure to communicate and a lack of feedback. During the second wave of study, several interviewees and survey respondents commented that the communication between the NITC and the NOC members had improved dramatically, and there had involved increased efforts particularly from the NOC side. There were more correspondences, and more emails and face-to-face interactions. However, there was still room for better communication, specifically regarding the roles and responsibilities of the NOC.

Major Roles of the NOC: Most NITC and NOC members agreed that the NOC should play a role of an Internet Service Provider (ISP), and to ensure the network is up running 24/7. Particularly given the needs for the research collaboration between the OU and the NOAA entities, the NOC was a key component in providing a fast, reliable, scalable, and secure network that can work with changes in research needs. However, there were different levels of services involved in the roles of an ISP. It seemed that there were still discrepancies between the NITC and the NOC at the granularity of services. In other words, questions remained about what services should be included into the responsibilities of the NOC and whether the same services should be provided to different entities.

The Mission Statement of the NOC: A number of NITC members felt that the mission statement needed to be revisited. As reported, one major issue with the current mission statement of the NOC was its lack of accuracy. Particularly, it did not address the boundary conditions of several NOAA entities, who maintained their own operational

networks. The mission statement was established before the function of the new building. After the OU and the NOAA entities moved into the building and started to actually share the network resources, the situation of the network usage had changed from what was initially depicted in the mission statement. Also, the mission statement was perceived to be too general. Although both the NITC and the NOC members agreed that the mission statement should be stated at a high level and should involve general terms, some members suggested that the mission statement should do a better job in defining the scope of the NOC's responsibilities and should be more open to accommodate different needs of multiple organizational entities.

Policies and Procedures: As an addition to the mission statement that depicts the general responsibilities of the NOC, policies and procedures that were more specific should be established to define what should be done and how those jobs should be done. The government entities must conform to specific policies on various issues; the OU entities also needed to abide by certain policies, e.g., in conducting life-critical research. When network services were reconfigured, changed or unavailable, it had to be ensured that none of these actions violated the government rules or disturbed any critical on-going research. For this matter, it was important that all the NITC and the NOC members had consistent policies and procedures specifying the NOC's roles and responsibilities in detail and how network-related activities should be carried out under different conditions. However, who should make these policies and procedures remained unclear, as either the NITC or the NOC may be expecting the other party to take the first step.

NOC Performance: Similar to the results from the first wave of the study, the NITC members consistently expressed that there was room for the NOC to improve its

performance. When explored in detail, the following areas were identified and a better job in these areas may help improve the NITC members' satisfaction with the services provided by the NOC.

- Reliability – Network reliability was critical to many entities. Because of some technical issues, there had been power and phone outages in the building. Minimization of such problems was necessary. Also, if there had to be any power or phone outages, the NITC members requested to be notified ahead of time.
- Responsiveness – The NITC members complained that sometimes their requests were not responded to in a timely manner.
- Flexibility –Windows-based technologies were well supported by the NOC. However, other operating systems (e.g. Mac) were widely used by the entities of the NITC. Openness of the NOC to non-proprietary technologies would be appreciated. In addition, the NITC members also wished to have more flexibility in terms of network connectivity and usage.

Partnership between the NITC and the NOC: Most NITC members expected the relationship between the NITC and the NOC to be based on partnership. In order to achieve partnership, the NOC should share a mutual understanding of the basic needs of the client entities, and address those needs effectively. Additionally, more attention needed to be given to cultivating and sustaining trust between the NITC and the NOC.

5.2.4. Feedback of Study Results

5.2.4.1 The NITC/NOC Leadership

Issues emerged from the second wave of data collection were summarized in a report, and was delivered to the NITC and the NOC leadership. One week following the delivery of the report, one of the members on the COD called for a meeting to meet with

the co-chairs of the NITC and the NOC. After this meeting, the primary researcher had a talk with one of the NITC co-chairs and was informed that the following plans were made as a way to address the second-wave report:

- The mission statement of the NOC should be revisited and revised.
- As a first step, one of the NITC co-chairs will take lead revising the MOA by defining the core services expected from the NOC. The draft will then be presented to the NOAA entities to achieve an agreement among the NITC. Then, the NOC will be involved to reach an agreement amongst three organizations.
- Once the core services of the NOC are defined, the policies and procedures will be followed up as a living document.

During the conversation, this NITC co-chair mentioned that resource constraint might be something to be kept in mind. The report suggested some changes to be made. However, to actually make those changes would require a budget. So the cost structure of the NOC was relevant to how fast or how well the situation would be improved.

He also mentioned that as the OU entities were constrained by OU-IT, the NOAA entities also faced the constraint from Washington D.C. in a way that they had to follow the federal policies and procedures. Yet, a new CIO of the NOAA was just appointed, and he had more technology knowledge. Hopefully, he would have a better understanding of the NWC's conditions and work better with the OU entities and the NOC for the network operations.

5.2.4.2 The COD Member

The member from the Council of Directors who called for the meeting with the NITC/NOC leadership was also asked to describe what was being discussed. He felt that

things were going very well, and “the users seem to be pretty happy with the services that are being provided”. Particularly, he was told that the communication and the relationship between the NITC and the NOC had improved substantially, and both groups have tried hard to make things work out.

In terms of the mission statement, although it was agreed that some amendment is needed, it was also agreed that “the document was the best effort put in place before people moved in the building, and it was the best they knew at the time”. Given the legal process that had to be involved in order to change the document, the NITC/NOC leadership did not wish to spend another year to get the document re-approved in a different format. Therefore, nobody felt it was imperative to make immediate changes to the legal document. Rather, a working document “will take on a new form that will have the modifications and better reflect how things are actually be run”. After things stabilize, the mission statement might get refreshed from the legal perspective.

It was also commented that the initial tendency of the two groups was to follow the letter of the document, so that they would not be held accountable when problems occurred. However, the top management had given them a lot of leeway such that the two groups did not feel threatened that they had to follow the letter of the document. The COD member thought this was a positive outcome.

5.2.5 Summary of the Second Wave of the Study

To summarize, through surveys, interviews, and observations, we found from the second wave of the study that both process control and outcome control were in place in the IT cooperative, and clan control was not heavily relied on in either the IT governance

council or the IT cooperative. These findings imply the use of mechanistic controls in the NOC and the lack of organic controls in both the NITC and the NOC.

In terms of the coordination of NOC-related activities, personal coordination was used in both the IT governance council and the IT cooperative to coordinate NOC-related activities. Yet, only ad-hoc or loosely defined document existed and formal policies and procedures were lacking regarding what services should be provided and how those services should be provided.

In terms of communication, vertical communication was more common in the IT cooperative, while horizontal communication was heavily relied on in the IT governance council. Greater communication had been observed in the IT cooperative than in the IT governance council. In addition, two-way communication was more common in the IT cooperative than in the IT governance council. As per the interviewees, communication had improved dramatically between the IT governance council and the IT cooperative.

Regarding the organizing vision, stakeholders in the IT cooperative tended to perceive the organizing vision to be more meaningful than did those in the IT governance council. However, it emerged that a revision of the mission statement was still necessary, and the mission statement should be more accurate in reflecting the actual situation regarding NOC-related operations.

Lastly, stakeholders within the IT governance council had greater disagreement regarding the roles and responsibilities of the NOC than did stakeholders in the IT cooperative, and expectation misalignment between the stakeholders in the IT governance council and those in the IT cooperative was more problematic than the

expectation misalignment within either of these two groups. Furthermore, the performance of the IT cooperative was still not quite satisfactory.

5.2.6 Comparison with the First Wave of the Study

We conducted a comparison between the responses from the first wave and the second wave of data collection for both the NITC members and the NOC members, as represented in Figure 5.2.5a and Figure 5.2.5b. Here, we noticed that for the NITC members, their responses in the second wave of the study were fairly comparable to those in the first wave of the study. For the NOC members, their responses were generally less extreme with the 2nd wave data.

In detail, what we observed from the second wave of study was that as compared to their first-wave responses, the NITC members reported less use of: interpersonal interaction, horizontal communication, face-to-face communication, email communication, web-based communication, and two-way communication. In comparison to the first wave results, the NITC members also perceived the mission statement of the NOC to be less interpretable and required less organizational changes. On the other hand, the NITC members reported more use of communication through telephone, electronic documents, and non-electronic documents in the second wave of the study. The NITC members also looked more at the mission statement of the NOC, and perceived the mission statement to be more reasonable and important in comparison to the first wave of the study.

For the NOC members, they reported that their perspectives tended to be shaped more by collective views in the second wave of the study, indicating that organic controls were more prevalent in the NOC overtime. In comparison to the first wave results, they

also reported more use of: horizontal communication, telephone communication, web-based communication, and two-way communication. In addition, the NOC members looked more at the mission statement of the NOC as compared to their responses in the first wave of the study. On the other hand, the NOC members reported less use of email communication and document-based communication in the second wave of the study. They also perceived the mission statement of the NOC to be less interpretable and reasonable as compared to their responses in the first wave of the study.

Figure 5.2.5a Mean Comparison across Time (NITC Members)

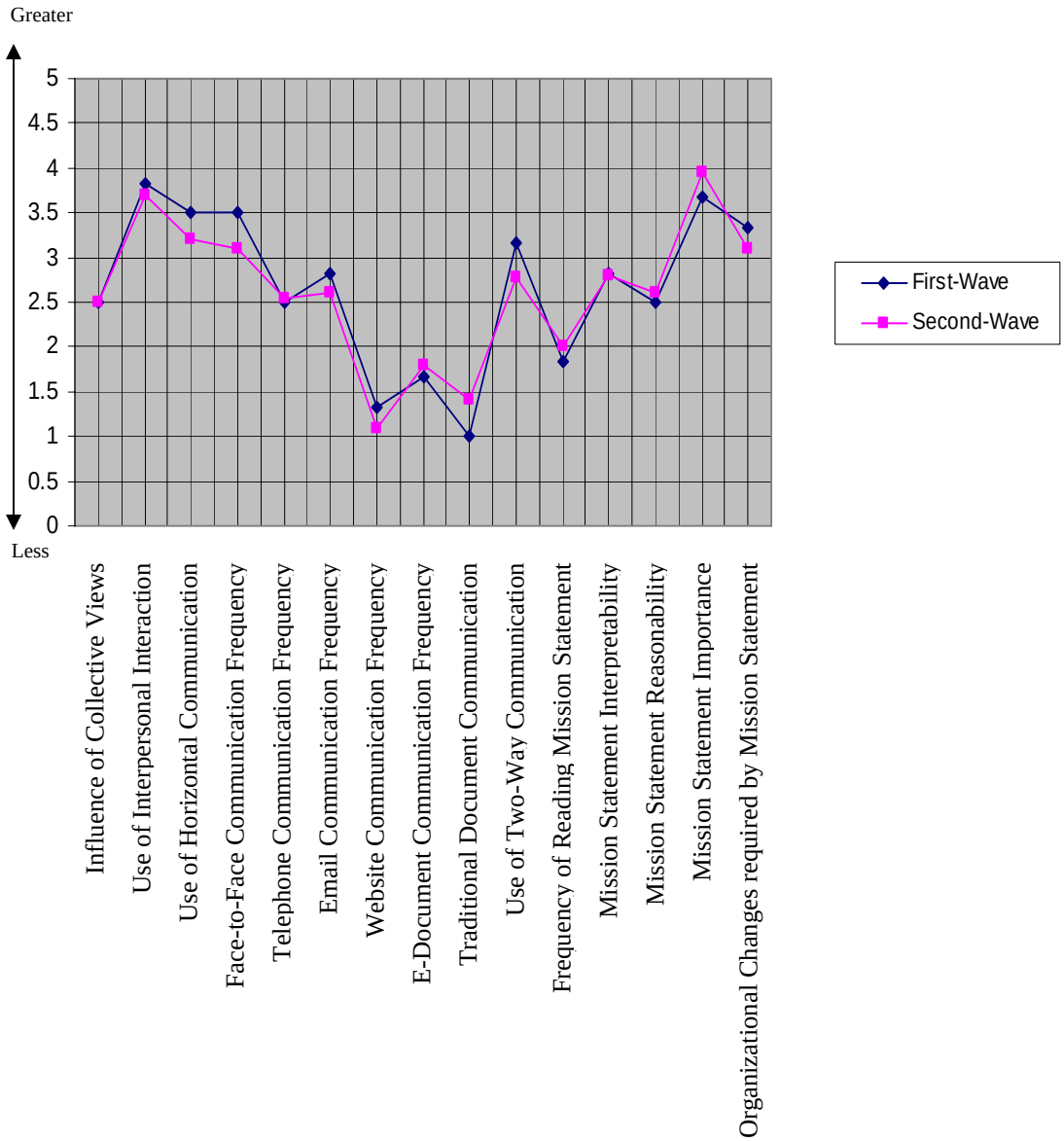
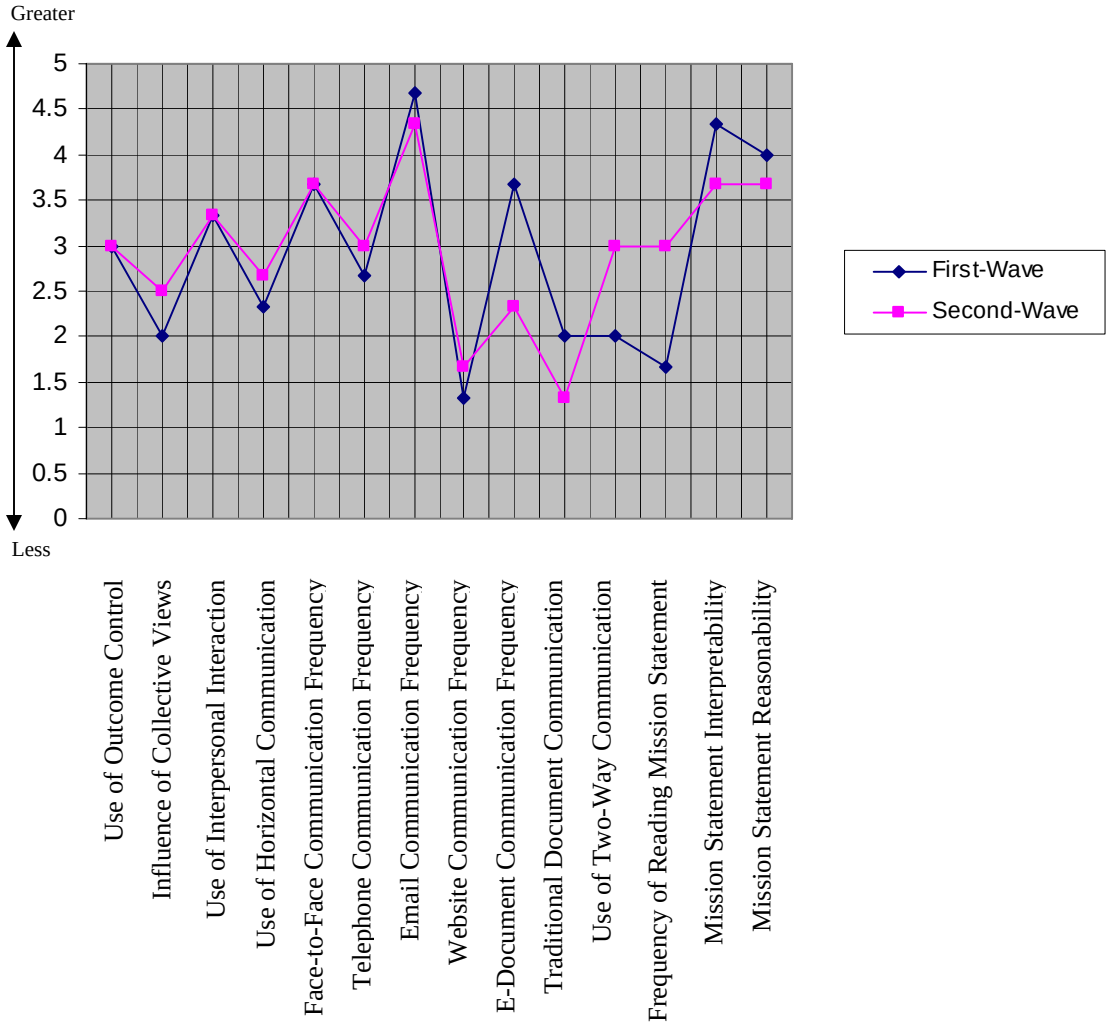


Figure 5.2.5b Mean Comparison across Time (NOC Members)



We also separated this comparison analysis for the OU and the NOAA members, as represented in Figure 5.2.6a and Figure 5.2.6b. We observed from the results that the OU members reported their perspectives were less influenced by collective views in the second wave of the study. In comparison to the first wave results, they reported less use of: horizontal communication, face-to-face communication, and web-based communication. The OU members also perceived the mission statement of the NOC to be less realistic and required less organizational changes in the second wave of the study. On the other hand, in comparison to the first wave results, the OU members reported more use of: interpersonal interaction, telephone communication, email communication, communication based on electronic documents, communication based on non-electronic documents, and two-way communication. The OU members tended to look more at the mission statement during the past three weeks as compared to a month ago, and they perceived the mission statement to be more understandable and more important compared to their first-wave responses.

In comparison, in the second wave of the study, the NOAA members reported less use of: interpersonal interaction, horizontal communication, face-to-face communication, telephone communication, email communication, communication based on electronic documents, and two-way communication. In comparison to the first wave results, the NOAA members looked at the mission statement less frequently during the past three weeks, and they perceived the mission statement to be less interpretable. On the other hand, the NOAA members' perspectives were influenced more by collective views, and they perceived the mission statement to be more realistic as compared to their responses in the first wave of the study.

Figure 5.2.6a Mean Comparison across Time (OU Members)

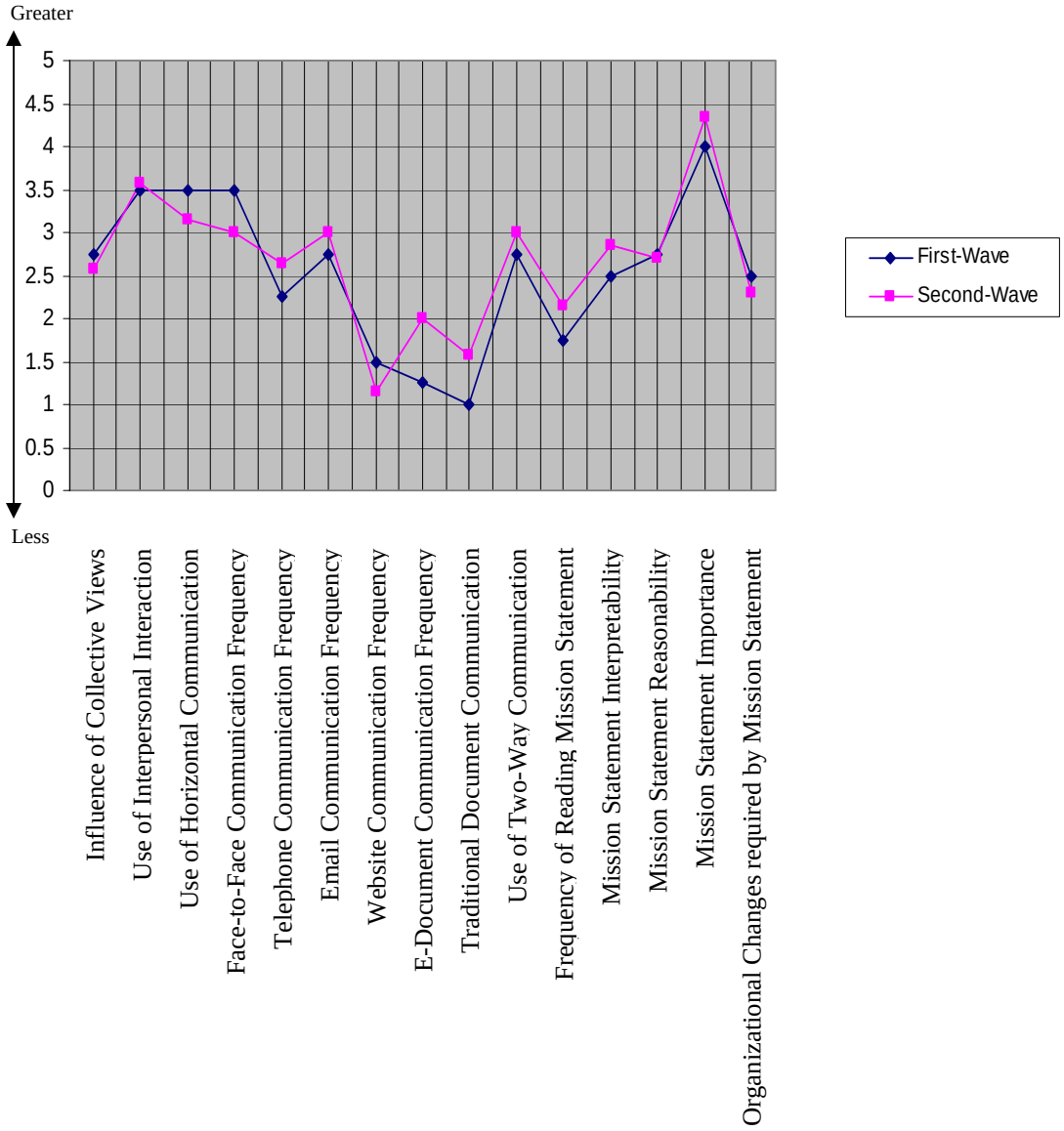
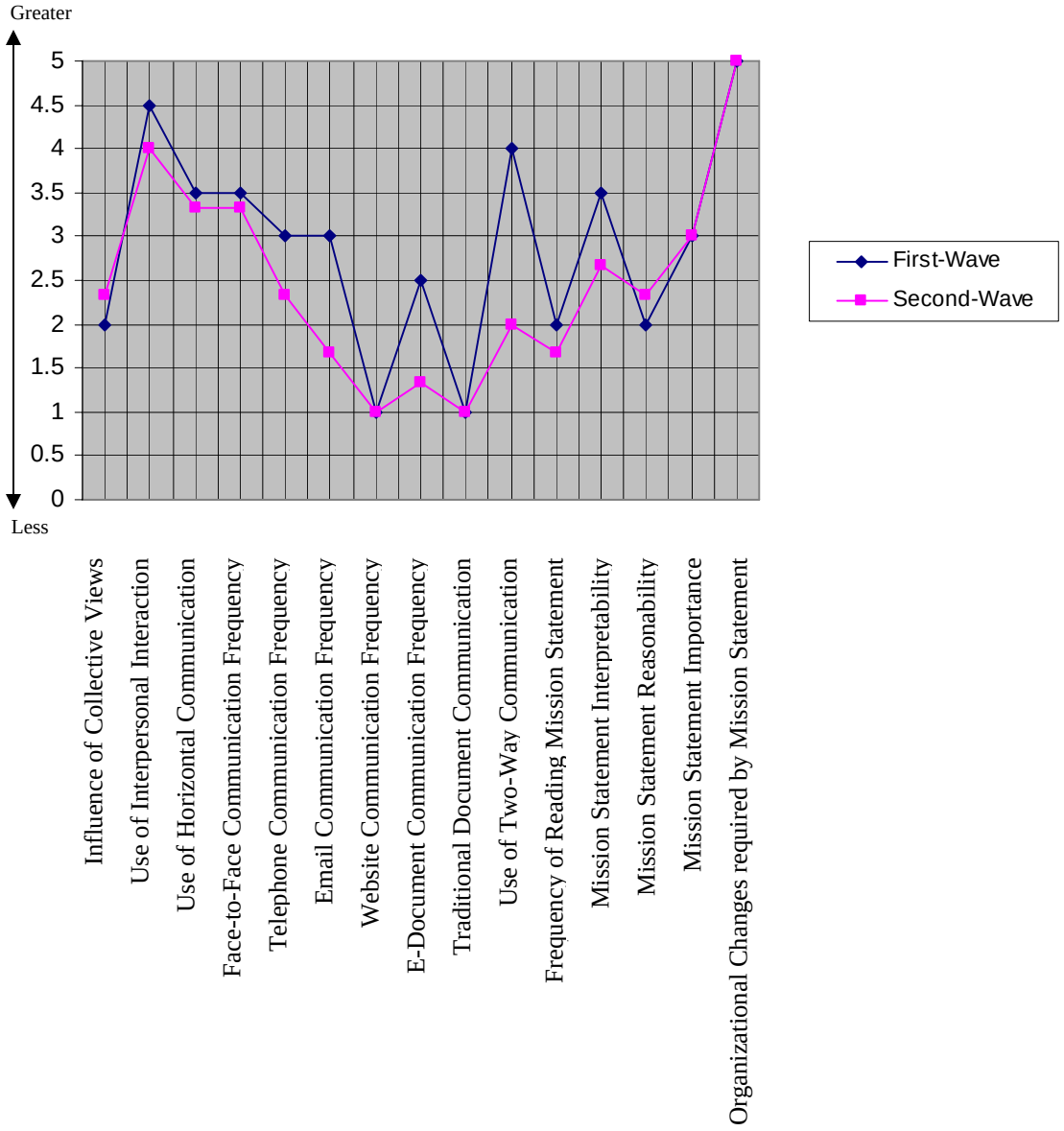
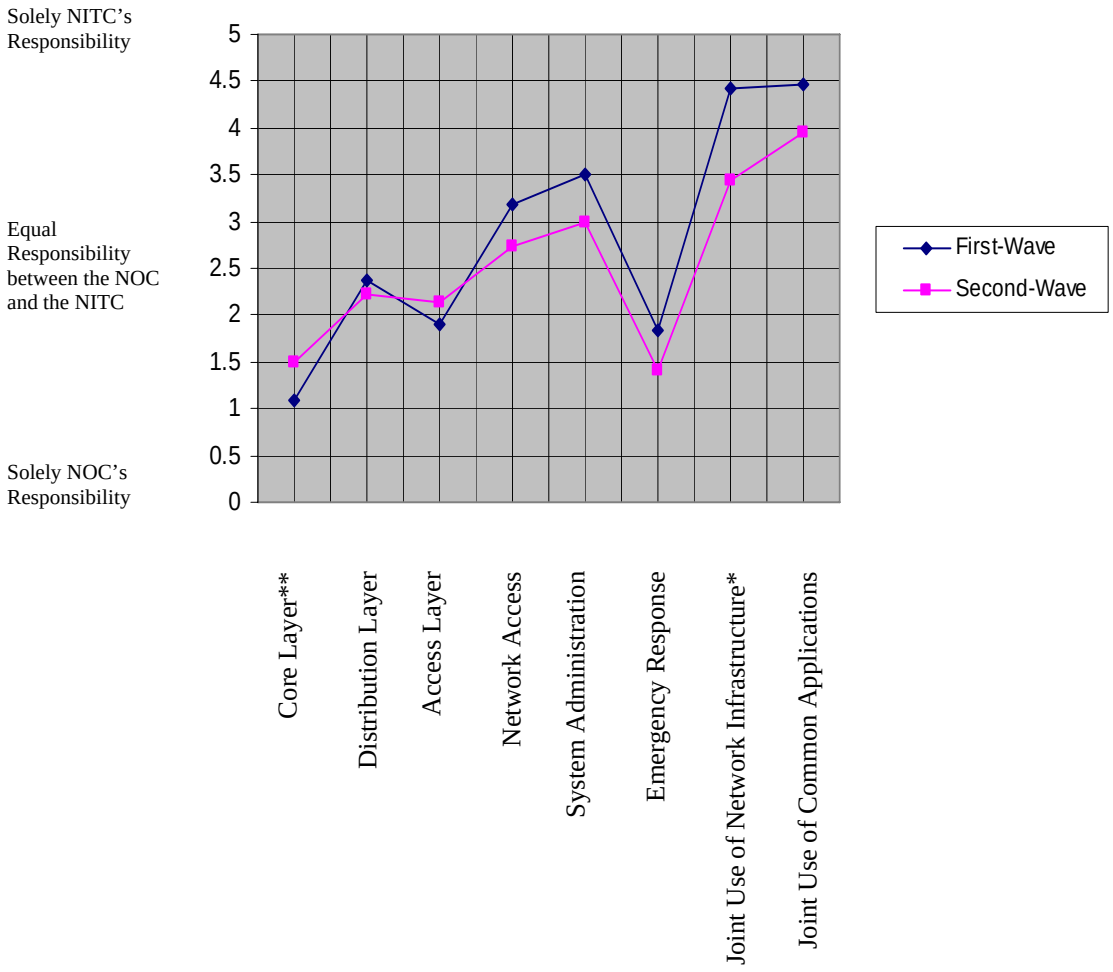


Figure 5.2.6b Mean Comparison across Time (NOAA Members)



Regarding the network services, a comparison between the first wave and the second wave data for both the NITC and the NOC members are summarized in Figure 5.2.7a and Figure 5.2.7b. Generally speaking, we noticed that as compared to the first wave findings, the NITC members were more willing to let the NOC have more control over most network services except for the core layer and the access layer of the network. The difference in the NITC members' expectations of the core layer between the first- and second wave response was significant at $p<.05$, and the difference in the NITC members' expectations of joint use of network infrastructure between the first- and second wave response was significant at $p<.10$.

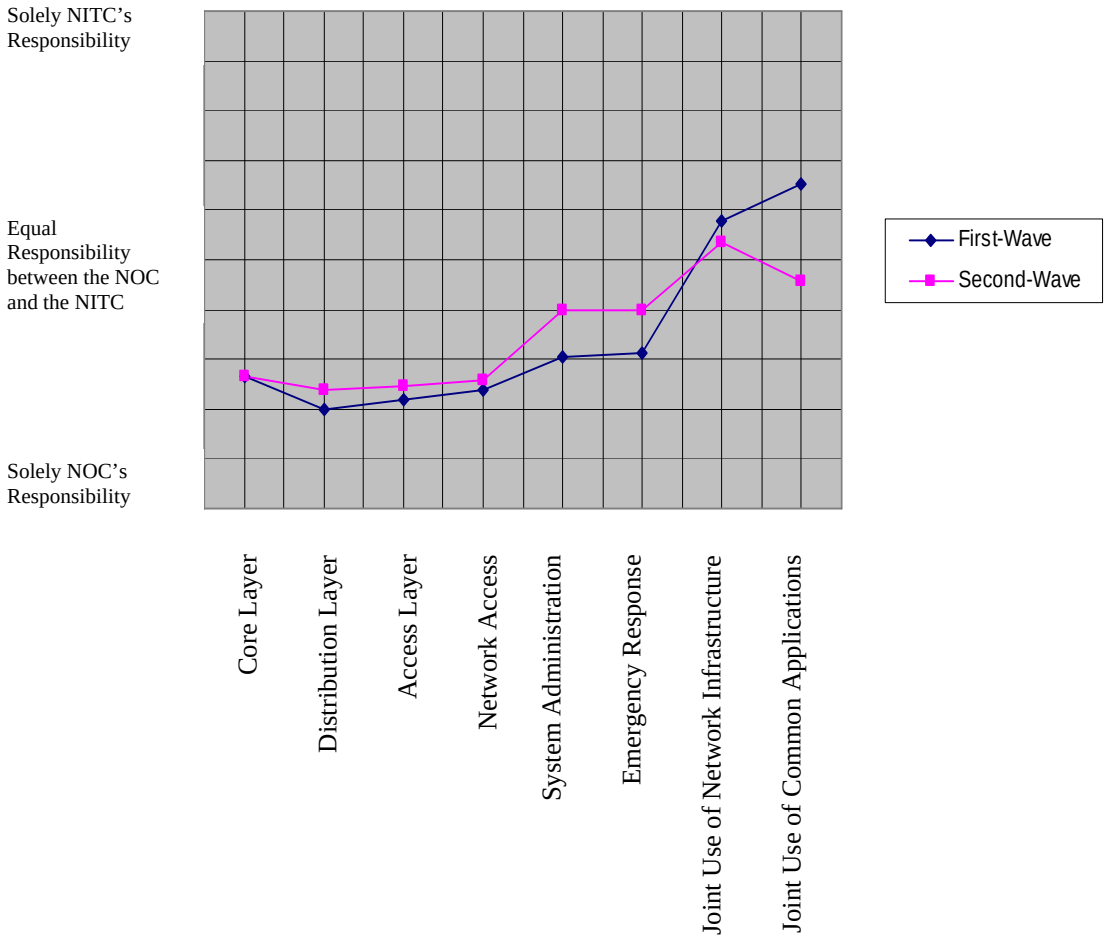
Figure 5.2.7a Mean Comparison across Time (NITC Members)



** The difference is significant at p<.05
* The difference is significant at p<.10

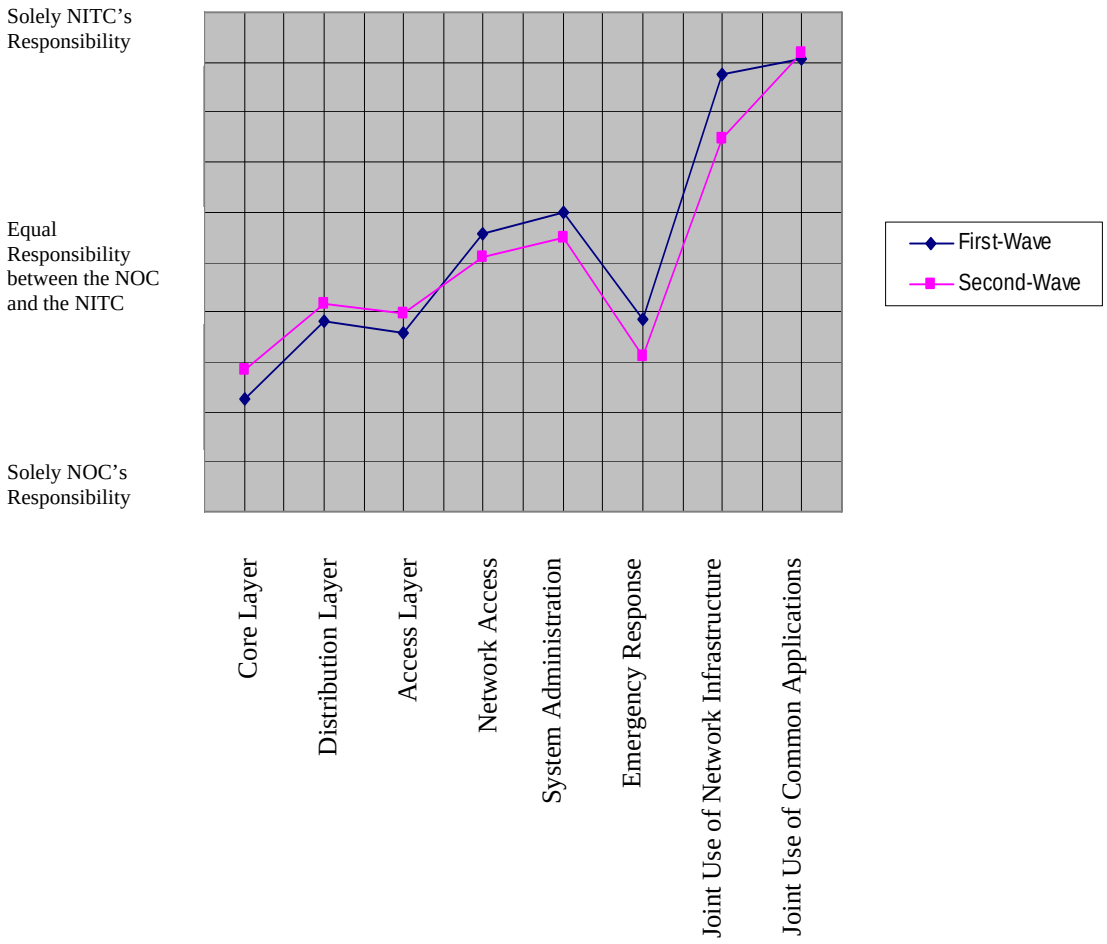
For the NOC members, in comparison to their first wave response, they were also more willing to cede control over most network services to the NITC except for joint use of network infrastructure and joint use of common applications.

Figure 5.2.7b Mean Comparison across Time (NOC Members)



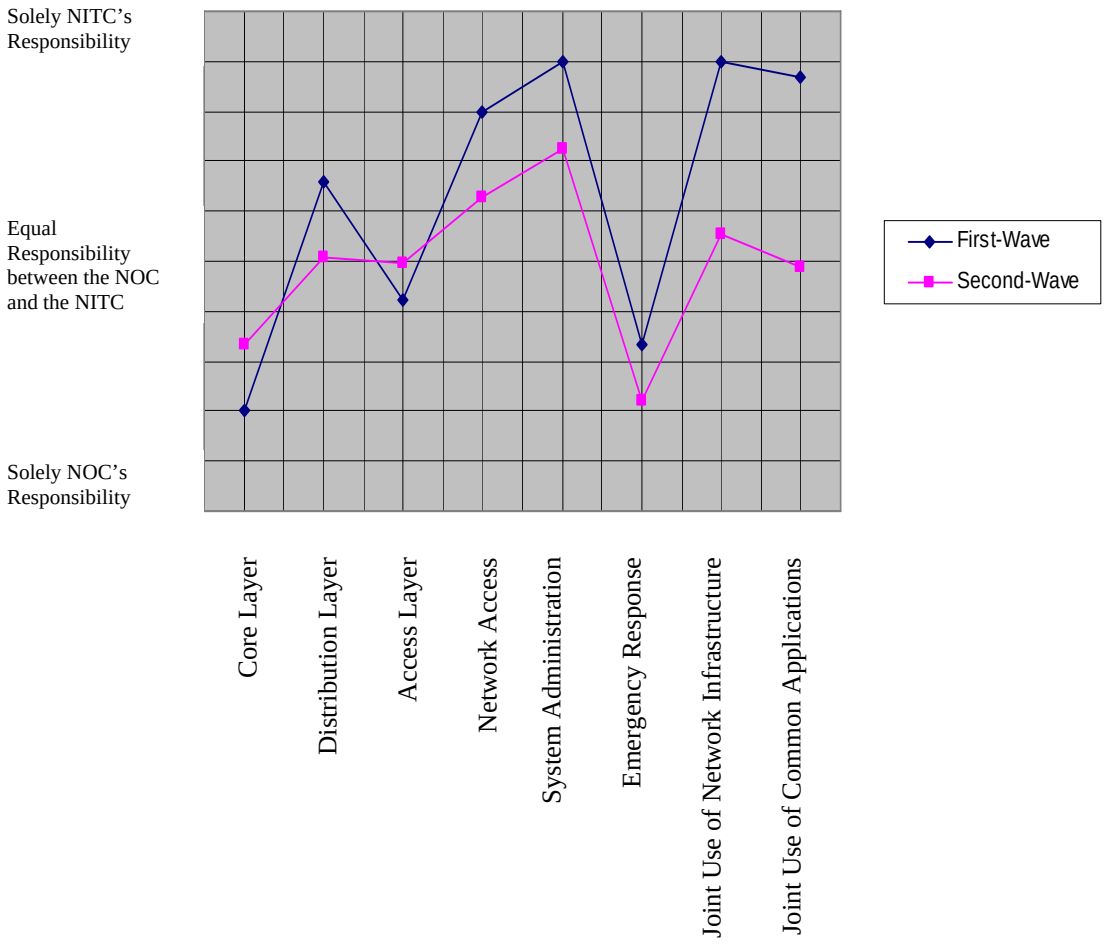
We further separated such comparisons for the OU and the NOAA members, as presented in Figure 5.2.8a and Figure 5.2.8b. For the OU members, in the second wave of the study, they were more willing to cede control to the NOC over network access, system administration, emergency response, and joint use of network infrastructure. However, they wished to take more control over the core layer, distribution layer, access layer, and joint use of common applications compared to their first-wave responses.

Figure 5.2.8a Mean Comparison across Time (OU Members)



In comparison, in the second wave of the study, the NOAA members were also more willing to cede control over most network services to the NOC except for the core layer and the access layer of the network.

Figure 5.2.8b Mean Comparison across Time (NOOA Members)



Compared to the first wave data results, the misalignment score within both the NITC and the NOC slightly increased, indicating that both the NITC and the NOC members tended to have more differences of opinion amongst themselves. On the other hand, the misalignment score between the NITC and the NOC reduced, indicating that there tended to be more agreement between the NITC members and the NOC members regarding the roles and responsibilities of the NOC as compared to the first wave results (Table 5.2.4). However statistically, the two misalignment scores (misalignment-within and misalignment-between) at the second wave of the study were not significantly different from those at the first wave of the study (at $p<.10$).

Table 5.2.4 Misalignment Scores across Time (NITC & NOC Members)

	NITC			**NOC**		
	First wave	Second wave	Mean Difference	First wave	Second wave	Mean Difference
Misalignment Within	29.87	35.71	5.84	20.22	22.00	1.78
Misalignment Between	59.78	53.12	-6.66	61.11	50.78	-10.33

Regarding the NITC members' evaluation of the performance of the NOC, the extent to which the NOC personnel understood client entities' needs had improved a little bit over time (Table 5.2.5a), implying that the IT stakeholders from the NOC had more understandings of what was required by the clients. Particularly, when we examined the responses from the OU members and the NOAA members separately (Table 5.2.5b), we noticed that the OU members felt that the NOC had less understandings of their requirement, yet the NOAA members showed more satisfaction with the NOC.

Table 5.2.5a Performance Evaluation across Time (All NITC Members)

	First Wave	**Second Wave**	**Mean Difference**
The NOC understands our organizational needs	2.50	2.60	0.10
NOC's services have met our expectations	2.50	2.50	0.00

Table 5.2.5b Performance Evaluation across Time (NITC members)

	OU Members			NOAA Members		
	First Wave	**Second Wave**	**Mean Difference**	**First Wave**	**Second Wave**	**Mean Difference**
The NOC understands our organizational needs	2.50	2.43	-0.07	2.50	3.00	0.50
NOC's services have met our expectations	2.75	2.29	-0.46^{+}	2.00	3.00	1.00

(+ Significant at p<.10)

To summarize, when we compare the first-wave and the second-wave responses, we noticed several changes. In terms of IT governance, clan control seemed to play a bigger role in the NOC in the second wave of the study, as the perspectives of the NOC members tended to be shaped more by collective view than individual views. This implies more use of organic controls in the IT governance control across time.

Compared to their behaviors in the first wave of the study, the NITC members (particularly the NOAA members) used less personal coordination. In terms of communication, both the NITC and the NOC members perceived communication to have been improved. However, the NITC members reported less use of two-way communication and horizontal communication in the second wave of the study, whereas the NOC members tended to communicate more horizontally and bi-directionally.

Regarding the meaningfulness of the organizing vision, as compared to their first-wave responses, the NITC members generally perceived the mission statement to be more reasonable and important. Yet, the NOC members perceived the mission statement of the NOC to be less interpretable and realistic.

Given that both the NITC and the NOC members were willing to let the other party take more control over most network services, stakeholders' expectations of the roles and responsibilities of the NOC have become alike over time. The expectation misalignment between the NITC and the NOC has minimized. However, the

expectations of the stakeholders within either the NITC or the NOC seemed to become more misaligned in the second wave of the study.

Lastly, stakeholders' evaluation of the performance of the NOC has improved slightly over time. Particularly, in the second wave of the study, the NOAA members seemed to become more satisfied with the extent to which the NOC understood their needs, as well as the extent to which the services provided by the NOC had met their needs.

5.3 Third Cycle Action Research

On June 13, the third round of surveys was sent to 11 NITC members and 5 NOC members. Like what we did in the first- and second wave of the study, we formatted the surveys in electronic forms and emailed them to the target respondents, requesting them to download the file and fill the survey upon their agreement to respond. One NITC member from OU opted out of the study due to his time constraint. Another two NITC members from OU and one NITC member from NOAA did not respond either, possibly due to their time constraint as well. On the NOC side, an operational staff and the NOC ITSO did not respond; they were less participative in the NITC meetings. Emails and phone calls were made to follow up the responses. After two weeks, 8 NITC members (4 from OU and 4 from NOAA) and 3 NOC members returned their completed surveys, resulting in a 68.75% response rate.

5.3.1 Survey Results

5.3.1.1 IT Governance and Organizing Vision

Figures 5.3.1a and 5.3.1b summarize the means and the standard deviations for all the items in the first two categories as responded by the NOC and the NITC members, with larger number indicating greater degrees of each variable.

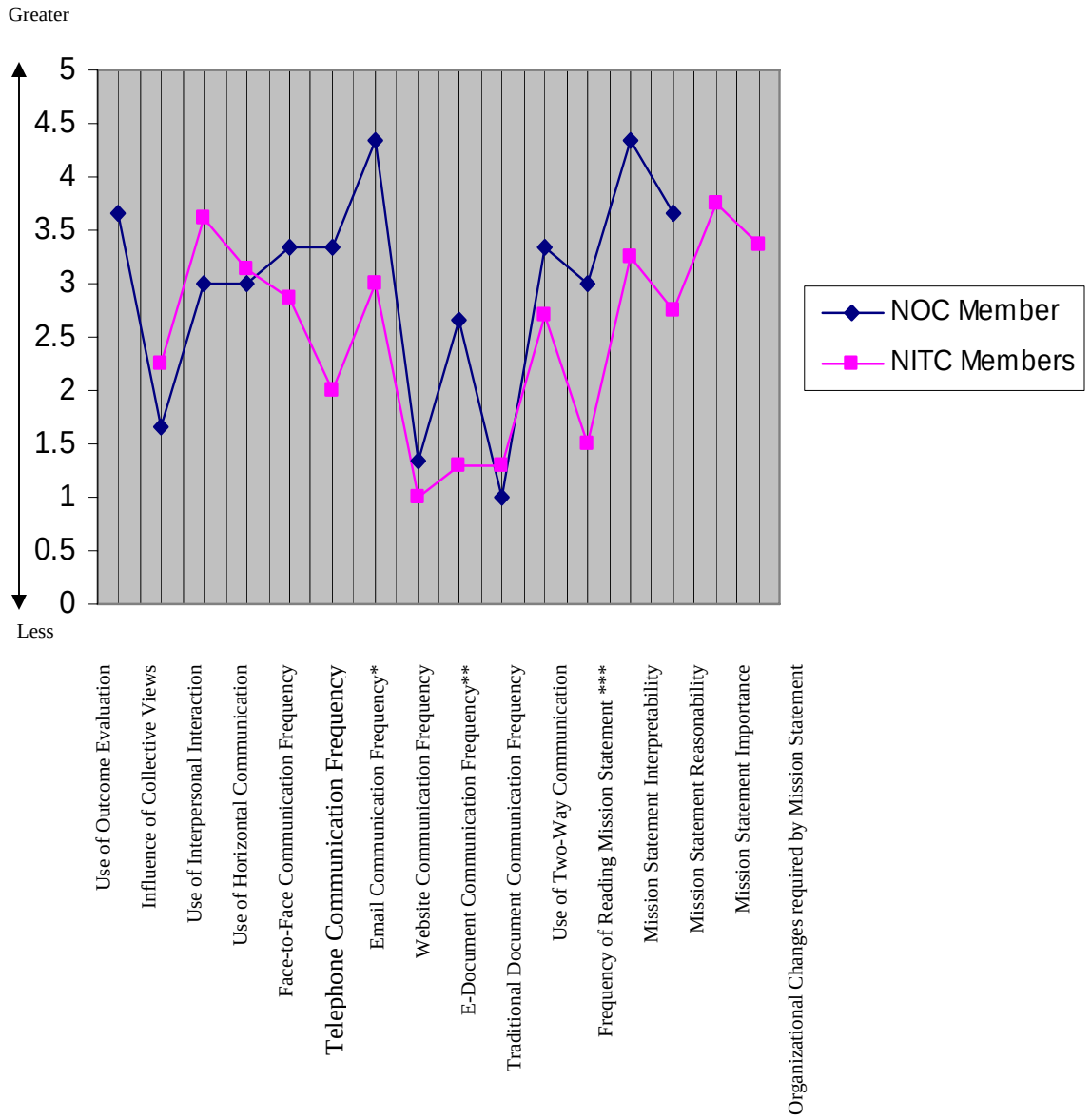
All responses reflect the perceptions of the NITC and the NOC members. The major differences between the responses from the NITC and the NOC members are summarized in Table 5.3.1.

Table 5.3.1 Differences between the NITC and the NOC Members

Construct	NITC	NOC
Mode of Control	Clan control	Outcome control
Coordination mechanism	Personal coordination	Both personal coordination and impersonal coordination
Communication structure	Horizontal communication	Both horizontal and vertical communication
Communication frequency	Less frequency	Greater communication
Communication direction	One-way	Two-way
Organizing vision	Perceived to be less meaningful.	Perceived to be more interpretable and realistic

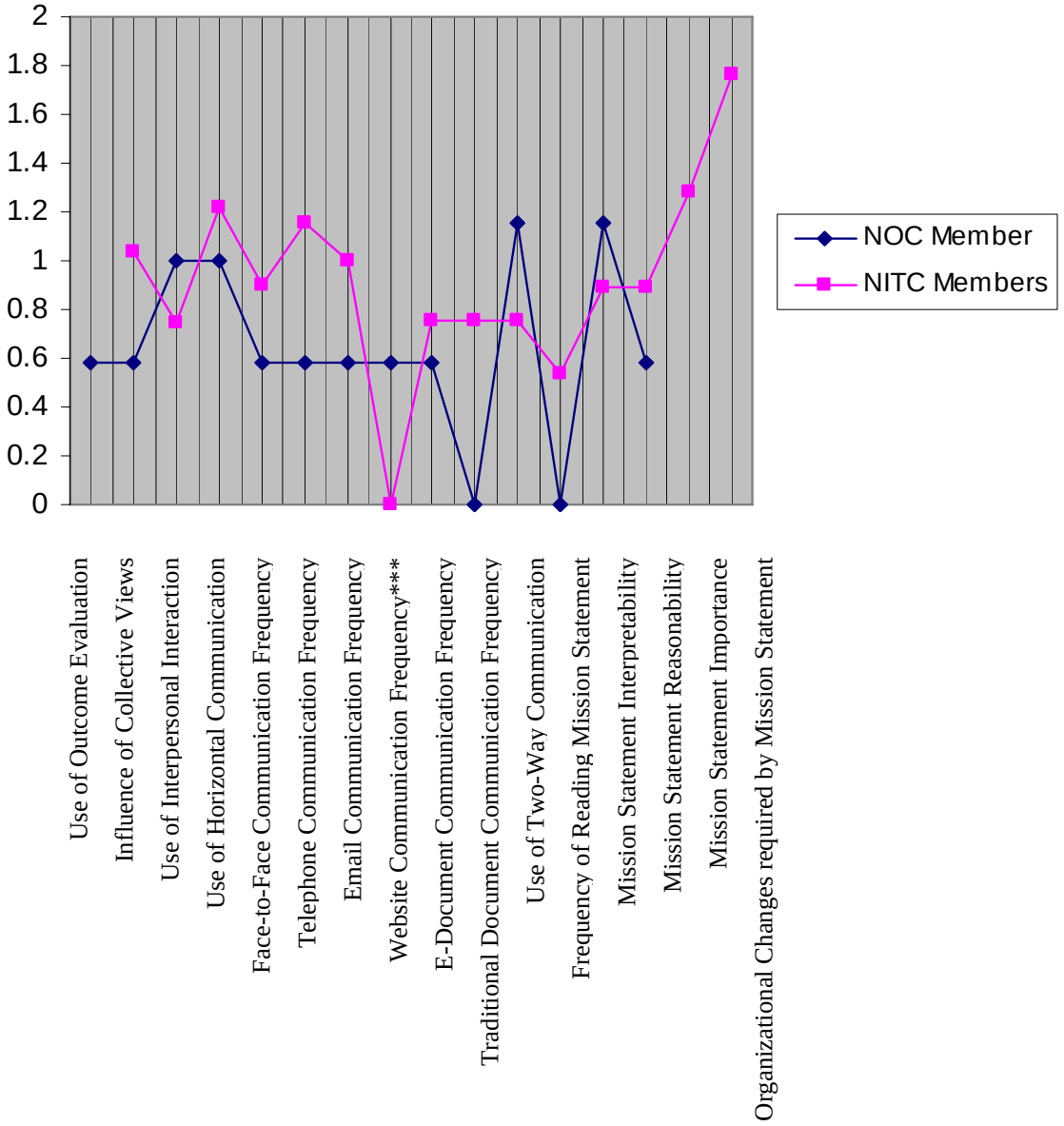
Regarding the standard deviations, the NOC members had greater differences of opinion amongst themselves than did the NITC members regarding the use of web-based communication (significant at $p<.01$).

Figure 5.3.1a Mean Comparison between NITC and NOC Members



*** The difference is significant at P<.01
** The difference is significant at P<.05
* The difference is significant at P<.10

Figure 5.3.1b Comparison of Standard Deviations (Between NITC and NOC Members)



*** The difference is significant at P<.01

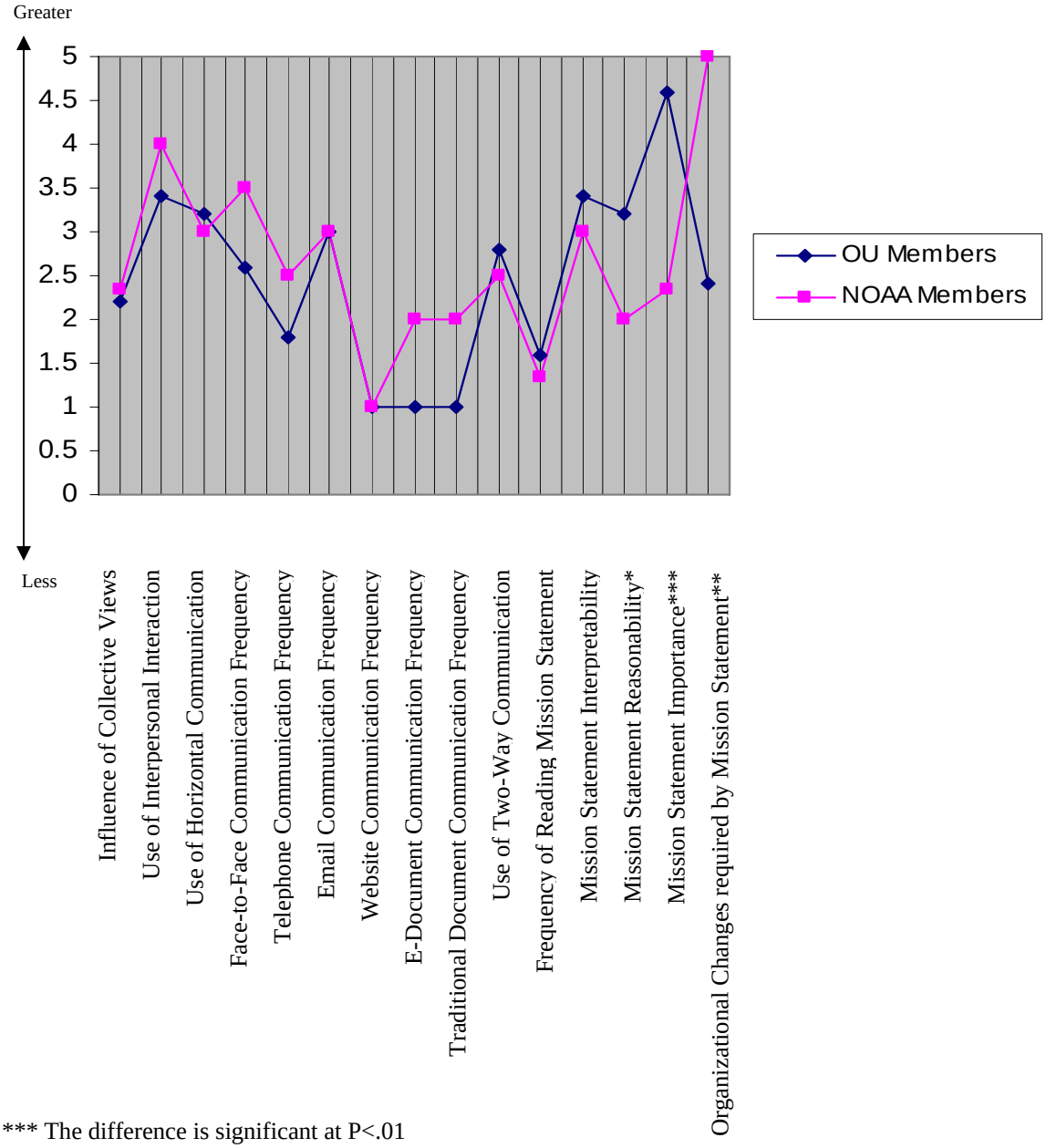
We also explored the differences between the OU and the NOAA members, as presented by Figure 5.3.2a and Figure 5.3.2b. Here, the major differences based on the responses from the OU and the NOAA members are presented in Table 5.3.2.

Table 5.3.2 Differences between the OU and the NOAA Members

Construct	OU	NOAA
Mode of Control	Less clan control	More clan control
Coordination mechanism	Less personal coordination	More personal coordination
Communication structure	More horizontal communication	Less horizontal communication
Communication frequency	Less communication	Greater communication
Communication direction	More two-way	Less two-way
Organizing vision	Perceived to be more interpretable, more realistic, and more important	Perceived to require more organizational changes

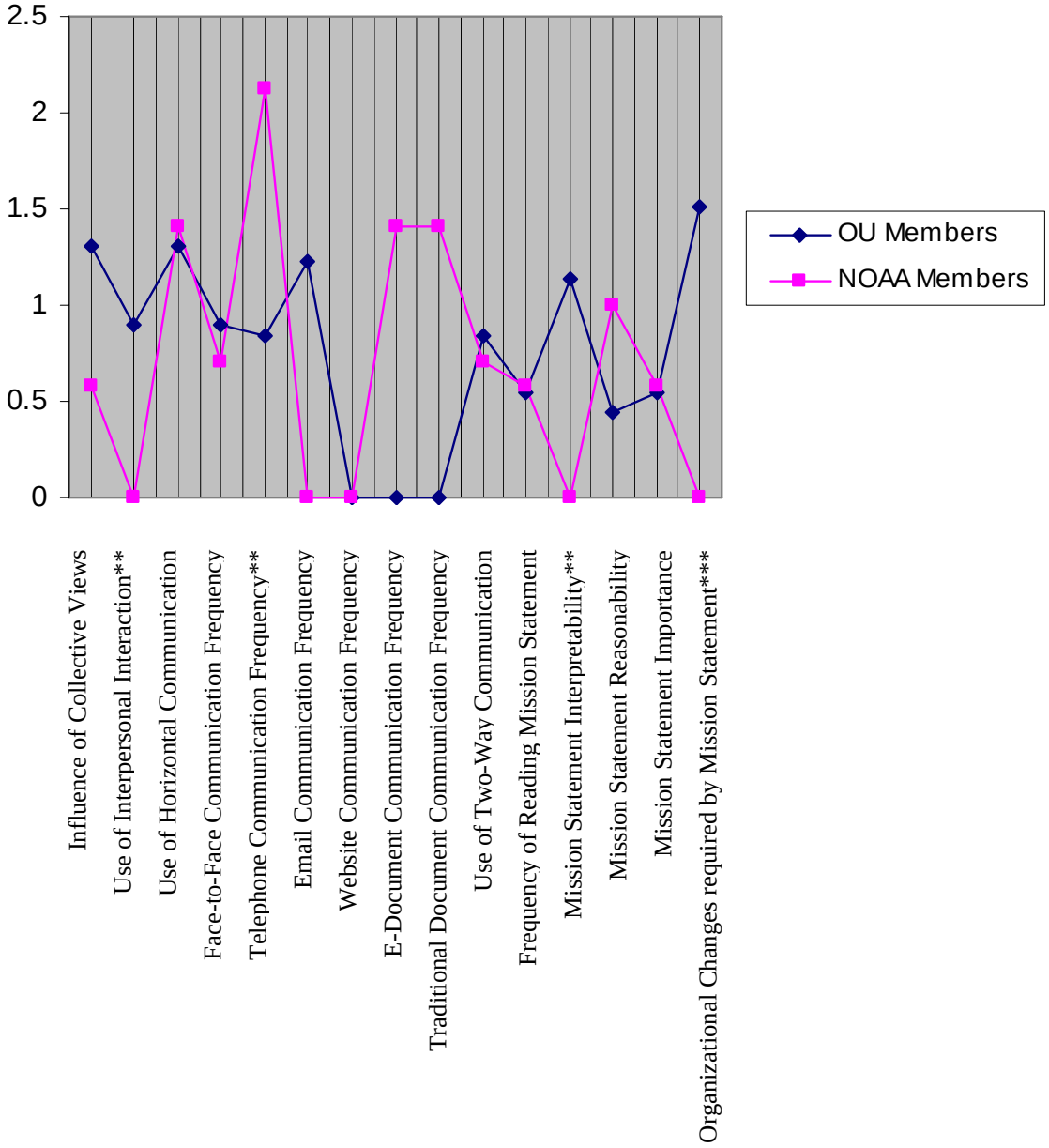
Regarding the standard deviation, the OU members had greater differences of opinion amongst themselves than did the NOOA members regarding: 1) the use of interpersonal coordination (significant at $p<.05$), 2) the extent to which the mission statement is interpretable (significant at $p<.05$), and 3) the extent to which the mission statement requires organizational changes (significant at $p<.01$). On the other hand, the NOAA members had greater differences of opinion amongst themselves than did the OU members regarding the frequency of communication through telephone (significant at $p<.05$).

Figure 5.3.2a Mean Comparison between OU and NOAA Members



*** The difference is significant at P<.01
** The difference is significant at P<.05
* The difference is significant at P<.10

Figure 5.3.2b Comparison of Standard Deviations (Between OU and NOAA Members)



*** The difference is significant at P<.01
** The difference is significant at P<.05

In the following sections, we will summarize the major differences between various groups of stakeholders in terms of the control, coordination, and communication aspects of IT governance, as well as the meaningfulness of the organizing vision.

5.3.1.1.1 The Control Aspect of IT Governance

Based on the responses from the NOC members, the evaluation of the performance of the NOC was mostly based on following pre-specified outcomes, indicating that outcome control was primarily relied on for the IT cooperative (i.e. the NOC). Furthermore, the expectations of the NOC members regarding the roles and responsibilities of the NOC were mostly based on personal views, whereas the expectations of the NITC members were influenced not only by personal views, but also by the collective views of other NITC members to some extent. This finding implied that clan control was in place in the IT governance council (i.e. the NITC).

In terms of the categorization of mechanistic and organic controls, mechanistic controls were present in the NOC, given the reliance on specification of outcome performance. In comparison, there were more organic controls in the NITC due to the influence of group cognitions.

5.3.1.1.2 The Coordination Aspect of IT Governance

When NOC-related activities needed to be coordinated, the NITC members (particularly the NOAA members) suggested that coordination tended to occur mostly through interpersonal interactions, whereas the NOC members reported that coordination occurred through both pre-established policies and interpersonal interactions. The result indicated that personal coordination was used in the IT governance council regarding

NOC-related activities, while both impersonal and personal coordination were in place in the IT cooperative.

5.3.1.1.3 The Communication Aspect of IT Governance

In terms of the communication structure, the NOC members equally communicated with their supervisors/subordinates and peers, whereas the NITC members (particularly the OU members) communicated more with other NITC members than with supervisors/subordinates. Such a result suggested that both vertical and horizontal communication were used in the IT cooperative, while horizontal communication was more common in the IT governance council.

Regarding the communication frequency, the NOC members generally communicated more frequently about the roles and responsibilities of the NOC than did the NITC members. Therefore, there was greater communication about the roles and responsibilities of the NOC in the IT cooperative than in the IT governance council. A comparison amongst the NITC members revealed that the NOOA members generally communicated more frequently about the roles and responsibilities of the NOC than did the OU members.

Lastly, regarding the roles and responsibilities of the NOC, the NOC members tended to use more two-way communication, whereas the NITC members (particularly the NOAA members) relied mostly on one-way communication. This result suggested that two-way communication was more common in the IT cooperative than in the IT governance council.

5.3.1.1.4 The Meaningfulness of the Organizing Vision

The findings about the four dimensions (i.e. interpretability, reasonability, importance, and discontinuity) of the meaningfulness of the organizing vision demonstrated that compared to the NITC members, the NOC members found the mission statement of the NOC to be more understandable and more realistic. A comparison between the OU members and the NOAA members demonstrated that the OU members perceived the mission statement of the NOC to be more understandable and realistic than did the NOAA members. The OU members also found the mission statement of the NOC to be more important to their organizations. However, the NOAA members felt that their organizations had to make substantial changes in order to fully leverage the services specified by the mission statement. To summarize, stakeholders in the IT cooperative perceived the organizing vision to be more meaningful than did those in the IT governance council.

5.3.1.2 The Roles and Responsibilities of the NOC

In this section, we will first look at the expectations of the NITC and the NOC members regarding the roles and responsibilities of the NOC. Then, stakeholders' expectations will be compared within the NITC and within the NOC, as well as between the NITC and the NOC, to examine the extent to which expectations are aligned in different stakeholder groups. Lastly, a summary of the findings regarding the roles and responsibilities of the NOC will be provided.

5.3.1.2.1 Expectation Alignment

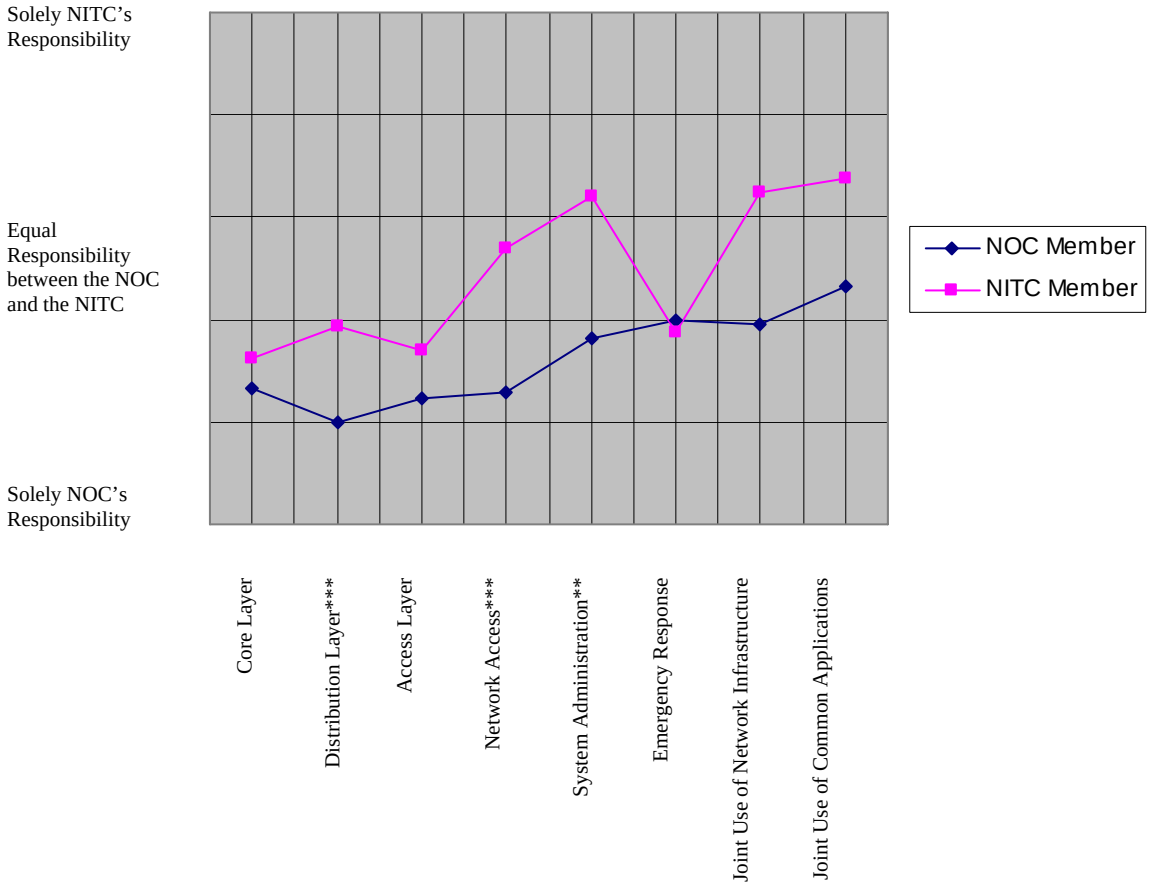
A list of network services, classified into eight major groups, was provided to capture the stakeholders' expectations of the roles and responsibilities of the NOC. The respondents were asked to indicate who should be expected to offer each service (e.g. by

the NOC, or by the NITC). Figures 5.3.3a and 5.3.3b present the means and the standard deviations for each group of the services as responded by the NOC and the NITC members. We found that except for the emergency response of the network, the NITC and the NOC members had quite different opinions about who should provide the other seven groups of services. Generally speaking, the NITC members felt that the NITC should have control over the responsibilities of most services, whereas the NOC members felt that the NOC should take more control. The major differences between the responses from the NOC and the NITC members were the following:

- The NITC members felt that responsibilities of most services under the core layer, the distribution layer (significant at $p<.01$), and the access layer of the network should be more of a shared responsibility between the NITC and the NOC, whereas the NOC members felt that they should be mostly the NOC's responsibilities.
- The NITC members thought that the responsibility for network accesses (significant at $p<.01$), system administration (significant at $p<.05$), joint use of network infrastructure, and joint use of application should be more of the NITC's responsibilities, while the NOC members thought that they should be more of the NOC's responsibilities.

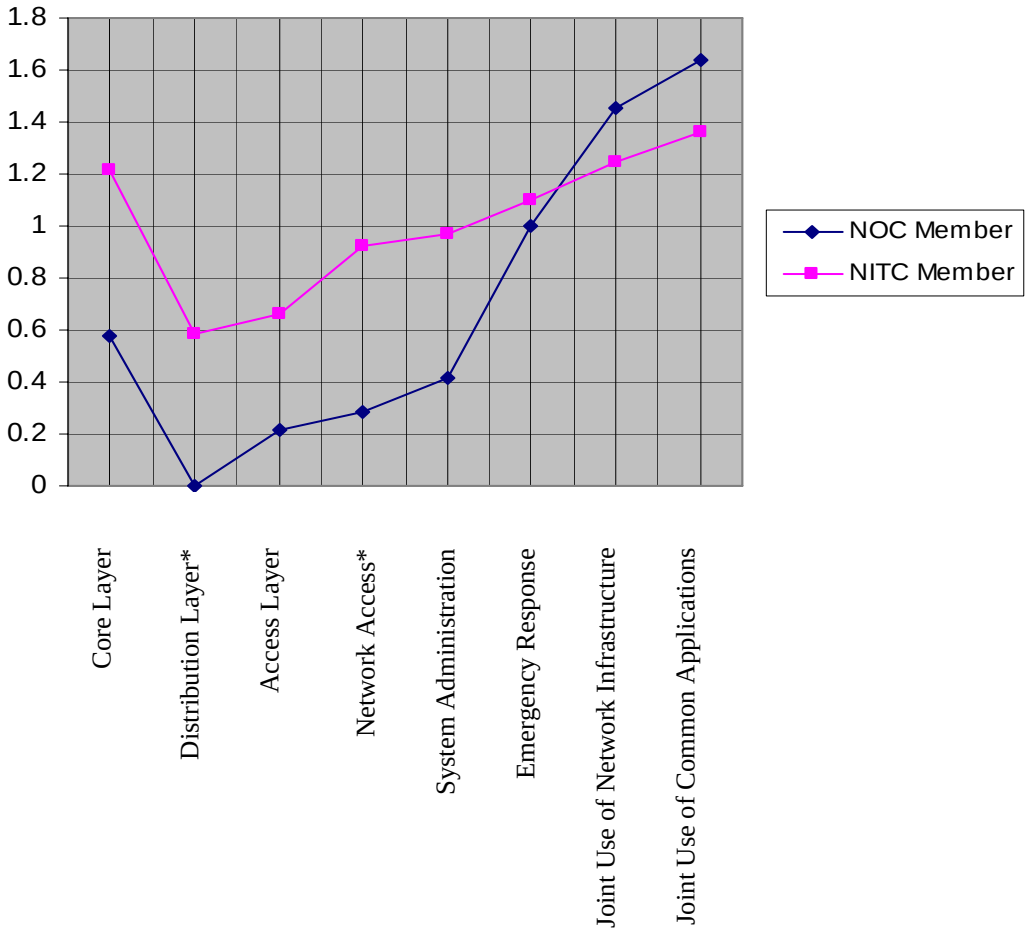
Regarding the standard deviations, the NITC members had greater differences of opinion amongst themselves than did the NOC members regarding the following network services: 1) network distribution layer (significant at $p<.10$), and 2) network access (significant at $p<.10$).

Figure 5.3.3a Mean Comparison of between NITC and NOC Members



*** The difference is significant at P<.01
** The difference is significant at P<.05

Figure 5.3.3b Comparison of Standard Deviations (Between NITC and NOC Members)



* The difference is significant at P<.10

Again, we separated the responses between the OU and the NOAA members, and compared the means and standard deviations as represented in Figures 5.3.4a and 5.3.4b. Here, we noticed that the OU members shared similar perceptions about the roles and responsibilities of the NOC with the NOAA members except for the core layer and joint use of common applications. Specifically:

- The OU members felt that the responsibilities of most services under the core layer should be shared between the NITC and the NOC, whereas the NOAA members felt that the NOC should take more control of these services.
- The NOAA members thought that most services of joint use of common applications should be more of the NITC's responsibilities, whereas the OU members thought that they should be shared between the NITC and the NOC.

Regarding the standard deviations, the variances of the OU members' responses were not significantly different from the variances of the NOOA members' responses.

Figure 5.3.4a Mean Comparison of between OU and NOAA Members

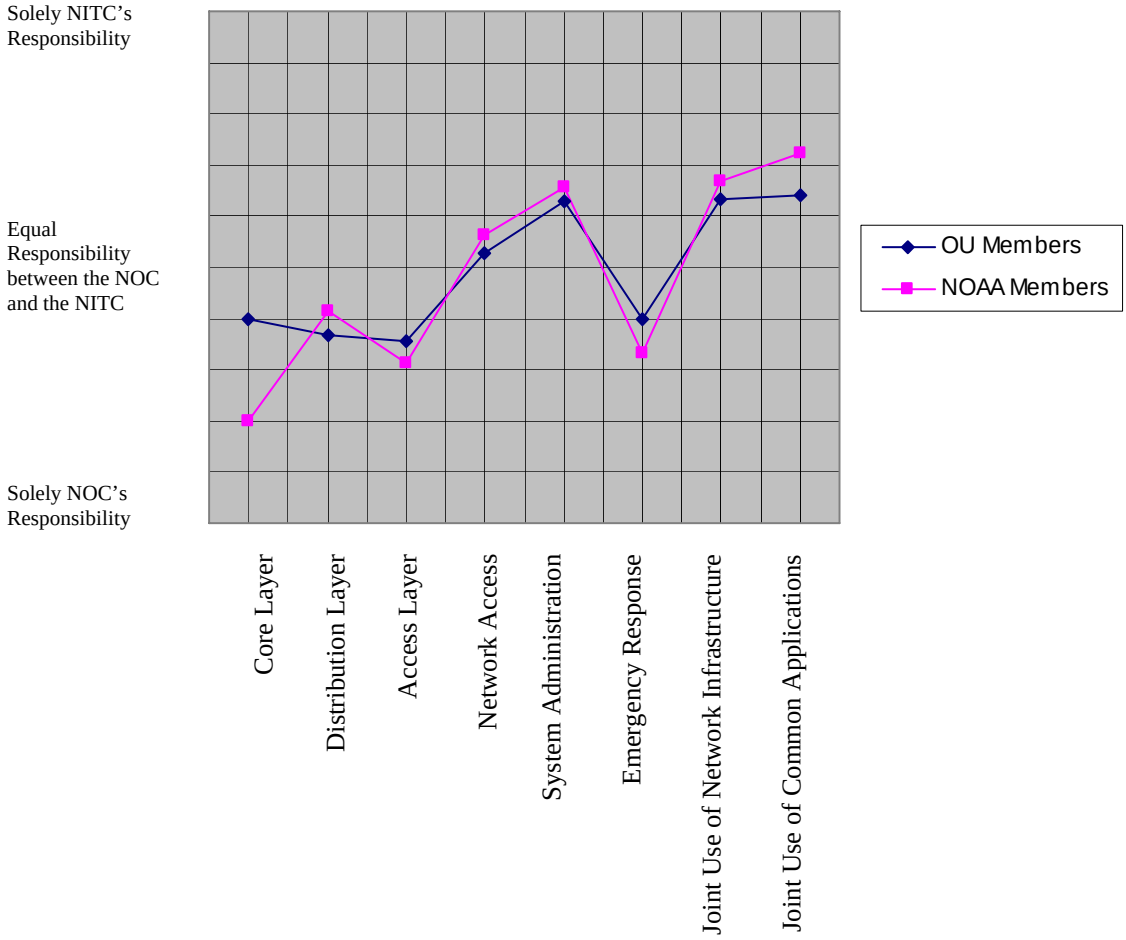
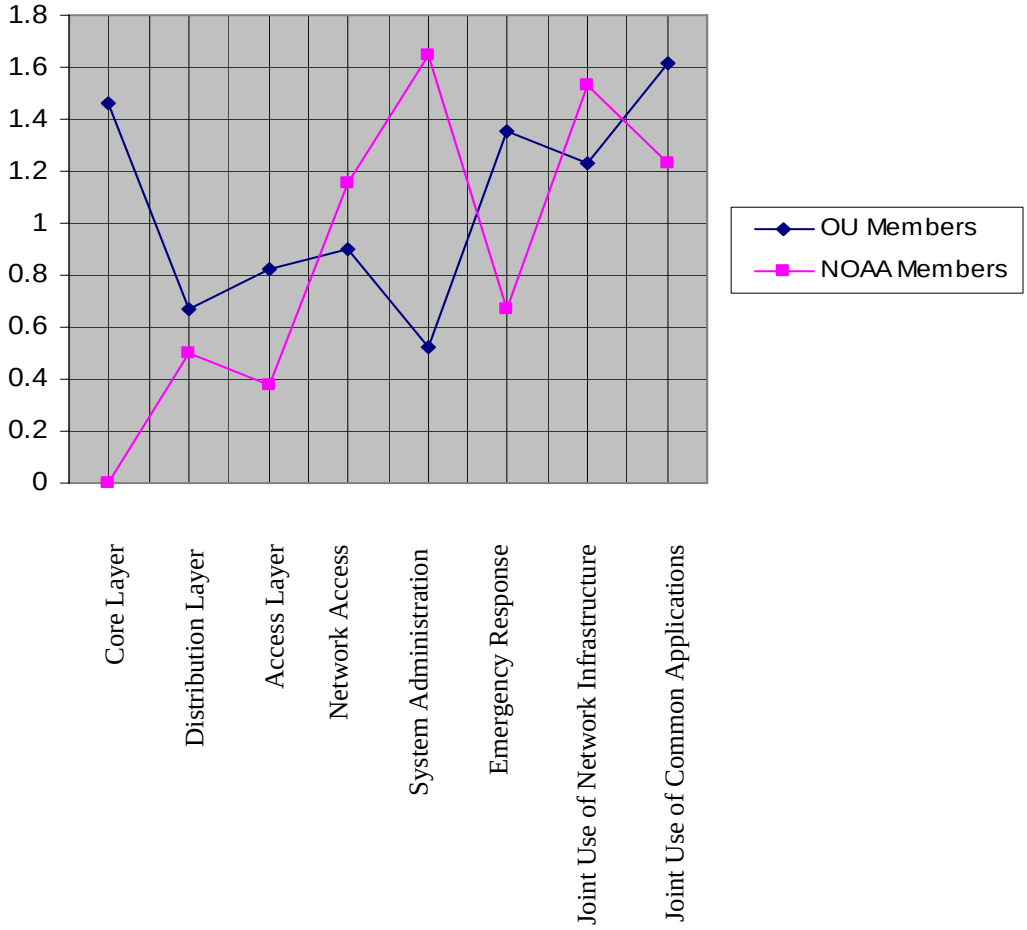


Figure 5.3.4b Comparison of Standard Deviation (Between OU and NOAA Members)



5.3.1.2.2 Misalignment Scores

Overall expectation misalignments amongst the NOC members and amongst the NITC members were calculated, with higher scores indicating greater degrees of misalignment with the NITC or the NOC. The expectation misalignment between the NITC and the NOC members was also calculated for each individual who responded the survey, with higher scores implying higher degrees of misalignment between the NITC and the NOC. Therefore, we derived two misalignment scores for each survey respondent: a) a score representing the expectation misalignment *within* the NITC or the NOC, and b) a score representing the expectation misalignment *between* the NITC and the NOC (Table 5.3.3a).

Table 5.3.3a Misalignment Scores

	NITC	NOC
Misalignment Within	44.60	21.33
Misalignment Between	56.46	51.61

T-tests were conducted to examine differences regarding the two within misalignments as well as regarding the within and between misalignment for both the NOC and NITC. Results indicated that the NITC members had more differences of opinion amongst themselves than did the NOC members (significant at $p<.10$). Results also indicated significant differences between misalignments for both the NOC (at $p<.05$) and NITC (at $p<.05$) (Table 5.3.3b), implying that the alignment issue was more problematic for stakeholders from different operational domains (i.e. between clients and IT professionals).

Table 5.3.3b T-Test Statistics

Respondents	Comparison	Mean Difference	t	df	Sig. (2-tailed)
	Misalignment Within NITC – Misalignment Within NOC	23.27	-2.100	9	.065
NITC	Misalignment Within – Misalignment Between	-11.86	-2.755	7	.028
NOC	Misalignment Within – Misalignment Between	-30.28	-4.732	2	.042

5.3.1.2.3 Summary

To summarize, both the NITC and the NOC members wished to maintain more control over most network services. Within the NITC, the OU members were more willing to cede control over joint use of common applications to the NOC as compared to the NOAA members. However, the OU members wished to maintain more control over the core layer of the network as compared to the NOAA members. When we examined the expectation misalignment in detail, it was noted that stakeholders in the IT governance council had greater disagreement regarding the roles and responsibilities of the NOC than did stakeholders in the IT cooperative. Furthermore, the expectation misalignment between the stakeholders in the IT governance council and those in the IT cooperative was more problematic than the expectation misalignment within either of these two groups.

5.3.1.3 The Performance of the NOC

The average performance scores as evaluated by the NITC members were 3.14 and 3.26. These scores may be interpreted as: a) the NOC personnel reasonably or mostly understood the NITC members' specific needs, and b) the services provided by the NOC had reasonably or mostly met the NITC members' expectations.

5.3.2 Critical Events

5.3.2.1 Email Communications

The communication between the NITC and the NOC regarding any changes, requests, and solutions still occurred mainly through emails. From May 10 2007(after the second-wave results were provided to the NITC and the NOC leadership) to June 28 (the date on which the third-wave survey was concluded), there were 55 emails exchanged in total between the NITC and the NOC, 41 from the NOC and 14 from the NITC. Most emails served the purpose of notifying network-related issues. From these emails, the following critical event was observed.

- In mid May, the NITC email list was moved to a new ListManager server from the old MailMan implementation. Because of this change, one of the NITC members from NOAA did not receive the notification message about a firewall reboot and emailed the NOC to inquire about this issue.

5.3.2.2 Observation at the NITC Meeting

At the NITC meeting in June, the NITC and the NOC members primarily discussed how network-related announcements/discussions should be communicated. As a follow up of the email list change, it was suggested that three email lists be established: one including all the NITC members and ex-officio, one including the NITC members only, and another one including additional members from the COD for example.

One of the NOC members also communicated that for some important issues they sent out, the NITC was expected to pass the information onto the higher management. Otherwise, the NOC was always the one being blamed, although in fact they did send out notification about certain network changes.

5.3.2.3 Survey Comments

Two NITC members and one NOC member provided comments on the mission statement of the NOC, possibly reflecting the salience of the mission statement during the second wave of data collection. One NITC member's comments were documented below:

> "The mission statement is in need of revision to provide clarification of services provided to the different entities. Services should not be mandatory in all instances and should be provided on an as-needed basis. There should be separation of federal and state agencies since responsibilities to both are different."

Another NITC member commented:

> "The mission statement of the NOC needs to be considered a living document in the short term. It needs to be flexible and changeable to fit the needs of the NITC members and the NOC."

One NOC member also expressed his feelings about the mission statement of the NOC:

> "The MOA was intended to paint the broad brushstrokes of how NOC/NITC relationships would be governed. A set of polices and procedures was the next step into actually defining into how the relationship would function on a daily basis."

These survey comments suggested that the NITC members felt it necessary to revise the mission statement of the NOC to fit the needs of the NITC and the NOC. However, the NOC member thought the mission statement should remain broad, while a set of policies and procedures should be established as a supplement to the mission statement.

5.3.3 Interview Results

We interviewed three people (1 NITC co-chair, 1 NITC member, and 1 NOC co-chair) during the third wave of the study to explore the research context. Questions were asked in four major areas: 1) the way the NITC and the NOC members communicated and coordinated NOC-related activities; 2) the mission statement; 3) the performance of

the NOC; and 4) the governance of the NITC. The following sections summarize the answers from the three interviewees.

5.3.3.1 Interactions between the NITC and the NOC

Although communication seemed to have improved between the NITC and the NOC, there were still areas where more attention was needed. Earlier, the NITC members suggested that a website should be established to facilitate the communication between the two groups. Yet up to today, this issue had not been addressed and the NITC members believed that improvement in this area would be particularly productive.

> "I don't think it is because of necessarily a lack of desire…probably a lack of people. But we've talked in the past about the NITC and the NOC having a blog set up somewhere, reporting things like that. Also, the availability of log files for NITC members to go and diagnose problems might be affecting them. That has just not happened."

> "I think having a form type environment like on a web server, or some sort of status, that would be the best thing they can do right now. That would alert us upcoming changes, or things they've done recently, emergency changes and things that if something happened. I can go and look. That's probably the biggest thing we need right now."

Also noted by a NITC member from NOAA was the following:

> "We need more and better communications. It's what seems to always come down to us, just people talking and getting things out in the open. Not from my side, but from the university side, I hear a lot they are not happy with, I don't want to say services, but there is no realization of who's supposed to be in charge of what. The NOC says we are going to do this service, and the NITC guys say no we want to do this service. So there is some lack of administration over on their side. But on our side, it's fine. "

The reason that communication about the roles and responsibilities was not as important for the NOAA side was that:

> "We do our own name servers, web servers, and everything we do ourselves. The only service that we expect from the NOC is to keep the network up and running, and to make changes as we need to change ports, and that kind of stuff. As far as I'm concerned, if those services are provided to us, then we are just fine."

As can be seen from the comment above, the NITC members expected some communication mechanisms (e.g. a website) to be put in place to systematically notify any important issues and allow individual units to have access to network-related files (e.g. log files).

5.3.3.2 Mission Statement

During the first two waves of study, several NITC members pointed out the mission statement lacked accuracy and did not reflect the actual situation of network operations in the building. Having discussed with a COD member, the NITC and the NOC leadership decided to start working on revising the mission statement of the NOC. When asked what should be the most important issues to address in this revision, one NITC member stated:

> "They need to define the service level agreements. That's my biggest concern. If you are going to provide the service to me, what can I expect out of that? What are the ramifications if something does happen bad? Are there going to be costs? Basically, it has to be detailed. It just needs to be more well defined on whose roles are whose."

Another NITC member commented:

> "As far as MOA, NOAA should, I believe, put OU (IT) on the spot as far as pushing them to get real redundancy for the network off the campus. Because NOAA obviously has a need for network connectivity and for it to be up all the time, but also it would be to OU's benefit to have redundant network connectivity. When I say that, I mean real redundant network connectivity going in different directions, not just on campus. I've talked with other people about the campus, and they are wanting to grow the campus in terms of research organizations here. People will not move their data center here if there is no real redundancy. So that is a big thing."

As we mentioned earlier, the current mission statement was established between the CIO of NOAA and the CIO of the university. A NITC member felt that more people should be involved in defining the mission statement:

> "The MOA needs to be worked over and rewritten and have more people looked at it. It needs to be a process that everybody involved in. Not just two people, which I think is what happened before."

However, a NOC member thought that establishing the MOA should be primarily the CIOs' responsibilities:

> "The MOA is not an agreement between the NITC and the NOC. The MOA is not between the OU NITC members and the NOAA NITC members. The MOA is an agreement between the CIO of NOAA and the CIO of the University of Oklahoma, and how the NOC should be run in regards to the NOAA units. It says very little how the NOC should be run in relations to the university units. Now, having said that, I think it's probably beneficial that this review of the MOA be undertaken. But at the same time, it should be with the full input of people that are outside this building that have a stake in how things are run. Just because the agreement is between the university and NOAA, not between the members of the NITC. I think in that regard, the review certainly will be beneficial. Perhaps some level of revision should be done. But at the same time, it's not really their document to sign. It has to be done with iterations amongst the different higher level management that is involved with the building and the document."

Also, this NOC member felt that "it would be useful to have an open discussion about what the different NITC and NOC members believe that the MOA actually says."

Regarding the discussion of the mission statement, similar to what was brought up by one of the NITC co-chairs earlier, a NITC member pointed out the resource constraint faced by the NITC and the NOC that limited them to make necessary changes:

> "Money and resources are always the thing. We are in a situation where certain amount is needed but the units can only contribute so much, and university and NOAA can only contribute so much, so we've got to do with what we get."

In conclusion, people propagating changes in the mission statement believed that the roles and responsibilities of the NOC should be better defined, and policies and procedures should be established to provide guidelines regarding how to carry out certain services based on the agreement between the NITC and the NOC. Yet, the NITC and the NOC seemed to have different opinions regarding the real purpose of the mission statement, and who should be involved in the process of defining the mission statement.

5.3.3.3 The Performance of the NOC

Most interviewees agreed that in terms of the services provided by the NOC, "the management of the network as whole is going well". Particularly with the firewall, "the NOC was able to satisfy the NOAA side the security issues while allowing the research units to do their thing". However, from the operational point of view, it might be necessary for the NOC "to better know the customer and know what their needs are". Also, the NOC may "need better trained personnel, the technical expertise".

Also, it seemed that as network users, the NITC members might appreciate the network helpdesk to be available 24/7.

> "Folks at the NOC do really well as far as for the amount of man power that they have in terms of response to outages or problems or questions. However, in the middle of the night they are all at home. In the middle of the night it's usually something break for some reasons. If the university wants to grow like we have here at the national weather center, what they need to do is to make it available a way for us the NITC members to be able to call OU's networking people in the middle of the night. I can call 325 HELP, but for a problem with VOIP, only a network engineer would understand."

Yet again, relevant to the mission statement of the NOC, a NOC member explained that "we are not doing a very good job in some areas because we are not being allowed to do a good job" (e.g. NOAA's DNS). On another note, a NITC member was unimpressed with the level of support from above the NOC:

> "I am unimpressed that someone at OU IT hasn't seen the vision that the more they will support and push the whole idea of the NOC down here and make things happening, it would be for the benefit of the research campus as a whole. Their focus has been a little bit here and there everywhere. But that wasn't their fault, that's because they are trying to fulfill the thing in the mission statement. What they are trying to support the NOC on is a lot of more application type of the thing, where as in my opinion, the support or the areas they can really help the NOC would be supporting them getting redundant connections."

In conclusion, we learned from the interviews that with regard to the NOC's performance, personnel training and better understanding of the customers' needs were

important. Moreover, an agreement on what services were actually requested from the NOC was critical as well, as it would allow the NOC to focus on meeting the expectations of the customers.

5.3.3.4 The Governance Council

As a governance entity, the NITC was also in the process of learning how to give direction and oversight of the NOC. As time goes on and the NITC members started to know one another better, the NITC was making some progress in its governing skills. As commented by a NOC member:

> "I think it would be unfair to characterize how the NITC was doing that very early on in the process a year and half ago. Because the NITC was an organization that barely knew who each other was, much less what their missions were, and how it was they were going to approach collegial networking in the same building. If you take it as a whole, I would have to say they've had tremendous improvement in how they provide direction, and I'll put direction in quotes. I think they are getting to the point now that they understand what their role is in regards to the NOC. I think we are just now beginning to see the NITC making preparations to set out guidance as they would see the NOC should be doing business."

However, given that the NITC was composed of representatives from multiple organizations, it was challenging for the NITC to speak in a coherent voice. As noted below:

> "I think things that have been handled well have really been on the individual basis. I don't think they've been really on the corporate basis. I don't think there's been any broad spectrum guidance from the NITC to the NOC other than communicating more with us."

Even the NITC members themselves agreed that "the NITC has been good at communicating the needs of the various units that we represent. However, I don't think that we have presented a coherent enough voice at times."

> "The problem we have is there are too many people trying to tell one organization what to do, and everybody's got their own agenda, everybody has their own needs and requirements…We really haven't given much guidance. Mostly guidance comes from individual members, not from the NITC council itself. There are way

too many people trying to give directions at the same time. We can't come to a consensus that's good for everybody."

In order to make things work out in the long run, a solution was suggested by a NITC member: "maybe rethinking the mission of the NITC, and dedicated only to matters that truly do affect everybody as a single unit, and not individual units". Alternatively, "the NOC needs to actually have an agreement with each individual organization of what their services are, what they expect to be. That way, they can take direction specifically from that organization." In other words, as a governance council, the NITC was not doing so well in giving directions and guidance to the NOC, whereas this was an area where improvement should be made by the NITC as a whole.

5.3.3.5 Summary of the Interviews

To summarize, the following themes emerged from the third round of interviews.

Communication between the NITC and the NOC: As reported by the NITC and the NOC members, communication between the NITC and the NOC had improved significantly. As time goes on, the NITC and the NOC members would have better understandings of each other in terms of which communication strategy worked better with different groups. However, some issues that were brought up by the NITC members before were still being neglected, e.g. a web-based communication channel. The NITC members believed that more attention to such issues will further improve the effectiveness of communication between various stakeholder groups.

The Mission Statement of the NOC: Given that the NITC/NOC leadership will take the lead in revising the mission statement, several respondents provided input regarding what issues should be addressed first. It was suggested that the mission statement should be more specific about what services the NOC would provide, and how

those services should be provided. However, the NITC and the NOC seemed to have different opinions regarding the real purpose of the mission statement. They also seemed to disagree who should be involved in the process of defining the mission statement. Given this situation, it might become beneficial to have an open discussion between the NITC and the NOC members to clarify how they understood the mission statement.

Resource and Managerial Support: Currently, the NITC and the NOC face various resource constraints in terms of what can be done and how much can be done. Particularly with the work of the NOC, the NITC members called for more support from the top management. With the necessary support from the level above the NOC, it will be more likely for the NOC to better understand the research needs of its clients and provide more satisfactory services. Also, more resource support will allow the NITC and the NOC to implement those actions that are critical to the operation of the NOC.

The IT Governance Council: The NITC serves as an IT governance council to give direction and oversight of the NOC. Given that multiple organizations with very different network needs were involved, it was challenging for the NITC to speak in a coherent voice. However, the unification of the NITC is important, especially when the NOC is trying to serve all the clients as a whole. Without being able to request the common services needed by all the NITC entities, the governance of the NITC will become ineffective.

5.3.4 Summary of the Third Wave of the Study

To summarize, through the third round of surveys, interviews, and observations, we found that clan control was in place in the IT governance council, while outcome control was primarily relied on in the IT cooperative. These findings imply the reliance

of mechanistic controls in the IT cooperative and the presence of organic controls in the IT governance council. However, similar to what we learned earlier, there was still not a formal control mechanism in terms of the performance of the IT cooperative.

In terms of the coordination of NOC-related activities, personal coordination was used in the IT governance council, while both impersonal and personal coordination was in place in the IT cooperative. However, formal policies and procedures were lacking regarding what services should be provided and how those services should be provided.

In terms of communication, both vertical and horizontal communication was used in the IT cooperative, whereas horizontal communication was more common in the IT governance council. Greater communication was observed in the IT cooperative than in the IT governance council. In addition, two-way communication was more common in the IT cooperative than in the IT governance council. Communication had improved based on the perceptions of the NITC and the NOC members.

Regarding the organizing vision, stakeholders in the IT cooperative found the mission statement of the NOC to be more meaningful. A revision of the mission statement will soon be undertaken by the leadership of the IT governance council.

Lastly, stakeholders within the IT governance council had greater disagreement regarding the roles and responsibilities of the NOC than did stakeholders in the IT cooperative, and the expectation misalignment between the stakeholders in the IT governance council and those in the IT cooperative was more problematic than the expectation misalignment within either of these two groups. Furthermore, the perceived performance of the IT cooperative was improved.

5.3.5 Comparison with the Second Wave of the Study

We conducted a comparison between the responses from the second wave and the third wave of data collection for both the NITC members and the NOC members, as represented in Figure 5.3.5a and Figure 5.3.5b. We noticed that for the NITC members, as compared to the second-wave results, they reported less influence of collective views, implying less use of organic controls. The NITC members also reported less use of interpersonal interaction, horizontal communication, face-to-face communication, telephone communication, web-based communication, document-based communication, and two-way communication. In addition, the NITC members looked less at the mission statement of the NOC in the third wave of the study, and they perceived the mission statement to be less important. On the other hand, the NITC members reported more use of email communication in the third wave of the study. The NITC members also perceived the mission statement of the NOC to be more interpretable, more reasonable, and required more organizational changes as compared to their second-wave responses.

For the NOC members, they reported more use of outcome control in the third wave of the study, indicating more reliance on mechanistic controls. As compared to their second-wave responses, they also reported more use of: horizontal communication, telephone communication, communication based on electronic document, and two-way communication. In addition, the NOC members perceived the mission statement to be more interpretable in the third wave of the study. On the other hand, their perspectives tended to be shaped less by collective views. The NOC members reported less use of interpersonal interaction, face-to-face communication, website communication, and communication based on non-electronic document in the third wave of the study.

Figure 5.3.5a Mean Comparison across Time (NITC Members)

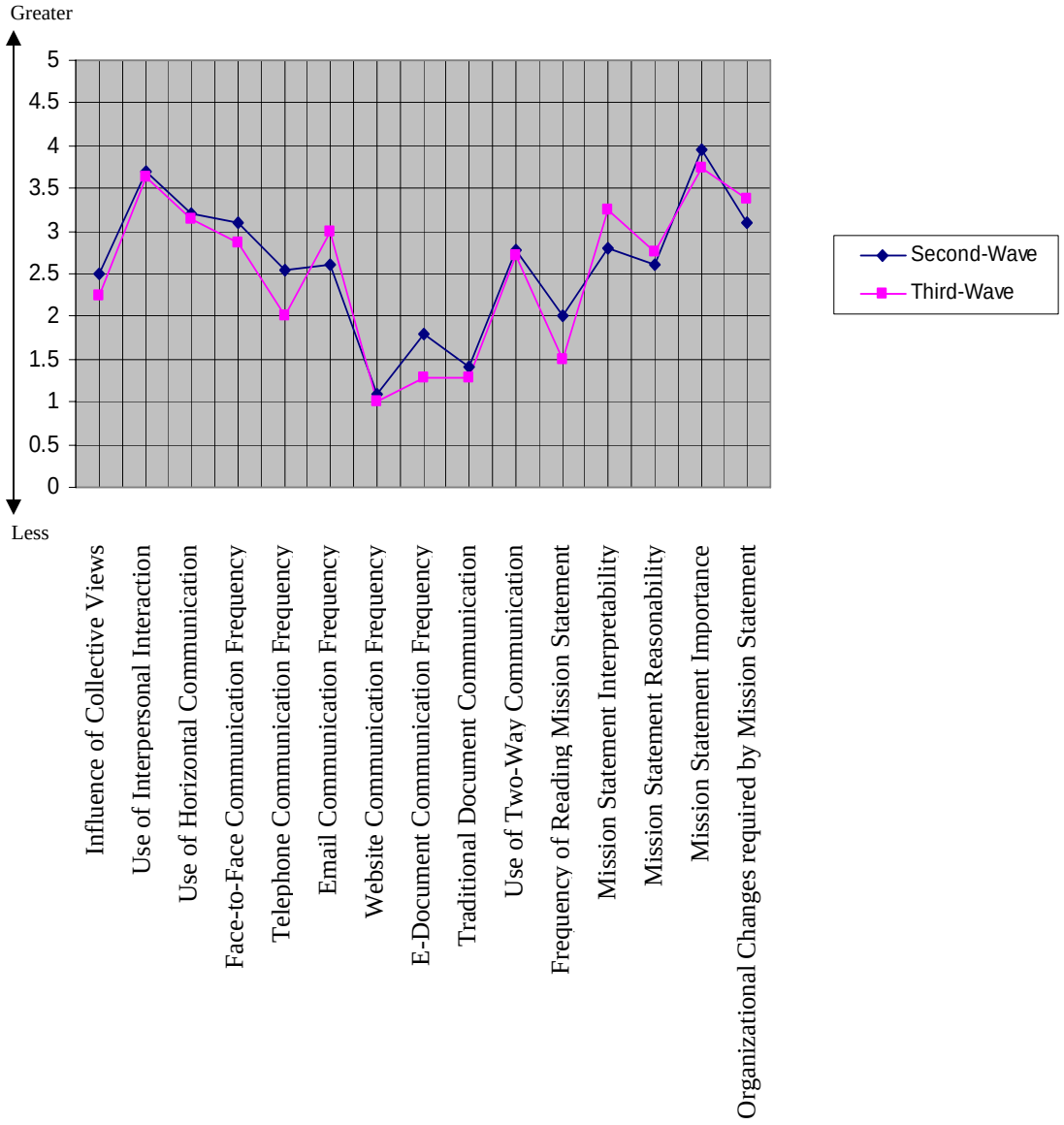
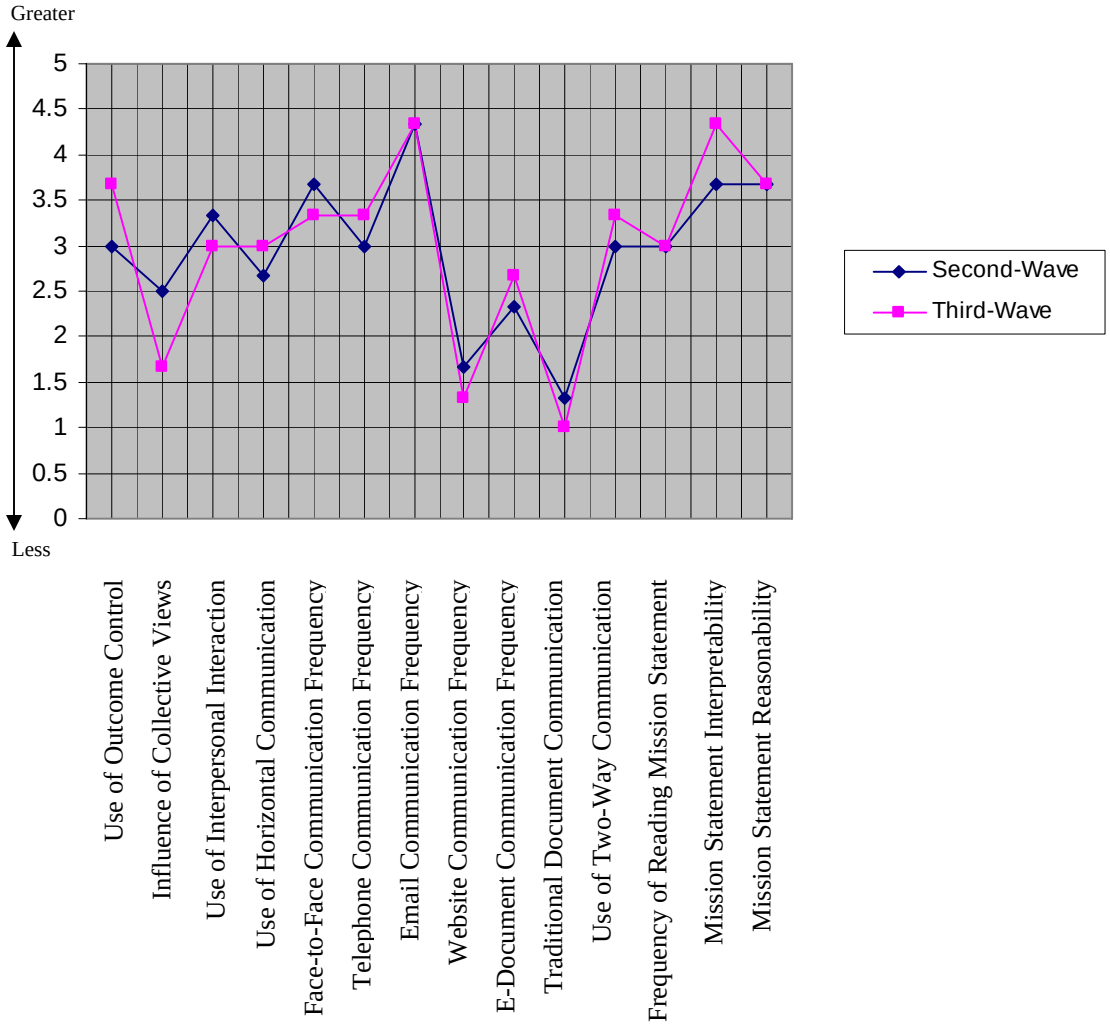


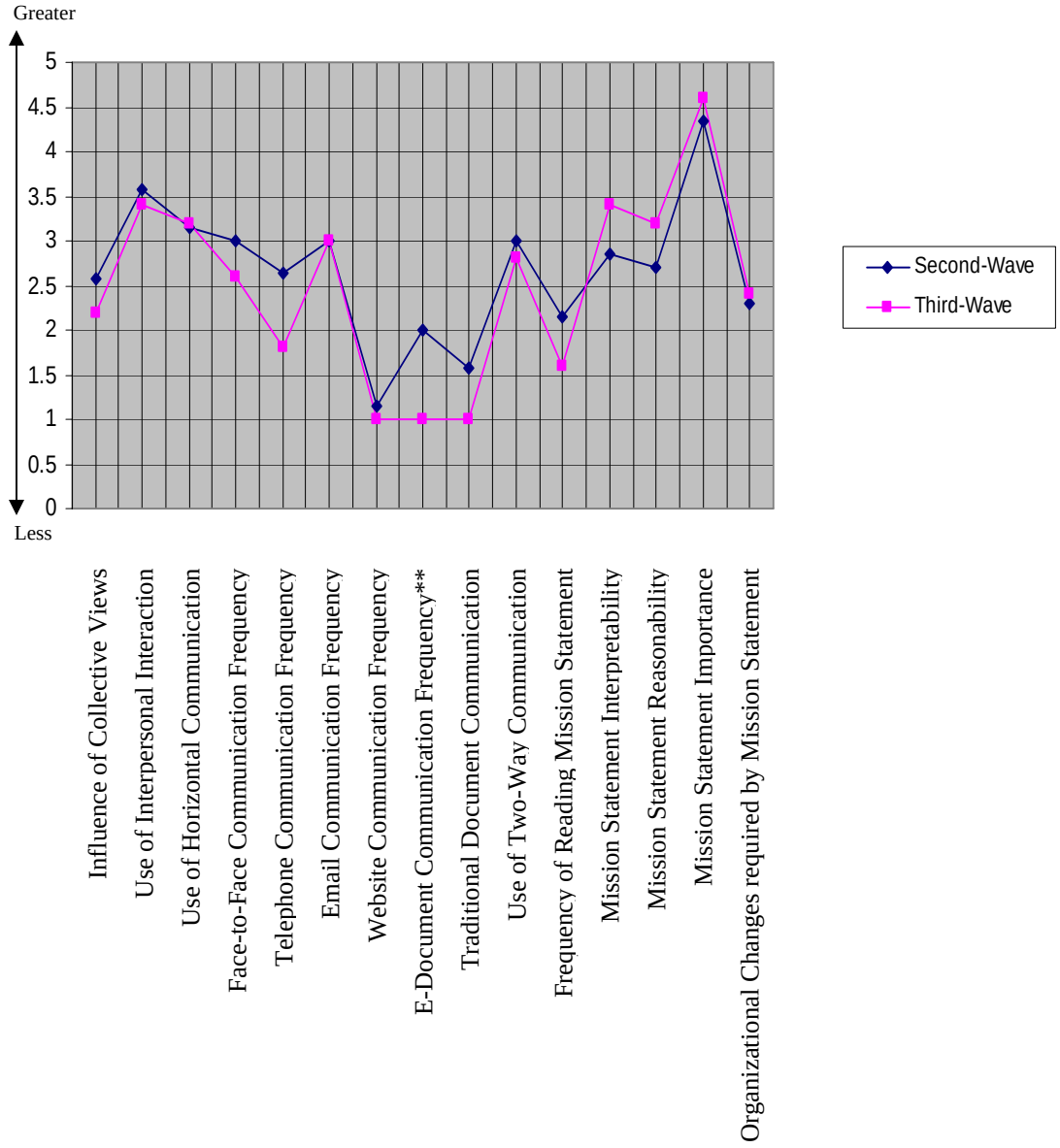
Figure 5.3.5b Mean Comparison across Time (NOC Members)



We also separated this comparison analysis for the OU and the NOAA members, as represented in Figure 5.3.6a and Figure 5.3.6b. We observed from the results that compared to the second wave of the study, the OU members reported their perspectives were less influenced by collective views. In the third wave of the study, they reported less use of: interpersonal interaction, face-to-face communication, telephone communication, web-based communication, communication through electronic document (significant at $p<.05$) and non-electronic document, and two-way communication. They also looked at the mission statement less frequently in the third wave of the study than did they in the second wave of the study. On the other hand, the OU members reported more use of horizontal communication as compared to their second-wave responses. In the third wave of the study, the OU members perceived the mission statement to be more understandable, more realistic, and more important. They also felt the mission statement of the NOC required more organizational changes.

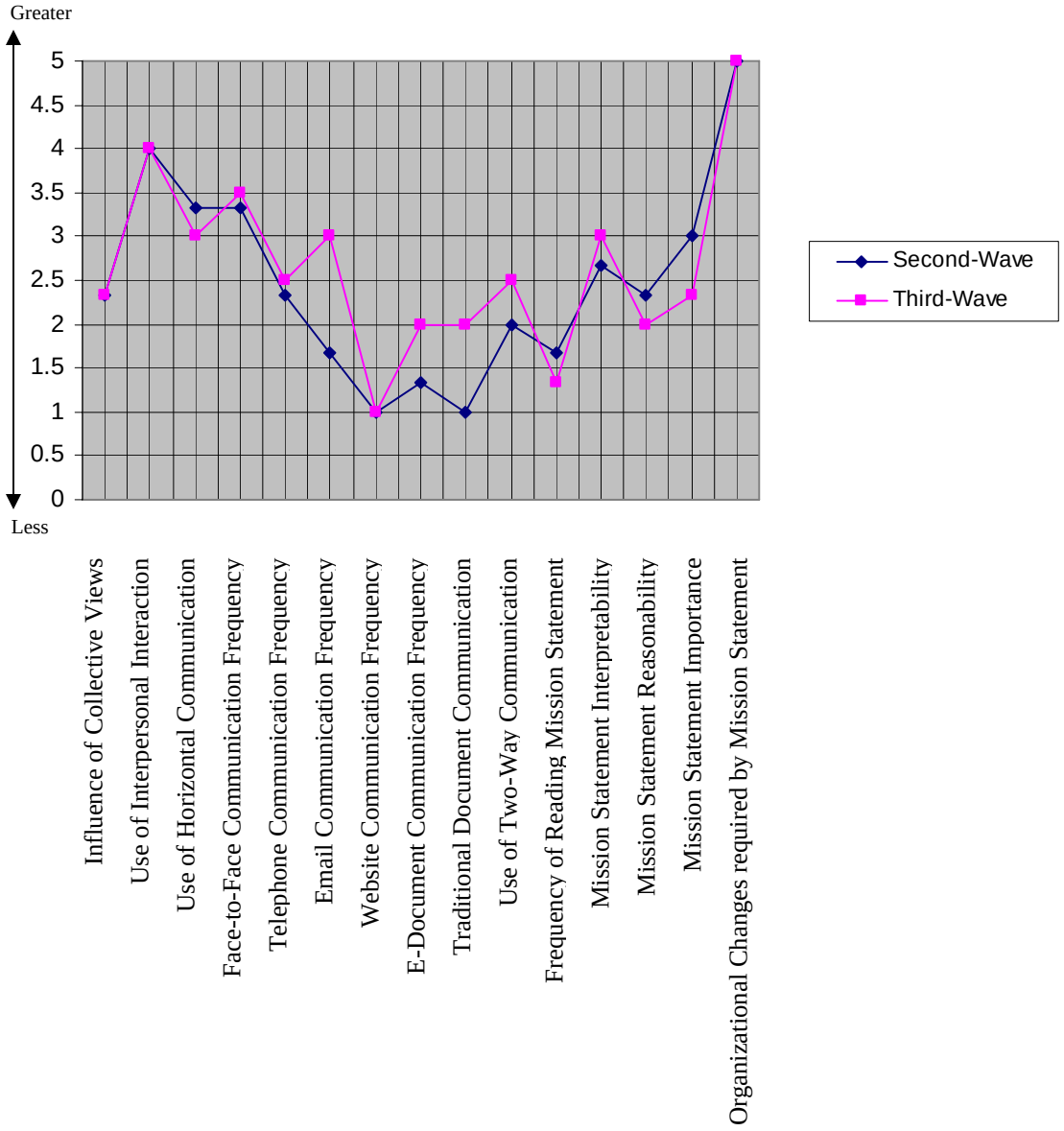
In comparison, the NOAA members reported less use of horizontal communication as compared to their second-wave responses. They looked at the mission statement less frequently, and they perceived the mission statement to be less realistic and less important in the third wave of the study. But in the third wave of the study, the NOAA members had more use of: face-to-face communication, telephone communication, email communication, communication based on electronic document, communication based on non-electronic document, and two-way communication. The NOAA members also perceived the mission statement to be more interpretable as compared to their second-wave responses.

Figure 5.3.6a Mean Comparison across Time (OU Members)



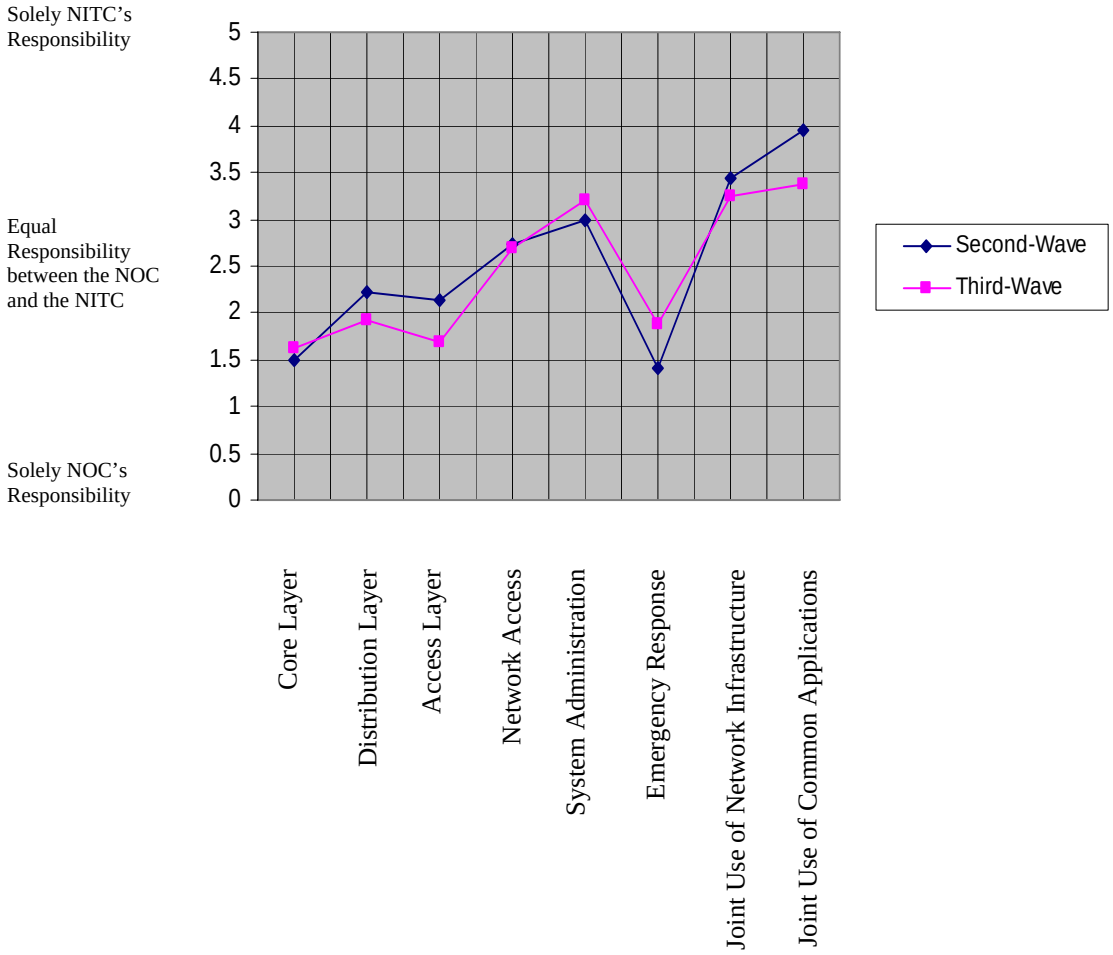
** The difference is significant at P<.05

Figure 5.3.6b Mean Comparison across Time (NOAA Members)



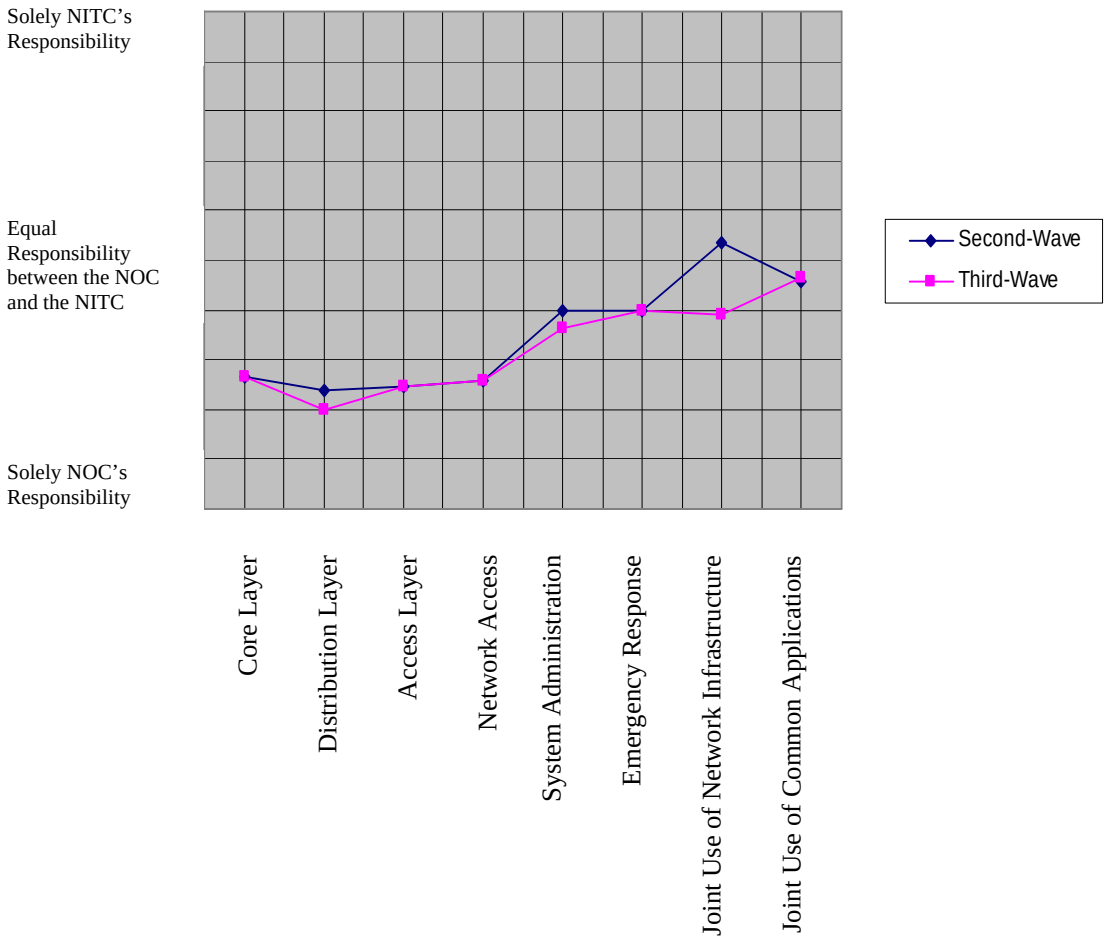
Regarding the network services, a comparison between the second-wave and the third-wave data for both the NITC and the NOC members are summarized in Figure 5.3.7a and Figure 5.3.7b. Generally speaking, we noticed that in the third wave of the study, the NITC members were willing to let the NOC have more control over the distribution layer, the access layer, joint use of network infrastructure, and joint use of common applications. Yet, the NITC members wished to maintain more control over the core layer, system administration, and emergency response. The differences between the two waves of data were not significant at p<.10.

Figure 5.3.7a Mean Comparison across Time (NITC Members)



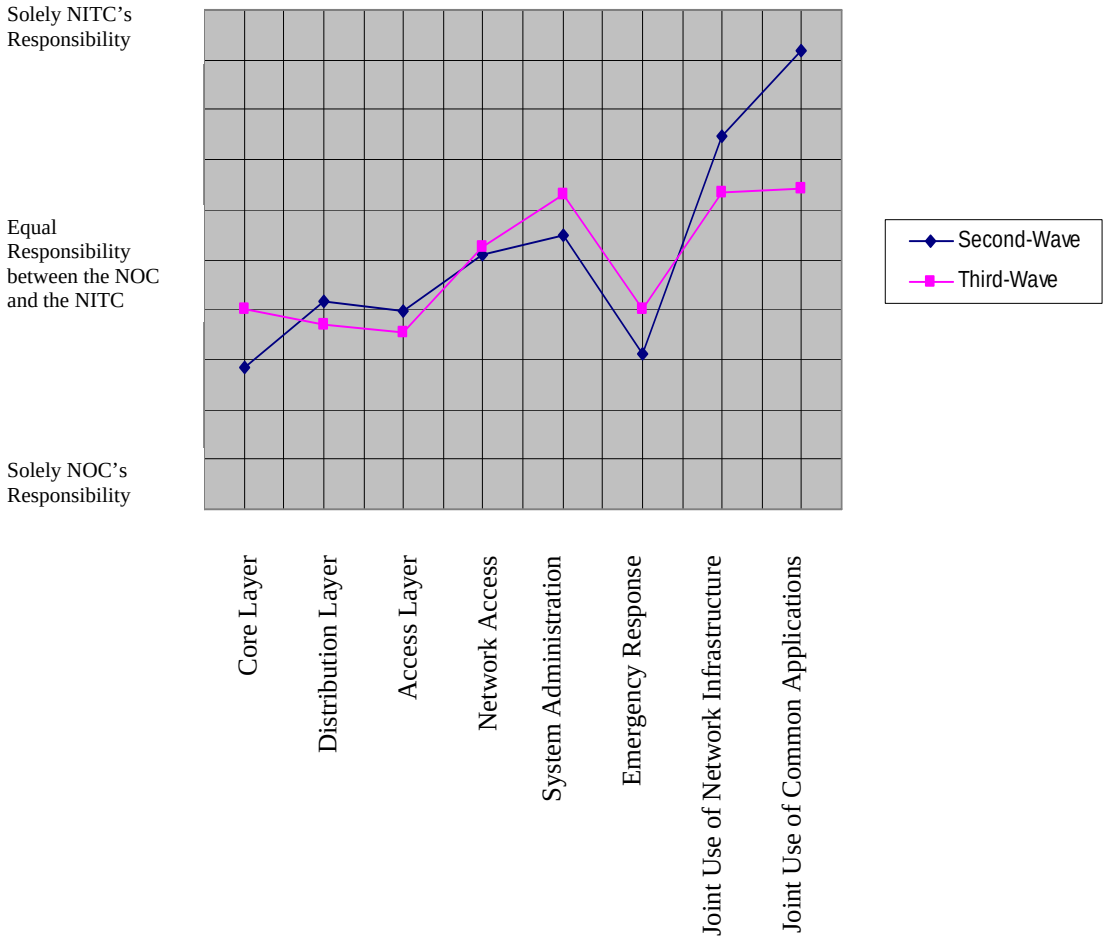
For the NOC members, they also wished to have more control over the distribution layer, system administration, and joint use of network infrastructure as compared to their second-wave responses.

Figure 5.3.7b Mean Comparison across Time (NOC Members)



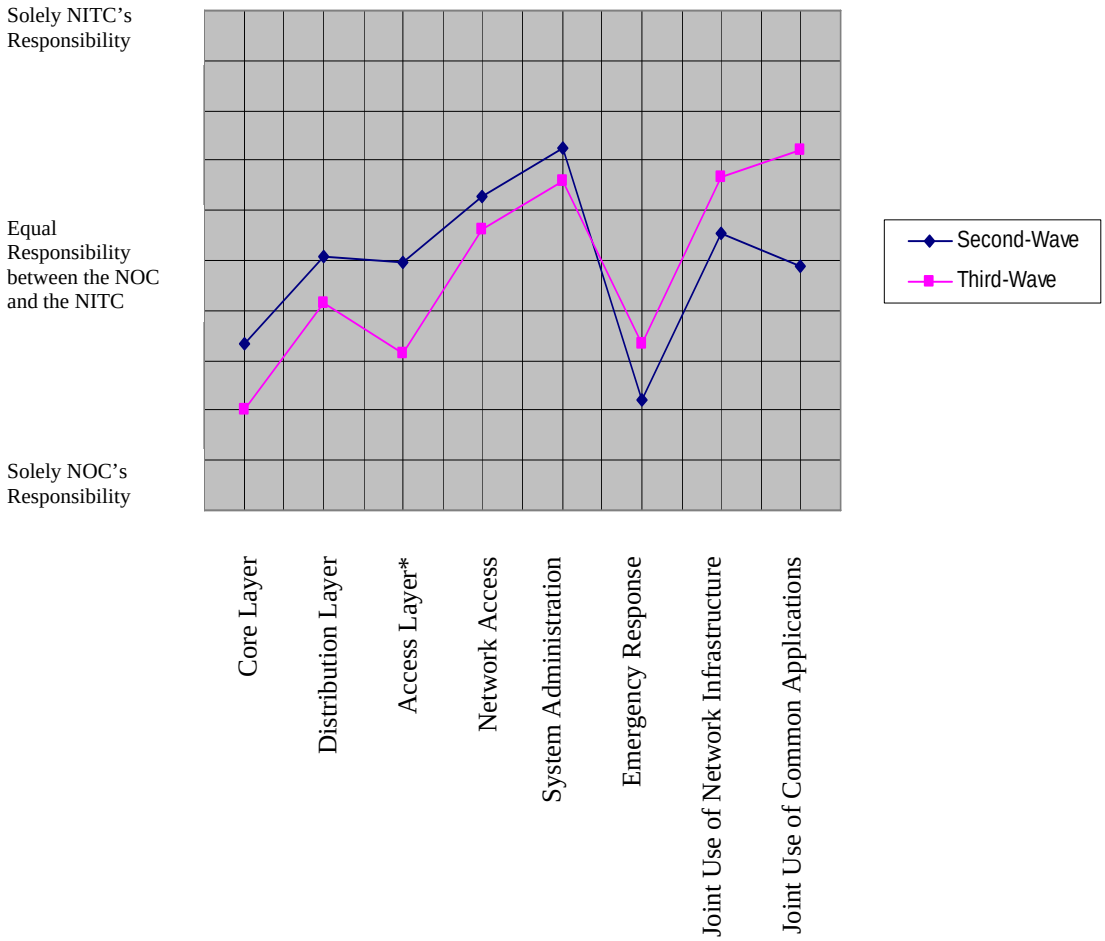
We further separated such comparisons for the OU and the NOAA members, as presented in Figure 5.3.8a and Figure 5.3.8b. For the OU members, in the third wave of the study, they were more willing to cede control to the NOC over the distribution layer, the access layer, joint use of network infrastructure, and joint use of common applications. However, they wished to take more control over the core layer, network access, system administration, and emergency response as compared to their second-wave responses.

Figure 5.3.8a Mean Comparison across Time (OU Members)



In comparison, the NOAA members were more willing to cede control over most network services to the NOC except for emergency response, joint use of network infrastructure, and joint use of common applications as compared to their second-wave responses. The difference between the two waves of data was significant for the access layer of the network (at p<.10).

Figure 5.3.8b Mean Comparison across Time (NOOA Members)



* The difference is significant at p<.10

Compared to the second-wave data results, the misalignment score within the NITC increased (significant at p<.10), but the misalignment score within the NOC slightly decreased. These findings indicated that the NITC members tended to have more discrepant perceptions amongst themselves, yet there seemed to be more agreement amongst the NOC members. On the other hand, the misalignment score between the NITC and the NOC increased slightly, indicating that there tended to be more disagreement between the NITC members and the NOC members regarding the roles and responsibilities of the NOC as compared to the second-wave results (Table 5.3.4).

Table 5.3.4 Misalignment Scores across Time (NITC & NOC Members)

	NITC			NOC		
	Second-Wave	Third-Wave	Mean Difference	Second-Wave	Third-Wave	Mean Difference
Misalignment Within	35.71	44.60	8.89*	22.00	21.33	-0.67
Misalignment Between	53.12	56.46	3.34	50.78	51.61	0.83

*The difference is significant at p<.10

Regarding the NITC members' evaluation of the performance of the NOC, the NITC members became more satisfied with the NOC (Table 5.3.5a), implying that the IT stakeholders from the NOC had more understandings of what was required by the clients, and their services had met the clients' expectation to a greater extent. Particularly, when we examined the responses from the OU members and the NOAA members separately (Table 5.3.5b), we noticed that the OU members felt that the NOC had more understanding of their requirements, and both the OU members and the NOAA members showed more satisfaction with the services provided by the NOC.

Table 5.3.5a Performance Evaluation across Time (All NITC Members)

	Second -Wave	Third-Wave	Mean Difference
The NOC understands our organizational needs	2.60	3.00	0.10
NOC's services have met our expectations	2.50	3.38	0.00

Table 5.3.5b Performance Evaluation across Time (NITC members)

	OU Members			NOAA Members		
	Second - Wave	**Third-Wave**	**Mean Difference**	**Second -Wave**	**Third-Wave**	**Mean Difference**
The NOC understands our organizational needs	2.43	3.00	0.57	3.00	3.00	0.00
NOC's services have met our expectations	2.29	3.20	0.91	3.00	3.67	0.67

To summarize the differences between the second- and the third-wave findings, in terms of IT governance, the NOC members reported more use of mechanistic controls (e.g. outcome control) in the third wave of the study. Both the NITC (particularly the OU side) members' and the NOC members' expectations were less influenced by the collective views of other NITC members as time goes on, implying less reliance on organic controls. Both the NITC members (particularly the OU members) and the NOC members also used less interpersonal interaction to coordinate NOC-related activities in the third wave of the study.

In terms of communication, in the third wave of the study, the NITC members (particularly the NOAA members) used more vertical communication, whereas the NOC members communicate more horizontally and bi-directionally. Both the NITC members (particularly the NOAA members) and the NOC members perceived greater communication over time.

Regarding the meaningfulness of the organizing vision, the NITC members (particularly the OU members) perceived the mission statement to be more understandable and realistic, but less important over time. The NOC members also perceived the mission statement of the NOC to be more interpretable in the third wave of the study. The NITC members (particularly the OU members) also perceived the mission statement required more changes in their organizations in the third wave of the study.

In terms of stakeholders' expectations of the roles and responsibilities of the NOC, in the third wave of the study, the NITC members were willing to let the other party take more control over some network services (e.g. distribution layer, access layer, joint use of network infrastructure, and joint use of common applications). Yet, the NOC members wished to maintain control over most network services. Over time, the expectation misalignment between the NITC and the NOC increased slightly. In addition, the expectations of the stakeholders within the NITC became significantly more misaligned.

Lastly, stakeholders' evaluation of the performance of the NOC was improved over time. Both the OU members and the NOAA members seemed to become more satisfied with the extent to which the NOC understood their needs, as well as the extent to which the services provided by the NOC had met their needs.

5.4 Changes across All Three Waves of Data Collection

In order to identify systematic trends overtime, we compared the responses from all survey subjects across three waves of the study. The findings are presented in the following sections.

5.4.1. Interactions between the NITC and the NOC

We first conducted a comparison between all three waves of the data collection for both the NITC members and the NOC members regarding IT governance and the organizing vision, as represented in Figure 5.4.1a and Figure 5.4.1b.

Figure 5.4.1a Mean Comparison across Time (NITC Members)

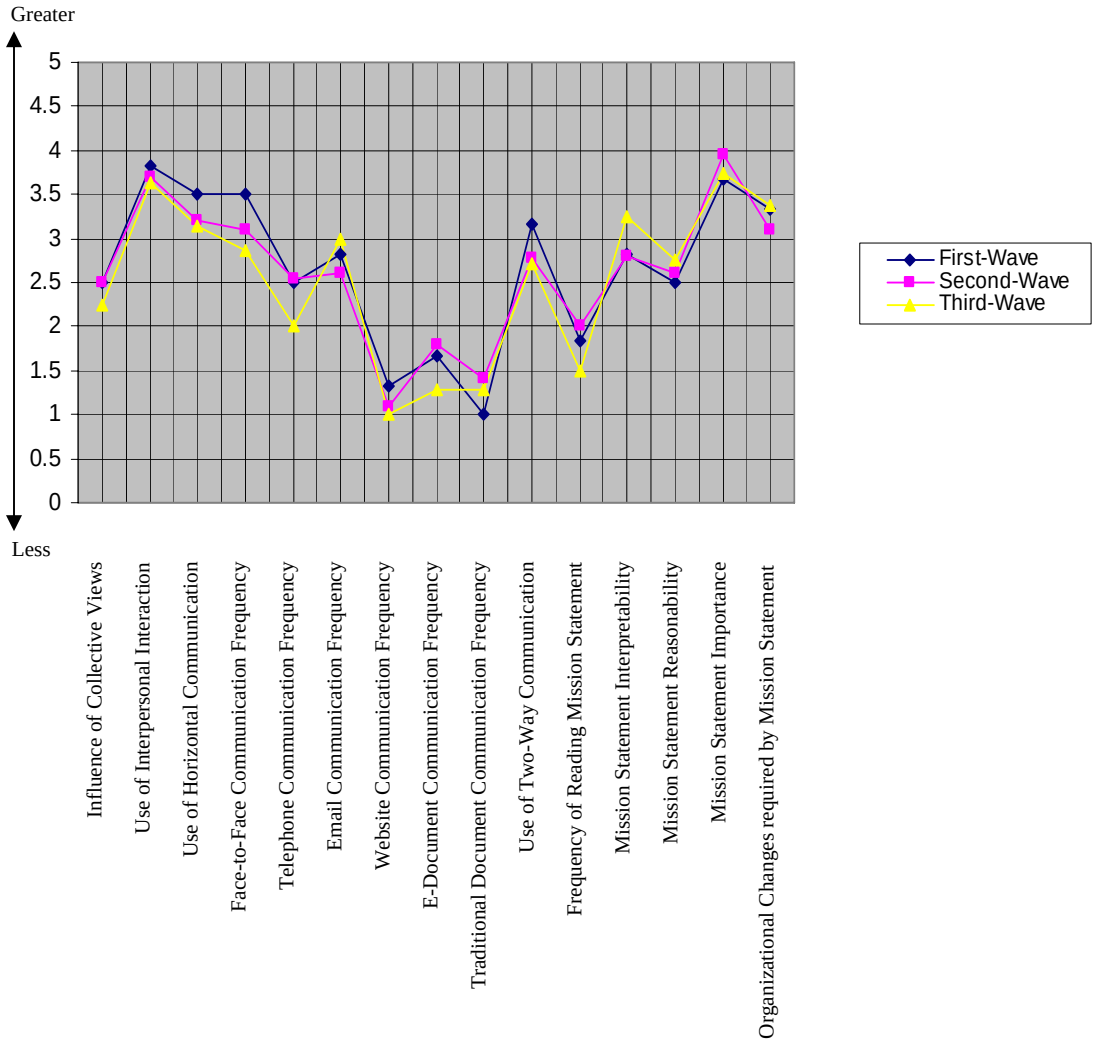
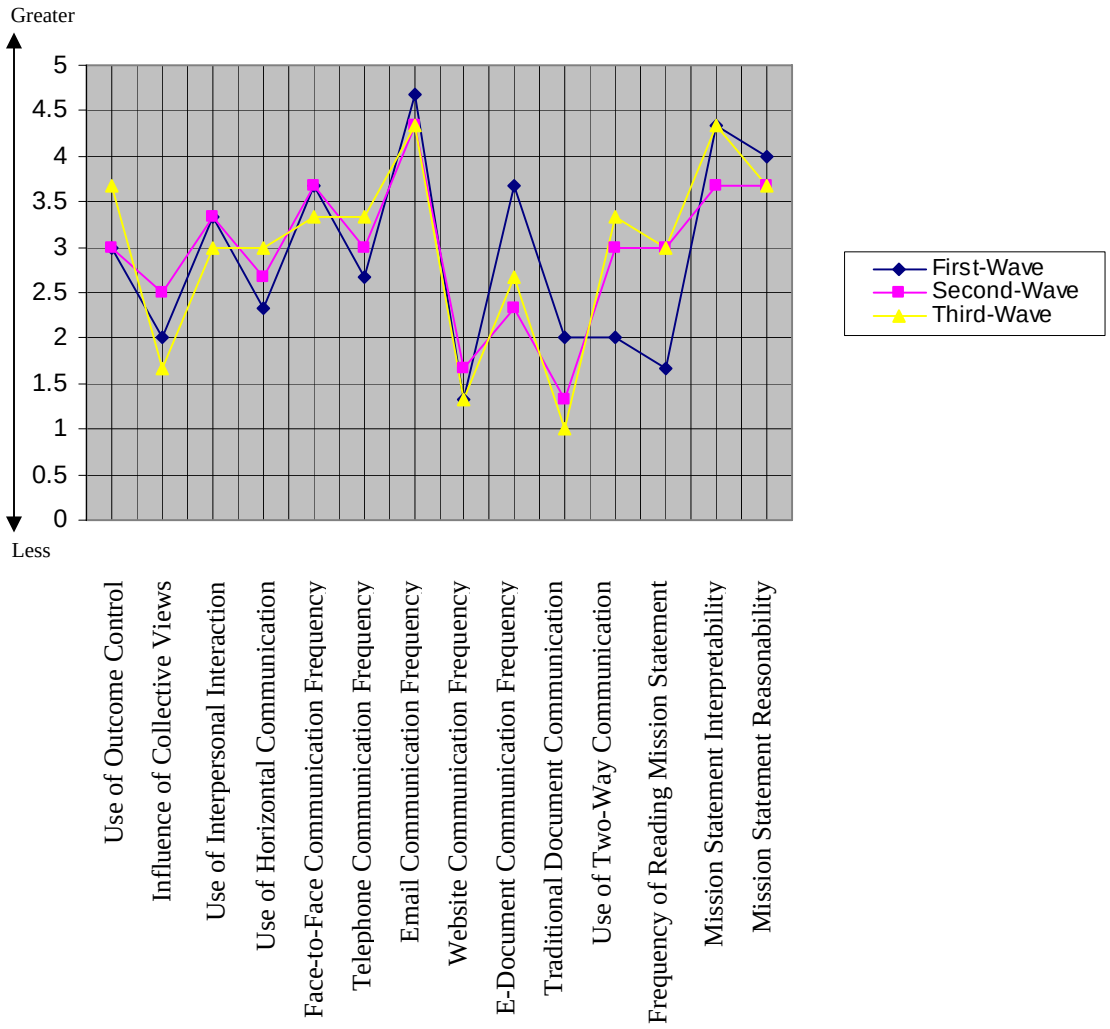


Figure 5.4.1b Mean Comparison across Time (NOC Members)



We also separated this comparison analysis for the OU and the NOAA members, as represented in Figure 5.4.2a and Figure 5.4.2b.

Figure 5.4.2a Mean Comparison across Time (OU Members)

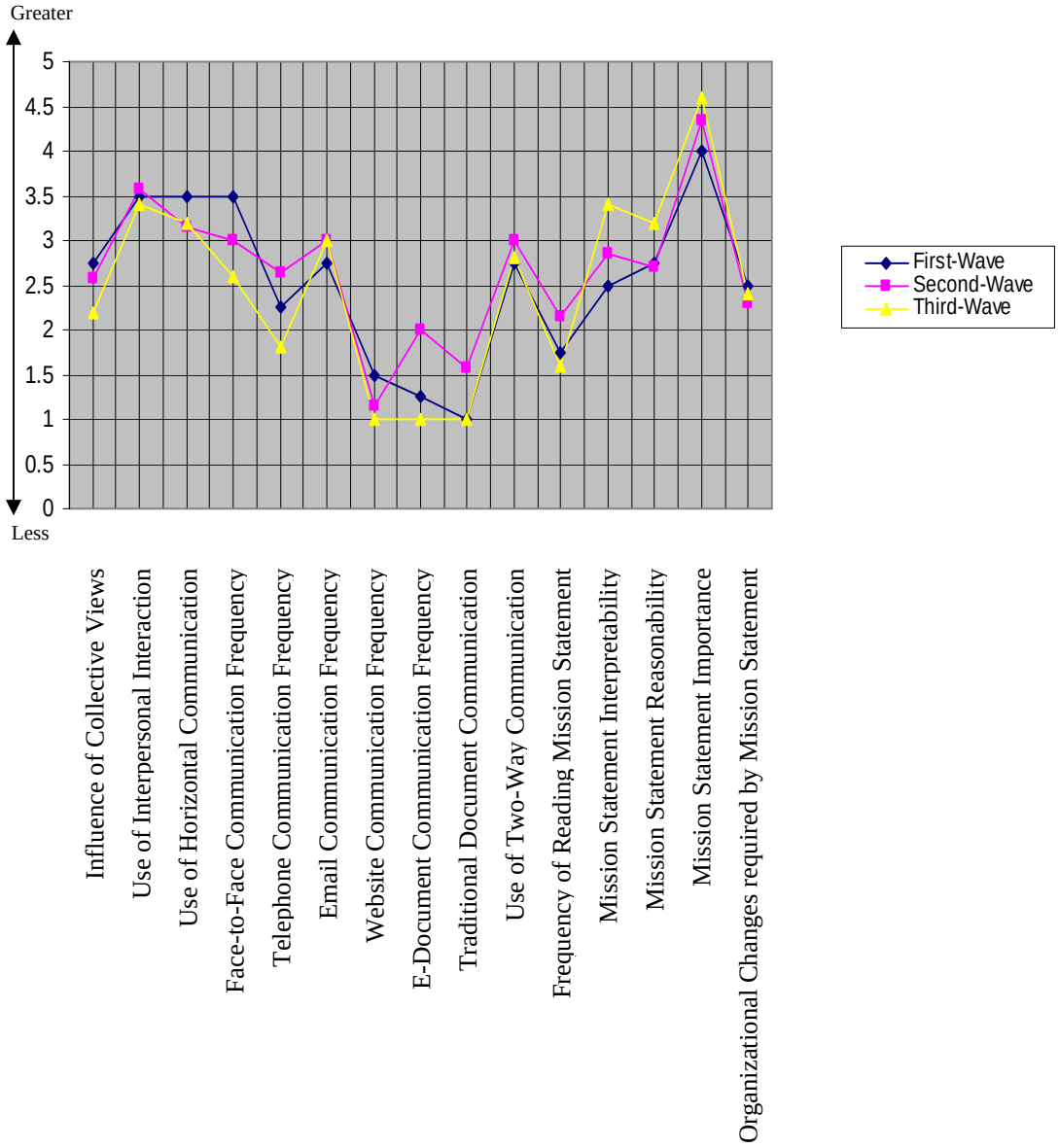
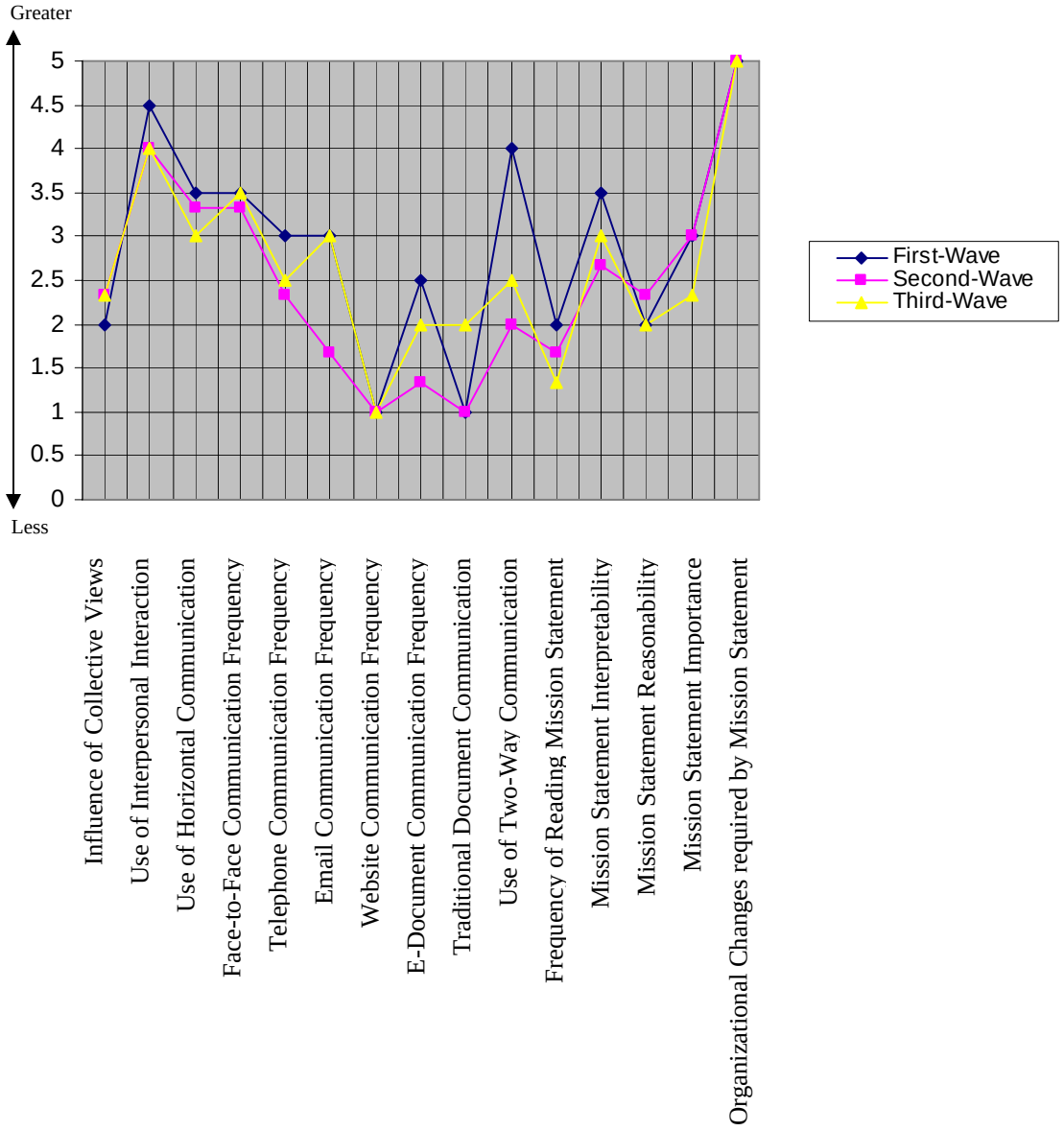


Figure 5.4.2b Mean Comparison across Time (NOAA Members)



As time goes on, the perspectives of the NITC members (particularly the OU members) were less influenced by the collective views of other NITC members, resulting in less reliance on organic controls in the NITC. They (mainly the OU members) also used less: 1) interpersonal interaction, 2) horizontal communication, 3) communication through face-to-face, telephone and website, and 4) two-way communication. However, across time, the NITC members tended to look more at the mission statement, and they perceived the mission statement to be more interpretable.

On the other hand, over time, the NOC members perceived more use of outcome control (i.e. more mechanistic controls). The use of organic controls increased in the second wave of study, but decreased afterwards. The NOC members also reported more use of horizontal communication, telephone communication, and two-way communication. Nevertheless, as time goes on, the NOC members observed less use of: 1) interpersonal interaction and 2) communication through face-to-face, email, and non-electronic document. The NOC members also perceived that the mission statement of the NOC to be less realistic.

We could further capture the changes occurring over time from a few interviews. Some interview questions that were designed to capture the actions taken to move things forward. During the very first wave of the study, both the NITC and NOC members pointed out that the two groups seemed lacking efficient communication. At the second wave of the study, it was noted that the communication between the NITC and the NOC had improved dramatically. When being interviewed for the third wave of the study, a member from the NITC and a member from the NOC again identified communication

improvement as a positive change in the way the NITC and the NOC interacts. As one NITC member mentioned:

> "They (the NOC) seem to be getting better with the communications. The NOC was telling us what's going on although there have been a few changes that haven't been documented or expressed to us before they happened. But overall, I think things are still getting better."

Also, one NOC member commented:

> "The NITC is more proactive in how they correspond with each other. They are more careful about making sure that whether the correspondence they have gets to the right people, and what is discussed is not left just languish without discussion. I think it's better amongst themselves as well as amongst the NITC and the NOC."

Therefore, although not significantly indicated in the figures, improvement in communication was observed between the NITC and the NOC members and amongst the NITC members as well.

5.4.2 Service Responsibilities

Compared with the first-wave and the second-wave data, the differences regarding the roles and responsibilities of the NOC are summarized in Figure 5.4.3a and Figure 5.4.3b. Based on these graphs, we noticed that overtime, the NITC members were willing to cede more control over the distribution layer, network access, joint use of network infrastructure, and joint use of common applications. But the NITC members wished to maintain more control over the core layer. In comparison, overtime, the NOC members were willing to have less influence the core layer, the access layer, and network access. On the other hand, the NOC members wished to maintain more control over joint use of network infrastructure and joint use of common applications.

Figure 5.4.3a Mean Comparison across Time (NITC Members)

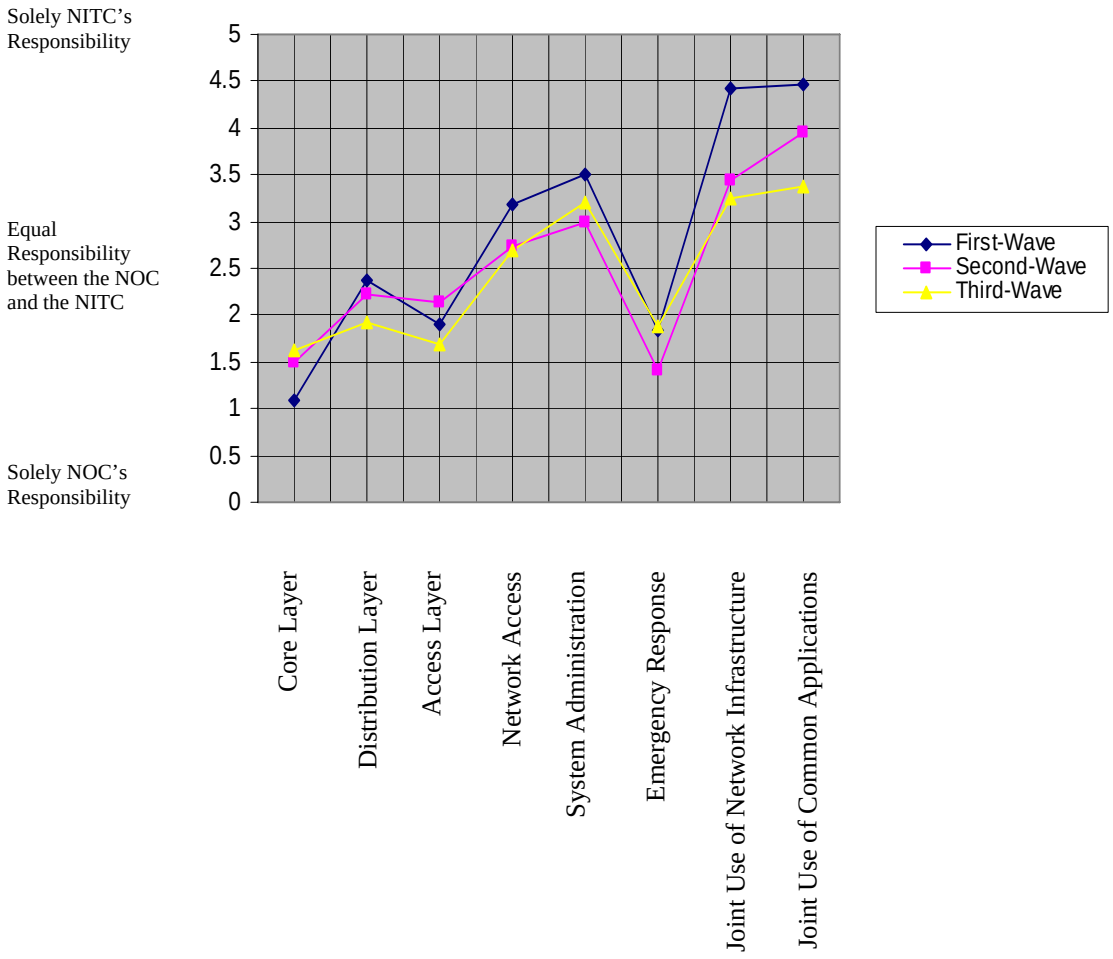
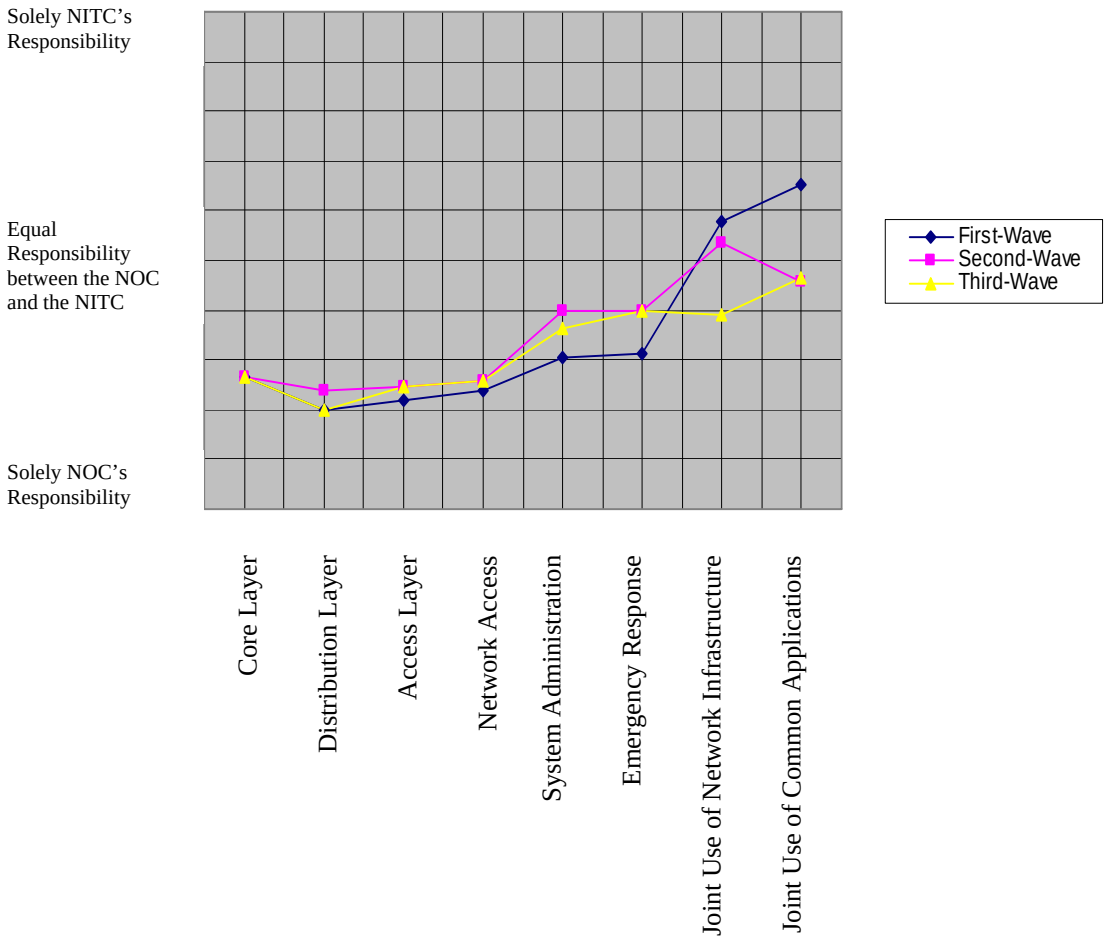


Figure 5.4.3b Mean Comparison across Time (NOC Members)



We further compared the first-wave, the second-wave, and the third-wave responses for the OU and the NOOA members, summarized in Figure 5.4.4a and Figure 5.4.4b. Based on these graphs, we noticed that over time, the OU members were more willing to cede control to the NOC over joint use of network infrastructure and joint use of common applications, yet maintaining more control over the core layer. In comparison, overtime, the NOAA members were more willing to cede control over the distribution layer, network access, and system administration.

Figure 5.4.4a Mean Comparison across Time (OU Members)

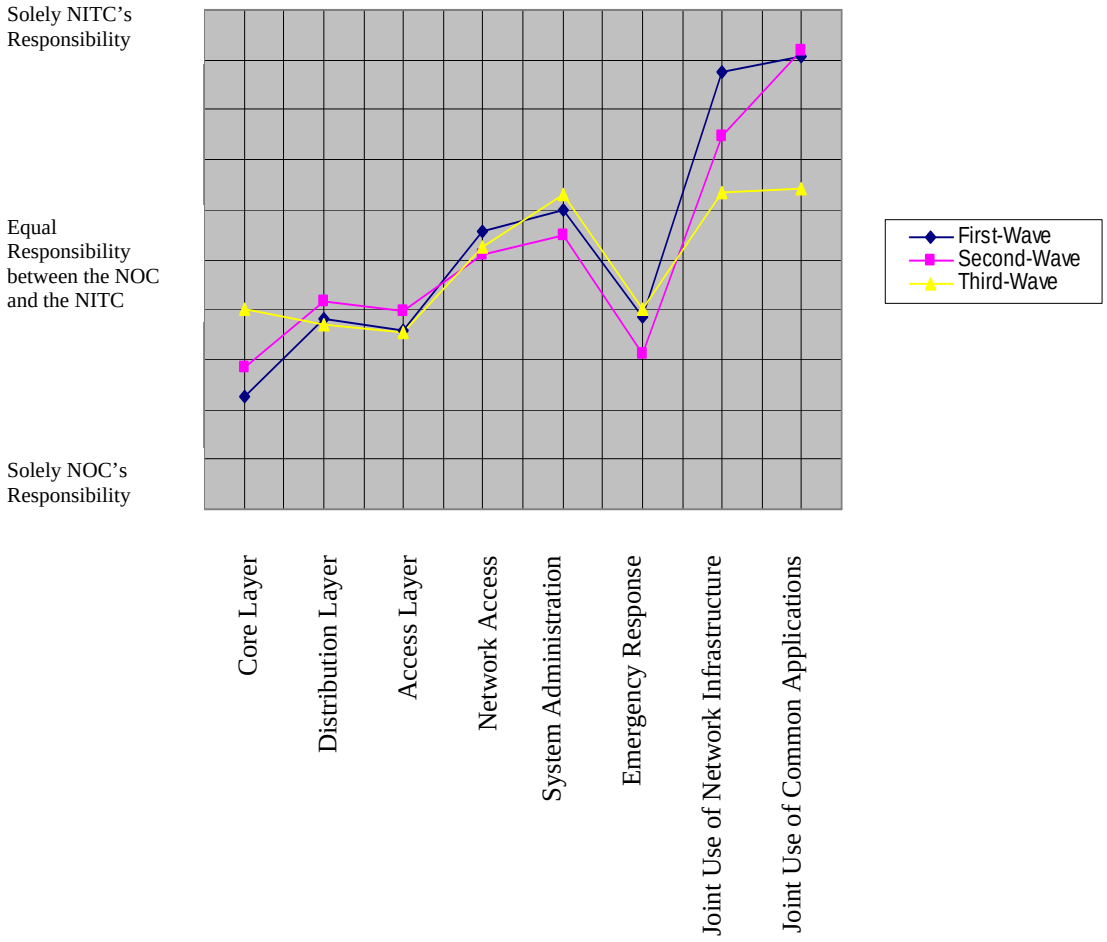
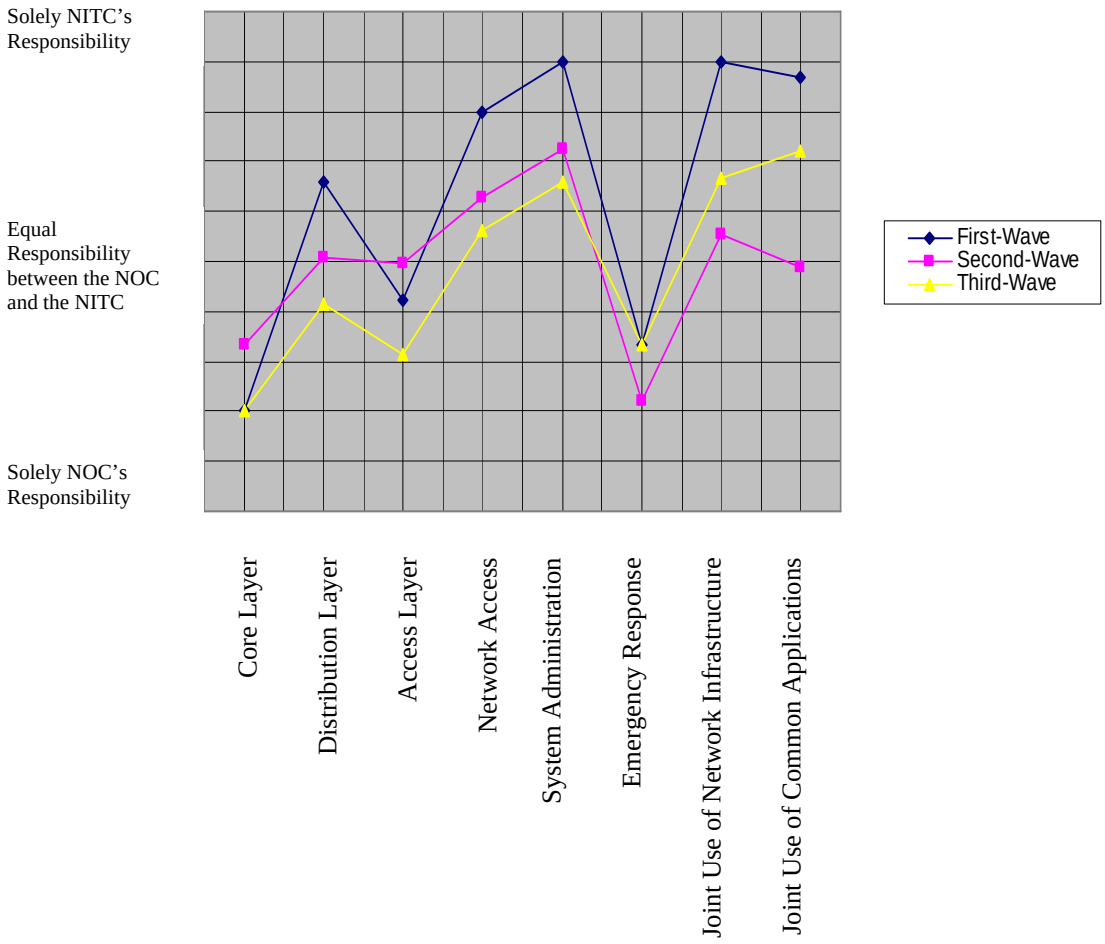


Figure 5.4.4b Mean Comparison across Time (NOOA Members)



5.4.3 Expectation Alignment

As summarized in Table 5.4.1, the misalignment score within the NITC increased over time, indicating that the NITC members tended to have more differences of opinion amongst themselves. Yet the misalignment score within the NOC increased compared to the first-wave result, but dropped compared to the second-wave result. On the other hand, the misalignment score between the NITC and the NOC generally reduced (except for the slight changes between the second- and the third-wave results), indicating that the NITC members and the NOC members tended to have more agreement regarding the responsibilities of the NOC over time.

Table 5.4.1 Misalignment Scores across Time

	NITC			**NOC**		
	First-Wave	Second-Wave	Third-Wave	First-Wave	Second-Wave	Third-Wave
Misalignment Within	29.87	35.71	44.60	20.22	22.00	21.33
Misalignment Between	59.78	53.12	56.46	61.11	50.78	51.61

Interviews also implied that the NITC and the NOC members seemed to have a somewhat better understanding of each others' perspectives over time. A comment made by a NITC member further suggested that it occurred to those being studied that a mutual understanding across multiple organizations was being reached.

> "Over the time we've been here in the building, and even more so in the past a month or two, people in the NITC and the NOC are beginning to really understand each others' thought process and how each other operate…Both the NOC and the NITC are beginning to recognize each others' areas of major concern. While they do have the mission statement and we have various documents about who handles what, there is still some of that intangible type of perception. But over time, we begin to get comfortable with understanding each others' world view on doing our job."

To summarize, over time, stakeholders across organizational boundaries started to have better understanding of each others' needs and requirements.

5.4.4 The Performance of the NOC

When we examined the mean value reported for the performance of the NOC across time, we noticed that the average score of either one of the two performance items had improved as compared to the first-wave and the second wave of the study (Table 5.4.2a and Table 5.4.2b).

Table 5.4.2a Performance Evaluation across Time (All NITC Members)

	First-Wave	Second-Wave	Third-Wave
The NOC understands our organizational needs	2.50	2.60	3.14
NOC's services have met our expectations	2.50	2.50	3.26

Table 5.4.2b Performance Evaluation across Time (OU vs. NOAA members)

	OU Members			NOAA Members		
	First-Wave	Second-Wave	Third-Wave	First-Wave	Second-Wave	Third-Wave
The NOC understands our organizational needs	2.50	2.43	3.00	2.50	3.00	3.50
NOC's services have met our expectations	2.75	2.29	3.20	2.00	3.00	3.50

5.5 Proposition Examination

In Chapter III, we proposed the effects of IT governance and an organizing vision on the alignment of stakeholders' expectations, which consequently impacted the performance of the IT cooperative (Table 5.5.1). A process-oriented view was also adopted to examine the relationships amongst research constructs over time. To test these propositions, a combination of the correlation analyses and the non-parametric sign test was conducted for each phase of the study. The findings will be presented in the following sections.

Bivariate correlation analyses between the survey items were conducted for three groups of respondents: 1) all survey respondents, 2) respondents from the NITC alone, and 3) respondents from the NOC alone. Significant associations observed between several variables and the misalignment scores for each wave of the study will be presented in the following sections.

Table 5.5.1 Research Hypotheses Summary

IT Governance	
Control	P1a: With regard to the control of the IT cooperative, outcome control will induce more alignment of stakeholders' expectations of desirable IT behaviors.
	P1b: In the IT governance council of the IT cooperative, clan control will induce more alignment of stakeholders' expectations of desirable IT behaviors than either outcome control or behavioral control.
Coordination	P2a: In the IT governance council of the IT cooperative, personal coordination will induce more alignment of stakeholders' expectations of desirable IT behaviors than impersonal coordination.
	P2b: With regard to the coordination within the IT cooperative, impersonal coordination will induce more alignment of stakeholders' expectations of desirable IT behaviors than personal coordination.
Communication	P3a: In the IT governance council, horizontal communication will induce more alignment of stakeholders' expectations of desirable IT behaviors than vertical communication.
	P3b: In the IT cooperative, vertical communication will induce more alignment of stakeholders' expectations of desirable IT behaviors than horizontal communication.
	P4a: Greater communication about desirable IT behaviors will induce more alignment of stakeholders' expectations of desirable IT behaviors.
	P4b: Bidirectional rather than unidirectional communication of desirable IT behaviors across stakeholder groups will induce more alignment of stakeholders' expectations of desirable IT behaviors.
Organizing Vision	
P5a: The more interpretable the organizing vision, the greater the alignment of stakeholders' expectations of desirable IT behaviors.	
P5b: The more plausible the organizing vision, the greater the alignment of stakeholders' expectations of desirable IT behaviors.	
P5c: The more important the organizing vision, the greater the alignment of stakeholders' expectations of desirable IT behaviors.	
P5d: The less discontinuous the organizing vision, the greater the alignment of stakeholders' expectations of desirable IT behaviors.	
IT Cooperative Performance	
P6: The greater the alignment of stakeholders' expectations of desirable IT behaviors, the greater the perceived performance of the IT cooperative.	
A Process-Oriented View	
P7: The extent to which stakeholders' expectations of desirable IT behaviors are aligned will reciprocally influence, over time, the control, coordination, and communication mechanisms of IT governance.	
P8: The extent to which stakeholders' expectations of desirable IT behaviors are aligned will reciprocally influence, over time, the meaningfulness (i.e. interpretability, plausibility, importance, and discontinuity) of the organizing vision.	

5.5.1 Correlation Patterns from the First Wave of the Study

Table 5.5.2 presents the correlation result form the first wave of the study. To summarize, the following relationships were found regarding the expectation misalignment *between* the NITC members and the NOC members:

- When the performance of the NOC was evaluated based on pre-specified outcomes, expectation misalignment seemed to be reduced.
- When the roles and responsibilities of the NOC were communicated more frequently by the NOC through non-electronic document, expectation misalignment tended to be lower.
- When the roles and responsibilities of the NOC were perceived by the NITC members to be communicated bi-directionally, expectation misalignment seemed to increase.

Also, the following associations were identified regarding the expectation misalignment *within* the NITC or the NOC:

- When the NITC members read the Memorandum of Agreement (MOA) more frequently, expectation misalignment within the NITC tended to be higher.
- When the roles and responsibilities of the NOC were communicated more frequently by the NOC through telephone, expectation misalignment within the NOC tended to be higher.
- When the NOC members perceived the MOA to be more understandable, expectation misalignment within the NOC seemed to be lower.

Table 5.5.2 Pearson Correlations (First Wave of the Study)

	All (n=9)		NITC Members (n=6)		NOC Members (n=3)	
	Misalignment Within	Misalignment Between	Misalignment Within	Misalignment Between	Misalignment Within	Misalignment Between
Use of Outcome Evaluation	-.062	-.998^{++}			-.062	-.998^{++}
Influence of Collective Views	-.304	.084	-.538	.114		
Use of Interpersonal Interaction	.228	-.295	.301	-.051	-.553	-.830
User of Horizontal Communication	.531	.431	.296	.506	.795	.602
Face-to-Face Communication Frequency	.331	-.465	.592	-.188	.445	-.898
Telephone Communication Frequency	.063	.563	.013	.740^{+}	.998^{++}	-.068
Email Communication Frequency	-.459	.067	.128	.571	-.553	-.830
Website Communication Frequency	-.341	.266	-.538	.114	.553	.830
E-Doc Communication Frequency	-.165	.205	.110	.265	.963	.262
Non E-Doc Communication Frequency	-.363	-.342			-.062	-.998^{++}
Use of Two-Way Communication	.341	.557	.025	.853^{++}		
Frequency of Reading Mission Statement	.696^{++}	-.142	.955^{++}	.310	.445	-.898
Mission Statement Interpretability	-.537	.217	-.173	.349	-.998^{++}	.068
Mission Statement Reasonability	-.408	-.233	-.425	-.316	.833	-.558
Mission Statement Importance	.057	-.489	.057	-.489		
Organizational Changes as per Mission Statement	.268	.667	.268	.667		
NOC understand client needs	.592	.188	-.592	.188		
NOC meet client expectations	-.170	.088	-.170	.088		

(+ Significant at p<.10
++ Significant at p<.05)

5.5.2 Correlation Patterns from the Second Wave of the Study

From the second wave of the study, significant associations observed between several variables and the misalignment scores are presented in Table 5.5.3. To summarize, the following relationships were found regarding the expectation misalignment *within* the NITC or the NOC:

- When the NOC members' perceptions of the roles and responsibilities of the NOC were influenced more by collective views of other NITC members, there tended to be less disagreement within the NOC.

- When the roles and responsibilities of the NOC was communicated more with peers than with supervisors or subordinates, the NITC or the NOC members tended to have more disagreement amongst themselves.
- When the NOC members used more two-way communication to communicate the roles and responsibilities of the NOC, they tended to have more disagreement amongst themselves.
- When the NITC members used more two-way communication to communicate the roles and responsibilities of the NOC, they tended to have less disagreement amongst themselves.
- When the mission statement of the NOC was perceived by all the NITC and the NOC members to be more understandable and more realistic, there tended to be less disagreement within the NITC or within the NOC.
- When the NITC members perceived the mission statement of the NOC to be more important, they tended to have less disagreement amongst themselves regarding the roles and responsibilities of the NOC.

Furthermore, the following associations were observed regarding the expectation misalignment *between* the NITC and the NOC:

- When the NOC members' perceptions of the roles and responsibilities of the NOC were influenced more by the collective views of other NITC members, the NOC members tended to have less disagreement with the NITC members regarding the roles and responsibilities of the NOC.

- When the NITC members perceived the mission statement of the NOC to be more understandable and more realistic, there tended to be less disagreement between the NITC and the NOC regarding the roles and responsibilities of the NOC.

Table 5.5.3 Pearson Correlations (Second Wave of the Study)

	All (n=13)		**NITC Members (n=10)**		**NOC Members (n=3)**	
	Misalignment Within	Misalignment Between	Misalignment Within	Misalignment Between	Misalignment Within	Misalignment Between
Use of Outcome Evaluation	.500	.969			.500	.969
Influence of Collective Views	.097	.192	.143	.274	-.1000^{++}	-.1000^{++}
Use of Interpersonal Interaction	.237	-.197	.416	-.066	-.866	-.962
User of Horizontal Communication	.560^{++}	.372	.531	.305	.866	.962
FtF Communication Frequency	-.027	-.166	.364	-.151	-.866	-.246
Telephone Communication Frequency	-.273	-.274	-.189	-.326	-.500	.272
Email Communication Frequency	-.436	-.249	-.195	-.232	.000	-.717
Website Communication Frequency	-.510^{+}	-.157	-.418	-.186	-.866	-.246
E-Doc Communication Frequency	-.210	-.403	.012	-.419	-.866	-.246
Non E-Doc Communication Frequency	-.218	-.181	-.246	-.180	-.866	-.246
Use of Two-Way Communication	-.395	.023	-.689^{++}	-.151	1.000^{++}	.697
Frequency of Reading Mission Statement	-.327	-.091	-.079	-.115	-.500	.272
Mission Statement Interpretability	-.503^{+}	-.391	-.245	-.369	-.866	-.962
Mission Statement Reasonability	-.536^{+}	-.461	-.378	-.601^{+}	.000	.717
Mission Statement Importance	-.762^{++}	-.068	-.762^{++}	-.068		
Organizational Change as per Mission Statement	.408	-.345	.408	.345		
NOC understand client needs	.151	-.464	.151	-.464		
NOC meet client expectations	.498	-.054	.498	-.054		

(+ Significant at p<.10
++ Significant at p<.05)

5.5.3 Correlation Patterns from the Third Wave of the Study

Based on the third wave of the study, significant associations observed between several variables and the misalignment scores are presented in Table 5.5.4. To summarize, the following relationships were found regarding the expectation misalignment between the NITC and the NOC:

- When NOC-related activities were coordinated through more interpersonal interactions, the NITC members and the NOC members tended to have less disagreement about the roles and responsibilities of the NOC (significant at $p<.01$).
- When the NOC members had more horizontal communication with peers about the roles and responsibilities of the NOC, the NITC members and the NOC members tended to have more disagreement about the roles and responsibilities of the NOC (significant at $p<.01$).

In addition, the following associations were observed regarding the expectation misalignment *within* the NITC or the NOC:

- When outcome control was perceived to be implemented, there tended to be more disagreement amongst the NOC members regarding the roles and responsibilities of the NOC (significant at $p<.10$).
- When the NOC members' perceptions were influenced more by collective views, the NOC members tended to have more disagreement amongst themselves regarding the roles and responsibilities of the NOC (significant at $p<.10$).
- When the NOC members communicated more frequently about the roles and responsibilities of the NOC through face-to-face, telephone, and website, they tended to have less disagreement amongst themselves (significant at $p<.10$).

- When the roles and responsibilities of the NOC were communicated more frequently by email and electronic document, the NITC or the NOC members tended to have less disagreement amongst themselves (significant at $p<.10$).
- When the NOC members used more two-way communication regarding the roles and responsibilities of the NOC, there tended to be more disagreement within the NOC (significant at $p<.10$).
- When the NITC members used more two-way communication regarding the roles and responsibilities of the NOC, there tended to be less disagreement within the NITC (significant at $p<.10$).
- When outcome control was perceived to be in place, the NOC members or the NITC members tended to have more disagreements amongst themselves regarding the roles and responsibilities of the NOC.

Furthermore, we identified a positive relationship between the expectation misalignment within the NITC and the extent to which the services provided by the NOC met clients' expectations. This finding implied that the more the NITC members disagreed with one another regarding the roles and the responsibilities of the NOC, the more satisfied they seemed to feel about the services provided by the NOC.

Table 5.5.4 Pearson Correlations (Third Wave of the Study)

	All (n=10)		NITC Members (n=7)		NOC Members (n=3)	
	Misalignment Within	Misalignment Between	Misalignment Within	Misalignment Between	Misalignment Within	Misalignment Between
Use of Outcome Evaluation	.990^{+}	-.030			.990^{+}	-.007
Influence of Collective Views	.161	-.213	-.047	-.289	.990^{+}	-.007
Use of Interpersonal Interaction	.370	-.141	.282	-.045	-.143	-1.000^{+++}
User of Horizontal Communication	.108	.099	.089	-.047	.143	1.000^{+++}
FtF Communication Frequency	-.691^{++}	-.273	-.668	-.258	-.990^{+}	.007
Telephone Communication Frequency	-.709^{++}	-.125	-.573	-.115	-.990^{+}	.007
Email Communication Frequency	-.603^{+}	-.077	-.453	.051	.371	-.870
Website Communication Frequency	-.380	-.029	-	-	-.990^{+}	.007
E-Doc Communication Frequency	-.609^{+}	-.231	-.374	-.168	-.619	-.862
Non E-Doc Communication Frequency	-.182	-.139	-.374	-.168	-	-
Use of Two-Way Communication	-.549	-.337	-.744^{+}	-.459	.990^{+}	-.007
Frequency of Reading Mission Statement	-.562^{+}	-.040	-.180	.152	-	-
Mission Statement Interpretability	-.296	-.404	.031	-.314	-.619	-.862
Mission Statement Reasonability	-.005	.066	.418	.075	-.371	.870
Mission Statement Importance	-.130	-.035	.130	.035		
Organizational Change as per Mission Statement	-.032	.085	-.032	.085		
NOC understand client needs	.369	-.060	.369	.060		
NOC meet client expectations	.721^{++}	.225	.721^{++}	.225		

(+ Significant at p<.10
++ Significant at p<.05
+++ Significant at p<.01)

5.5.4 Correlation Results and Research Propositions

In this section, we will explore these correlation patterns in light of research propositions as summarized in Table 5.5.5. Specifically, we will examine how the control, coordination, and communication aspects of IT governance, as well as the meaningfulness of the organizing vision, are correlated with the misalignment of stakeholders' expectations across time. The correlations between expectation misalignment and the performance of the IT cooperative will also be explored.

Table 5.5.5 Correlation Results (All Three Waves of the Study)

	All		**NITC Members**		**NOC Members**	
Variables	Misalignment Within*	Misalignment Between*	Misalignment Within*	Misalignment Between*	Misalignment Within*	Misalignment Between*
Use of outcome control	1/0	0/1	-	-	1/0	0/1
Use of clan control	0/0	0/0	0/0	0/0	1/1	0/1
Use of personal coordination	0/0	0/0	0/0	0/0	0/0	0/1
Use of horizontal Communication	1/0	0/0	0/0	0/0	0/0	1/0
Use of greater communication	0/5	0/0	0/0	1/0	1/3	0/1
Use of two-way communication	0/0	0/0	0/2	1/0	2/0	0/0
Mission Statement Interpretability	0/1	0/0	0/0	0/0	0/1	0/0
Mission Statement Reasonability	0/1	0/0	0/0	0/1	0/0	0/0
Mission Statement Importance	0/1	0/0	0/1	0/0	-	-
Mission statement discontinuity	0/0	0/0	0/0	0/0	-	-
The performance of the IT cooperative	1/0	0/0	1/0	0/0	-	-

*Numbers in the cells indicate [# of significant positive correlations/# of significant negative correlations]

5.5.4.1 Control of the IT Cooperative

The findings are mixed regarding the effect of outcome control. Based on the correlation analysis from the first wave of the study, we found a negative association (significant at $p<.05$) between the use of outcome control and the expectation misalignment between the NITC and the NOC. This is consistent with our proposition regarding the control of the IT cooperative (i.e. the NOC), and it implies that the NITC members and the NOC members tend to have more agreement when outcome control is

being implemented. In other words, when the performance of the IT cooperative (i.e. the NOC) is evaluated based on pre-specified outcomes, it will be more likely for stakeholders from different domains to share a consistent understanding with regard to the roles and responsibilities of the IT cooperative.

However, this negative relationship was reversed based on the third-wave data. In the third wave of study, when outcome control was perceived to be in place, there seemed to be more different perceptions within the NOC about the roles and responsibilities of the NOC (significant at $p<.10$). When we were conducting interviews in the first wave of the study, we learned that there was not a formal evaluation system in place as a control mechanism of the performance of the IT cooperative. It remains to be the situation today. Therefore, given the lack of an official outcome control system, we suspect that the informal performance evaluation does not really serve the purpose of achieving mutual understandings.

5.5.4.2 Control in the IT Governance Council

The effect of clan control could not be observed in the IT governance council. Interviews from the third wave of the study indicated that although working together as a governance council, the NITC members remained focused on their individual needs rather than taking account for the common needs of all the NITC entities. Therefore, although most NITC members reported that they always listened to the collective views of other NITC members, they might not have been willing to change their personal perspective based on the opinions of other people.

On another note, however, we did find a negative impact of clan control in the IT cooperative based on the second-wave data (significant at $p<.05$). Specifically, when the

perspectives of the NOC members were shaped more by collective views of the other NITC members, there tended to be more agreement within the NOC, as well as between the NOC and the NITC, about the roles and responsibilities of the NOC. Such a result indicates that it is helpful for both the IT cooperative and the IT governance council to reach consensus when stakeholders in the IT cooperative are more open to and more accepting of others' opinions.

However, this relationship was reversed again based on the third-wave data, which demonstrated that when the perspectives of the NOC members were shaped more by the collective views of other NITC members, there was more disagreement within the NOC regarding its roles and responsibilities (significant at $p<.10$). A possible explanation for this contradicting relationship is that stakeholders from different organizations have not reached a point where they could stably influence each other's opinions. Therefore, by learning more about the perspectives of other NITC members without willing to accept all those different perspectives, the NOC members start to realize the differences amongst individual stakeholders but are not yet ready to change their personal views, resulting in a greater degree of expectation misalignment amongst multiple stakeholders.

5.5.4.3 Coordination

We did not find any impact of personal coordination on the alignment of stakeholders' expectations within the IT governance council. Again, this may be due to the unwillingness of the NITC members to change their personal perspectives based on the needs of other entities.

In the IT cooperative, a negative effect of interpersonal interaction on the expectation misalignment between the NTIC and the NOC was found based on the third-wave data (significant at $p<.01$). This finding implied that through more personal interactions (i.e. less impersonal coordination), stakeholders in the IT cooperative were able to learn better about the perspectives of those in the IT governance council, and were more likely to reach an agreement with the stakeholders from other groups. This finding contradicts our prediction regarding the coordination in the IT cooperative. This may be attributed to the lack of pre-established rules and procedures in terms of the operation of the NOC. Currently, there are only ad hoc procedures on how to coordinate certain NOC-related activities, but formal policies are missing.

5.5.4.4 Communication Structure

Based on the third-wave data, it was observed that there was a positive association between the use of horizontal communication and the expectation misalignment between the NITC and the NOC (significant at $p<.01$). This finding suggested that when stakeholders within the IT cooperative communicated more vertically, they would become more agreeable with other stakeholders regarding the roles and responsibilities of the IT cooperative. This is consistent with our proposition – in a situation where the IT leadership of the IT cooperative serves as a boundary spanner between the IT cooperative and the IT governance council, it is important for stakeholders in the IT cooperative to have a good communication with their supervisors in order to understand the perspectives of other stakeholders in the IT governance council.

However, according to all three waves of data, neither horizontal communication nor vertical communication within the IT governance council had any effect on the alignment of stakeholders' expectations.

5.5.4.5 Communication Frequency

From the first wave of data, it was observed that greater communication through non-electronic document helped align the expectations held by the NITC and the NOC members (significant at $p<.05$). From the second wave of data, we found that a negative correlation between greater communication through website and the expectation misalignment within the NITC or the NOC (significant at $p<.10$). Furthermore, it was observed from the third wave of data that: 1) the use of face-to-face communication was negatively related to the expectation misalignment within the NOC (significant at $p<.10$); 2) the use of telephone communication was negatively related to the expectation misalignment within the NOC (significant at $p<.10$); 3) the use of web-based communication was negatively related to the expectation misalignment within the NOC (significant at $p<.10$); and 4) the use of communication through electronic document was negatively related to the expectation misalignment within the NITC or the NOC (significant at $p<.10$). Only from the first wave of data did we observe a positive correlation between the use of telephone communication and expectation misalignment within the NOC, and between the use of telephone communication and expectation misalignment between the NITC and the NOC. This could be because that at the very beginning of this research, stakeholders realized their perspectives were quite different through greater degrees of telephone communication. All other negative correlations between communication frequency and expectation misalignment support our proposition

that when stakeholders from multiple groups have greater communication about the roles and responsibilities of the IT cooperative, it will be more likely for them to agree on the common services to be provided.

5.5.4.6 Communication Directionality

Regarding the effect of the communication directionality, the results were again mixed. From the first-wave data, we observed that the use of two-way communication in the NITC was positively related to the expectation misalignment between the NITC and the NOC (significant at $p<.05$). Based on the second-wave data, the use of two-way communication in the NITC was negatively related to the expectation misalignment within the NITC (significant at $p<.05$), but the use of two-way communication in the NOC was positively related to the expectation misalignment within the NOC (significant at $p<.05$). Similarly, the third-wave data demonstrated that the use of two-way communication in the NITC was negatively related to the expectation misalignment within the NITC (significant at $p<.10$), but the use of two-way communication in the NOC was positively related to the expectation misalignment within the NOC (significant at $p<.10$).

The positive association between the use of two-way communication and expectation misalignment contradicts our proposition that bidirectional communication will induce more alignment of stakeholders' expectations of desirable IT behaviors. A possible explanation for the positive correlation between two-way communication and expectation misalignment is that when there was more two-way communication between the NITC and the NOC members, differences between individual perceptions were more likely to be realized and reflected in their survey responses. In other words, the

respondents might have thought they were in agreement in the first place. However, through two-way communication, they may start to realize that they indeed have different opinions because of the richer communication.

5.5.4.7 The Effect of an Organizing Vision

Based on the first-wave data, we found that when survey respondents perceived the mission statement of the NOC to be more interpretable, there tended to be less expectation misalignment within the NOC members (significant at $p<.05$). The same effect was also observed based on the second-wave data (significant at $p<.10$). Also observed from the second wave of the study, 1) when survey respondents perceived the mission statement of the NOC to be more realistic, there tended to be less expectation misalignment within the NITC or the NOC (significant at $p<.10$), as well as between the NITC and the NOC (significant at $p<.10$); and 2) when survey respondents perceived the mission statement of the NOC to be more important, there was less expectation misalignment within the NITC or the NOC (significant at $p<.05$). These findings support our propositions that the more interpretable, realistic, and important an organizing vision is, the greater the alignment of stakeholders' expectations of desirable IT behaviors. However, the effect of the discontinuity of an organizing vision could not be observed.

5.5.4.8 The Performance of the IT cooperative

Lastly, a positive relationship was observed between the expectation misalignment within the NITC and the perceived performance of the NOC from the third wave of study (significant at $p<.05$). Contrary to our predictions, this result indicated that when stakeholders within the IT governance council had more disagreement regarding the roles and responsibilities of the IT cooperative, they tended to feel more satisfied with

the services provided. Taking into consideration the research context, we suggest that it might be because the NITC members were still focused on their individual needs rather than the common needs of all entities. Specifically, the NITC members requested the NOC to provide services that would best meet their individual requirements. Although each NITC entity's expectation was different from the others', they tended to become satisfied with the NOC as long as the job they requested got done.

5.5.5 Non-Parametric Sign Test

Based on the propositions, we expected negative correlations between appropriately architected IT governance (in terms of control, coordination, and communication) and the expectation misalignment amongst stakeholders, as well as between the meaningfulness of the organizing vision (i.e. interpretability, reasonability, importance, and discontinuity) and the expectation misalignment amongst stakeholders. Furthermore, we expected negative correlations between the expectation misalignment amongst stakeholders and the performance of the IT cooperative.

To test the probabilities of the correlation directionality between 1) the independent variables and the expectation misalignment scores, and 2) the expectation misalignment scores and the performance of the NOC, we conducted the sign test using StatXact 7. The null hypothesis for this test is that there are equal opportunities for positive and negative associations between the misalignment scores and other variables, and we expect the same number of positive and negative signs. In other words, P(positive sign)=0.5 (Higgins, 2004). A p-value in the sign test is the probability of obtaining the observed value or something more extreme under the null hypothesis (p=0.5). It is the probability of the observed number of positive signs. As indicated in

Table 5.5.6a, at P<.10, we may make the conclusion, using all correlations between research constructs, that the negative correlations between the expectation misalignment within the NITC or the NOC and the performance of the IT cooperative received support for the first-wave data. However, given that only one finding out of 13 was consistent with research propositions, this result must be treated with caution because it could simply occurring by chance.

We also tested the signs for significant correlations, as presented in Table 5.5.6b. However, the signs of the significant correlations were not found to be significant.

Table 5.5.6a Sign Test (First Wave of the study: All Correlations)

	Misalignment Within (All)	Misalignment Within (NITC)	Misalignment Within (NOC)	Misalignment Between (All)	Misalignment Between (NITC)	Misalignment Between (NOC)
IVs						
Positive Signs	8	10	7	9	10	4
Negative Signs	8	4	5	7	4	8
1-Sided P-Value	0.5	0.05	0.28	0.31	0.05	0.12
NOC Performance						
Positive Signs	1	0		2	2	
Negative Signs	1	2		0	0	
1-Sided P-Value	0.5	0.08		0.08	0.08	

Table 5.5.6b Sign Test (First Wave of the study: Significant Correlations)

	Misalignment Within (All)	Misalignment Within (NITC)	Misalignment Within (NOC)	Misalignment Between (All)	Misalignment Between (NITC)	Misalignment Between (NOC)
IVs						
Positive Signs	1	1	1	0	2	0
Negative Signs	0	0	1	1	0	1
1-Sided P-Value	0.16	0.16	0.5	0.16	0.08	0.16

As indicated in Table 5.5.7a, at P<.10, we may make the conclusion, using all correlations between research constructs, that the following negative correlations received support for the second-wave data: 1) the negative correlations between the independent variables and the expectation misalignment within the NOC, 2) the negative correlations between the independent variables and the expectation misalignment

between the NITC and the NOC, and 3) the negative correlations between the expectation misalignment between the NITC and the NOC and the performance of the NOC.

By testing the signs for significant correlations (Table 5.5.7b), we may make the conclusion that the negative correlations between the independent variables and the expectation misalignment within the NITC received support for the second-wave data.

Table 5.5.7a Sign Test (Second Wave of the Study: All Correlations)

	Misalignment Within (All)	Misalignment Within (NITC)	Misalignment Within (NOC)	Misalignment Between (All)	Misalignment Between (NITC)	Misalignment Between (NOC)
IVs						
Positive Signs	5	6	5	4	3	6
Negative Signs	11	9	9	12	12	8
1-Sided P-Value	0.07	0.22	0.04	0.02	0.01	0.30
NOC Performance						
Positive Signs	2	2		0	0	
Negative Signs	0	0		2	2	
1-Sided P-Value	0.08	0.08		0.08	0.08	

Table 5.5.7b Sign Test (Second Wave of the Study: Significant Correlations)

	Misalignment Within (All)	Misalignment Within (NITC)	Misalignment Within (NOC)	Misalignment Between (All)	Misalignment Between (NITC)	Misalignment Between (NOC)
IVs						
Positive Signs	1	0	1	-	0	0
Negative Signs	4	2	1	-	1	1
1-Sided P-Value	0.25	0.08	0.5	-	0.16	0.16

Lastly, as indicated in Table 5.5.8a, at P<.10, we may make the conclusion, using all correlations between research constructs, that the following negative correlations received support for the third-wave data: 1) the negative correlations between the independent variables and the expectation misalignment within the NITC or the NOC, and 2) the negative correlations between the independent variables and the expectation misalignment between the NITC and the NOC.

By testing the signs for significant correlations (Table 5.5.8b), we also made the conclusion that the negative correlations between the independent variables and the

expectation misalignment within the NITC or the NOC received support for the third-wave data.

Table 5.5.8a Sign Test (Third Wave of the study: All Correlations)

	Misalignment Within (All)	Misalignment Within (NITC)	Misalignment Within (NOC)	Misalignment Between (All)	Misalignment Between (NITC)	Misalignment Between (NOC)
IVs						
Positive Signs	4	5	4	3	5	5
Negative Signs	12	9	7	13	9	7
1-Sided P-Value	0.02	0.14	0.28	0.01	0.14	0.05
NOC Performance						
Positive Signs	2	1		2	2	
Negative Signs	0	1		0	0	
1-Sided P-Value	0.08	0.5		0.08	0.08	

Table 5.5.8b Sign Test (Third Wave of the study: Significant Correlations)

	Misalignment Within (All)	Misalignment Within (NITC)	Misalignment Within (NOC)	Misalignment Between (All)	Misalignment Between (NITC)	Misalignment Between (NOC)
IVs						
Positive Signs	1	0	2	-	-	1
Negative Signs	5	1	3	-	-	1
1-Sided P-Value	0.05	0.16	0.13	-	-	0.5
NOC Performance						
Positive Signs	1	1		-	-	
Negative Signs	0	0		-	-	
1-Sided P-Value	0.16	0.16		-	-	

To summarize, based on the past three waves of results, a few propositions received support from the correlation analyses. But several other propositions either received no support, or were challenged with an opposite direction of the proposed relationships. Based on the sign test, the negative correlations between the independent variables and the expectation misalignment received support from the second- and third-wave of the study, while the negative correlations between the expectation misalignment and the performance of the IT cooperative received support from the first- and second-wave of the study. Table 5.5.9 summarizes the empirical findings.

Table 5.5.9 Summary of Empirical Findings

	Propositions	Results
1a	With regard to the control of the IT cooperative, outcome control will induce more alignment of stakeholders' expectations of desirable IT behaviors.	Supported (first wave of the study) Opposite (third wave of the study)
1b	In the IT governance council of the IT cooperative, clan control will induce more alignment of stakeholders' expectations of desirable IT behaviors than either outcome control or behavioral control.	Observed for the IT cooperative (second wave of the study) Opposite for the IT cooperative (third wave of the study)
2a	In the IT governance council of the IT cooperative, personal coordination will induce more alignment of stakeholders' expectations of desirable IT behaviors than impersonal coordination.	Not observed
2b	With regard to the coordination within the IT cooperative, impersonal coordination will induce more alignment of stakeholders' expectations of desirable IT behaviors than personal coordination.	Opposite (third wave of the study)
3a	In the IT governance council, horizontal communication will induce more alignment of stakeholders' expectations of desirable IT behaviors than vertical communication.	Not observed
3b	In the IT cooperative, vertical communication will induce more alignment of stakeholders' expectations of desirable IT behaviors than horizontal communication.	Supported (third wave of the study)
4a	Greater communication about desirable IT behaviors will induce more alignment of stakeholders' expectations of desirable IT behaviors.	Supported (all three waves of study)
4b	Bidirectional rather than unidirectional communication of desirable IT behaviors across stakeholder groups will induce more alignment of stakeholders' expectations of desirable IT behaviors.	Observed for the IT governance council (second- and third wave of the study) Opposite for the IT governance council (first wave of the study) Opposite for the IT cooperative (second- and third wave of the study)
5a	The more interpretable the organizing vision, the greater the alignment of stakeholders' expectations of desirable IT behaviors.	Supported (first- and second wave of the study)
5b	The more plausible the organizing vision, the greater the alignment of stakeholders' expectations of desirable IT behaviors.	Supported (second wave of the study)
5c	The more important the organizing vision, the greater the alignment of stakeholders' expectations of desirable IT behaviors.	Supported (second wave of the study)
5d	The less discontinuous the organizing vision, the greater the alignment of stakeholders' expectations of desirable IT behaviors.	Not Observed
6	The greater the alignment of stakeholders' expectations of desirable IT behaviors, the greater the perceived performance of the IT cooperative.	Opposite (third wave of the study)

5.5.6 Dynamic Analysis

In order to test the last two propositions, correlations between the misalignment score from the concurrent time and the independent variables from the subsequent wave of the study are explored in the this section.

5.5.6.1 Changes due to Expectation Misalignment

In order to test the last two propositions, we conducted correlation analyses between the misalignment scores from the concurrent time and the independent variables (control, coordination, communication, and the organizing vision) from the subsequent waves of study. Correlation findings are presented in Tables 5.5.10a and 5.5.10b.

Here, based on responses from the first two-waves of the study, we found the following relationships:

- Expectation misalignment within the NITC or the NOC in the first-wave study was negatively associated with NOC members' reliance on collective views in the second-wave study (significant at $p<.01$).
- Expectation misalignment within the NITC or the NOC in the first-wave study was negatively associated with NOC members' use of email communication in the second-wave study (significant at $p<.05$).
- Expectation misalignment within the NITC or the NOC in the first-wave study was negatively correlated with the NITC members' use of communication through electronic document in the second-wave study (significant at $p<.10$).
- Expectation misalignment within the NITC or the NOC in the first-wave study was negatively correlated with the NITC members' frequency of reading the mission statement in the second-wave study (significant at $p<.10$).

- Expectation misalignment within the NITC or the NOC in the first-wave study was positively correlated with the reasonability of the mission statement as perceived by the NOC members in the second-wave study (significant at p<.05).

Table 5.5.10a Pearson Correlations (between First-Wave and Second-Wave data)

	All (n=9)		NITC Members (n=6)		NOC Members (n=3)	
	Misalignment Within	Misalignment Between	Misalignment Within	Misalignment Between	Misalignment Within	Misalignment Between
Use of Outcome Evaluation	.895	.440			.895	.440
Influence of Collective Views	-.173	.363	-.250	.628	-1.000^{+++}	-1.000^{+++}
Use of Interpersonal Interaction	.014	-.382	-.095	-.033	-.553	-.830
User of Horizontal Communication	.402	.085	-.029	-.326	.553	.830
FtF Communication Frequency	-.348	-.420	-.556	-.192	.445	-.898
Telephone Communication Frequency	-.243	-.329	-.309	-.286	.833	-.558
Email Communication Frequency	-.762^{++}	-.542	-.643	-.847^{++}	-.998^{++}	.068
Website Communication Frequency	-.141	-.388	-	-	.445	-.898
E-Doc Communication Frequency	-.614^{+}	-.615^{+}	-.745^{+}	-.585	.445	-.898
Non E-Doc Communication Frequency	-.024	-.602^{+}	-.128	-.571	.445	-.898
Use of Two-Way Communication	-.040	-.675^{+}	.221	.204	.062	.998^{++}
Frequency of Reading Mission Statement	-.625^{+}	-.507	-.944^{+++}	-.571	.833	-.558
Mission Statement Interpretability	-.297	-.021	.286	.323	-.553	-.830
Mission Statement Reasonability	-.317	-.031	-.050	-.023	.998^{++}	-.068
Mission Statement Importance	-.023	-.586	.023	-.586		
Organizational Change as per Mission Statement	.398	.587	.398	.587		

(+ Significant at p<.10
++ Significant at p<.05
+++ Significant at p<.01)

On the other hand, the following relationships were observed:

- Expectation misalignment between the NITC and the NOC in the first-wave study was negatively associated with the NOC members' reliance on collective views in the second-wave study (significant at $p<.01$).
- Expectation misalignment between the NITC and the NOC in the first-wave study was negatively correlated with the NITC members' use of email communication in the second-wave study (significant at $p<.05$).
- Expectation misalignment between the NITC and the NOC in the first-wave study was negatively associated with the use of communication through electronic and non-electronic document by both the NITC and the NOC members in the second-wave study (significant at $p<.10$).
- Expectation misalignment between the NITC and the NOC in the first-wave study was positively correlated with the NOC members' use of two-way communication in the second-wave study (significant at $p<.05$).

Based on survey responses from the last two-waves of the study, we found the following relationships:

- Expectation misalignment within the NITC or the NOC in the second-wave study was negatively correlated with frequency (of both the NITC and the NOC members) of reading the mission statement in the third-wave study (significant at $p<.10$).
- Expectation misalignment within the NITC or the NOC in the second-wave study was negatively associated with the perceived interpretability (significant at

p<.10), reasonability (significant at p<.05), and importance (significant at p<.05) of the mission statement in the third-wave study.

Table 5.5.10b Pearson Correlations (between Second-Wave and Third-Wave data)

	All (n=10)		NITC Members (n=7)		NOC Members (n=3)	
	Misalignment Within	Misalignment Between	Misalignment Within	Misalignment Between	Misalignment Within	Misalignment Between
Use of Outcome Evaluation	.866	.246			.866	.246
Influence of Collective Views	.031	.028	-.239	-.057	.866	.246
Use of Interpersonal Interaction	.336	-.027	.328	.069	-.500	-.969
User of Horizontal Communication	.247	.307	.284	.180	.500	.969
FtF Communication Frequency	.048	.328	.514	.606	-.866	-.246
Telephone Communication Frequency	-.437	.342	-.126	.567	-.866	-.246
Email Communication Frequency	-.501	-.019	-.181	.326	.000	-.717
Website Communication Frequency	-.469	-.138	-	-	-.866	-.246
E-Doc Communication Frequency	-.204	.184	.514	.606	-.866	-.962
Non E-Doc Communication Frequency	.532	.572	.514	.606	-	-
Use of Two-Way Communication	-.387	-.074	-.655	-.156	.866	.246
Frequency of Reading Mission Statement	-.623^{+}	-.144	-.258	.102	-	-
Mission Statement Interpretability	-.574^{+}	-.474	-.186	-.371	-.866	-.962
Mission Statement Reasonability	-.696^{++}	-.518	-.581	-.644	.000	.717
Mission Statement Importance	-.848^{++}	-.328	-.848^{++}	-.328		
Organizational Change as per Mission Statement	.420	.363	.420	.363		

(+ Significant at p<.10
++ Significant at p<.05
+++ Significant at p<.01)

5.5.6.2 Actions Invoked

After each round of the study, summarized findings were provided as feedback to the research site. As a consequence of the feedback, some management actions were invoked.

After the first wave of the study, focus was put on improving communication by the leadership. Actions were taken for this matter. The correlations presented in the previous section (e.g. Tables 5.5.10a and 5.5.10b) indicated that when the NITC and the NOC members had greater expectation misalignment, they made some changes in the subsequent waves of the study in the way they communicated with each other. As we observed from the descriptive statistics earlier, the NOC members perceived more use of telephone communication and two-way communication overtime (Figure 5.4.1b). These changes in communication behavior may very well have contributed to the improved perceptions of communication as reflected in interviews.

After the second wave of the study, the need to revise the mission statement was recognized. However, revisions have yet to be done. As the mission statement remained unchanged, stakeholders seemed to become increasingly sensitive to the mission statement. For instance, as indicated in Figure 5.4.2b, the NOOA members continued to perceive the mission statement of the NOC to be less realistic.

Based on the qualitative data, two interviewees also identified these two major actions being taken to be effective in moving things forward between the NITC and the NOC.

> "About a month and half ago, the NOC began sending out emails and they would begin checking with the people that were affected first. That may have been their plans all along, but being in environment in the past where networking on the outside of our building could go down, and we would have no idea why, that is a

> very big thing for me. Notification is big because we may have, not necessarily a severe weather event, but we may have an event that is affected by the weather. So having them ask is this a good thing or bad thing is big deal for us. I think they've done well with that, and that's good."
>
> "I think the actions of Mark and Jeff in beginning the dialogue regarding the MOA has been productive. I have not been personally part of any of those meetings, but I'm hopeful that it will produce a good consensus of what the MOA really means. I also think it's useful that Mark and Jeff have been talking more about particular issues that affect the entire building as a whole, rather than just this affects me, this affect me, and this affects me. I think that's been very helpful."

Another area where actions were taken was related to policies and procedures. Although formal policies had still not yet been established regarding what services should be provided and how those services should be provided, an effort had been made to ensure that appropriate people would be contacted in case of network emergencies. From the second wave of the study, two NITC members suggested that certain rules and procedures started to emerge regarding NOC-related activities. For example, a mailing list had been used to coordinate NOC-related issues. Each organization had been requested to designate someone as the point of contact with the NOC and to use email as a coordination effort to get things done. We expected these procedures would improve the communication between different stakeholder groups. As we observed, the NOC members were perceived to be communicating better about network-related issues.

5.5.6.3 Summary

To summarize, because of the misalignment of stakeholders' expectations, we observed some changes, in the subsequent waves of the study, in terms of the control of the NOC, communication frequency regarding the roles and responsibilities of the NOC, communication directionality, and the meaningfulness of the organizing vision. Specifically, when stakeholders realized more misalignment of their expectations

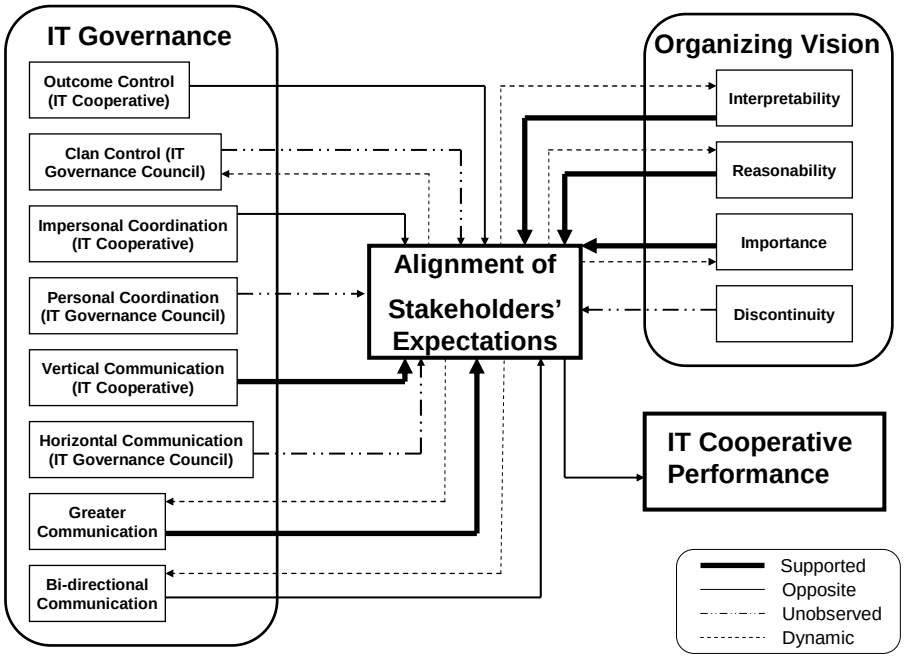
regarding the roles and responsibilities of the IT cooperative, they tended to use less clan control and less frequency of communication, but more bi-directional communication. Stakeholders also tended to find the organizing vision to be less interpretable, and less important. Regarding the reasonability of the mission statement, when stakeholder realized more expectation misalignment from the first-wave study, the NOC members tended to perceive the mission statement to be more realistic in the second-wave study. However, when stakeholder realized more expectation misalignment from the second-wave study, both the NITC and the NOC members tended to perceive the mission statement to be less realistic in the third-wave study.

The directions of the changes were mixed. To what extent the decreasing misalignment caused changes in control, communication, and perceived meaningfulness of the organizing vision was also unclear. However, the correlations between the expectation misalignment and the independent variables do provide some support for propositions P7 and P8, and demonstrated dynamic relations between research constructs. In addition, from the qualitative data, we also received support for the changes in the way that the NITC and the NOC members communicated, after a report summarizing the findings from a previous wave of the study was delivered to the research site. Therefore, we may make the conclusion that the extent to which stakeholders' expectations of desirable IT behaviors are aligned reciprocally influence, overtime, the control and communication aspects of IT governance, and the meaningfulness of the organizing vision in terms of its interpretability, reasonability, and importance.

Chapter VI: Discussion

This research examined factors contributing to improved performance of an inter-organizational IT cooperative that provides IT services to support business entities across distinct organizational boundaries. In light of the theory of the collective mind and the knowledge-based view, we suggest that appropriate IT behaviors are enabled by an alignment of stakeholders' understandings of the expected roles and responsibilities of the IT cooperative. In light of the literature on IT governance and organizing vision, we further suggest that the alignment of stakeholders' expectations is facilitated by appropriately architected IT governance (through effective communicating, coordinating, and controlling cognitive structures across stakeholder groups) and a meaningful organizing vision (along the dimension of interpretability, plausibility, importance, and discontinuity). Figure 6 illustrates the findings of the study.

Figure 6 A Summary of Study Results



Given that the relationships between research constructs are dynamic and process oriented, three waves of action research have been undertaken. Research propositions are tested, and findings from quantitative and qualitative analyses are presented in Chapter V. Overall, the proposed negative correlations between the independent variables and the expectation misalignment, as well as the negative correlations between the expectation misalignment and the performance of the IT cooperative received support from the sign test from the last two waves of data collection. When examining the correlations in detail, some results are consistent with our propositions. Yet, some other results contradict our predications. In this chapter, the findings will be discussed in four major sections: 1) relationships consistent with the propositions, 2) constructs demonstrating no effects, 3) inconsistent (with propositions) relationships amongst research constructs, and 4) contingent factors unaccounted for in the research design that may be influencing the observed behaviors and outcomes.

6.1 Relationships Supporting the Propositions

Our propositions about the effects of vertical communication in the IT cooperative, communication frequency, and three dimensions of the meaningfulness or the organizing vision were supported from empirical analyses. In addition, the dynamic relations between the alignment of stakeholders' expectations and IT governance and the organizing vision also received some support.

6.1.1 Communication

First, we observed that greater use of vertical communication in the IT cooperative tended to result in greater expectation alignment between the stakeholders in the IT governance council and those in the IT cooperative. This finding is consistent with

the proposition. Operational staff in the IT cooperative is involved in a hierarchical relationship with the IT leadership of the IT cooperative, who connects the IT cooperative with the IT governance council as a boundary spanner. Through communication and interactions, the IT leadership will have a good understanding of the perspectives of the clients. In order for the other stakeholders in the IT cooperative to understand clients' perspectives as well, effective communication between the operational staff and the IT leadership is necessary. Such communication is characterized as vertical because it's between subordinates and supervisors.

Second, we proposed that greater communication would improve the alignment of the expectations of multiple stakeholders. As observed from the data, greater communication through various channels (e.g. email, face-to-face, etc) did help stakeholders from different entities to better understand each others' perspectives. This finding supports the argument that when desirable IT behaviors are communicated through greater frequencies, inter-organizational stakeholders will have greater exposure to these messages, which enables a gradual convergence of meanings and conceptions and helps stakeholders from different knowledge domains better understand one another.

6.1.2 Organizing Vision

In terms of the meaningfulness of the organizing vision, we found that the extent to which an organizing vision was interpretable, realistic, and important significantly influenced the alignment of stakeholders' expectations. The organizing vision provides a social definition of desirable IT behaviors. Stakeholders are more likely to accept and sustain the organizing vision when they find it more meaningful (i.e. more interpretable, more plausible, and more important), under which circumstances the organizing vision

will continue to shape stakeholders' shared interpretations. Thus, a meaningful organizing vision serves as the boundary object across functional boundaries and facilitates shared understandings of deep cognitive structures, resulting in greater alignment of expectations.

6.1.3 Dynamic Relations

Lastly, we also found support for the dynamic relations amongst research constructs. In was observed that the extent to which stakeholders' expectations of desirable IT behaviors were aligned reciprocally influenced, overtime, the control and communication aspects of IT governance, as well as the meaningfulness of the organizing vision.

Specifically, when stakeholders realized their expectations were misaligned, they tended to use less clan control and less frequency of communication, but more bi-directional communication. Stakeholders also tended to find the organizing vision to be less interpretable and less important. Regarding the reasonability of the mission statement, when more expectation misalignment was recognized from the first-wave study, stakeholders in the IT cooperative tended to perceive the mission statement to be more realistic in the second-wave study. However, when more expectation misalignment was recognized from the second-wave study, stakeholders in both the IT cooperative and the IT governance council tended to perceive the mission statement to be less realistic in the third-wave study.

An explanation for the inconsistent changes in communication is that stakeholders may perceive bi-directionality to be more important than greater communication in helping them align expectations. Also, stakeholders tended to find the mission statement

to more problematic (particularly in terms of its interpretability and importance) given their realization of expectation misalignment.

Although the directions of these relationships were mixed, results provided some support for our arguments that over time, the extent to which stakeholders' expectations were aligned would be incorporated into the design of IT governance and the organizing vision. By changing the way they control and communicate IT-related activities, as well as their perceptions of the organizing vision, stakeholders attempt to find ways to influence others with different opinions, to get their perspectives accepted by others.

6.2 Constructs with Non-Effects

The proposed effects of control, coordination, and communication structure in the IT governance council, as well as the proposed effect of the discontinuity of the organizing vision, are not observed from any waves of the study. In this section, we will explore these constructs and provide explanations to these non-effects.

6.2.1 Control, Coordination, and Communication in the IT Governance Council

First, it was expected that through effective control, coordination, and communication of cognitions across organizations, stakeholders from multiple groups will achieve a greater mutual understanding of the actual roles and responsibilities of the IT cooperative. However, effects regarding control, coordination, and communication structure were not observed in the IT governance council of the IT cooperative.

Stakeholders in the IT governance council come from different operational entities that shape their understandings of the roles and responsibilities of the IT cooperative. We first expect that given the tacit nature of knowledge, clan control in the IT governance council will induce more alignment of stakeholders' expectations of

desirable IT behaviors, because clan control involves the promulgation of common beliefs and the identification and reinforcement of acceptable behaviors. However, although in the IT governance council, stakeholders' perceptions were influenced by collective views to a great extent, clan control did not exhibit any impact on the alignment of stakeholders' expectations of the roles and responsibilities of the IT cooperative.

Secondly, interpersonal interactions enable stakeholders to recognize a linkage of different knowledge domains. Therefore, it is expected that in the IT governance council, personal coordination will induce more alignment of stakeholders' expectations of desirable IT behaviors than impersonal coordination. However, such an effect could not be identified in our study either.

Lastly, given that there are no hierarchical structures amongst stakeholders in the IT governance council, horizontal communication with peers in the council is expected to foster a greater awareness of others' views as compared to communication with supervisors/subordinates who are outside the council and who are not involved with the IT cooperative as much. Yet, the effect of horizontal communication was not observed.

An explanation for the non-effects of clan control, personal coordination, and communication structure is that apparently stakeholders in the IT governance council have very different needs regarding what services should be provided by the IT cooperative and they are not open to adjust their requirements of the IT cooperative based on the needs of other organizational entities. This is reflected from the misalignment scores within the NITC. Based on the second- and third-wave data, the expectation misalignment within the NITC was significantly higher than the misalignment within the

NOC regarding the roles and services of the NOC. Furthermore, we observed from all three waves of the study that the variances of the NITC members' responses were quite large in terms of who should provide certain network services. These results suggest that stakeholders in the IT governance council have not reached consensus amongst themselves on a common set of services for all members.

Specifically, although stakeholders in the IT governance council were open to the collective views of other stakeholders, they might not have been willing to change their personal perspectives based on the opinions of other people. Also, although most activities that were relevant to the IT cooperative were coordinated through interpersonal interactions by stakeholders in the IT governance council, interactions were mostly focused on fixing a problem when it occurred and were usually on a one-on-one basis between stakeholders in the IT governance council and those in the IT cooperative. However, interactions amongst stakeholders in the IT governance council were limited, particularly regarding their expectations of the roles and responsibilities of the IT cooperative. Furthermore, there was also minimal communication amongst stakeholders in the IT governance council about what services were needed across all entities

Stakeholders in the IT governance council represent organizational entities with different network requirements. They expected the services provided by the IT cooperative to meet their individual needs, whereas the IT cooperative was established to create economies of scale and scope by satisfying the common needs required by all entities. In the absence of any effort to building a common perspective, it will be unlikely for client stakeholders to move beyond an individual focus and align their expectations with other stakeholders. Therefore, although clan control, personal

coordination, and horizontal communication were in place, the lack of an effort to reach consensus within the IT governance council regarding the roles and responsibilities of the IT cooperative might have been a major reason for the non-effects of these three constructs on the alignment of stakeholders' expectations.

6.2.2 Discontinuity of the Organizing Vision

Regarding the effect of the organizing vision, we proposed that if an organizing vision was quite disparate from the stakeholders' original way of thinking and required a huge paradigm shift (i.e. conceptual discontinuous), or if stakeholders perceived a lot difficulty entailed in implementing the organizing vision (i.e. structural discontinuous), individual stakeholders would become reluctant to accept the organizing vision. Without a mutually agreed-upon organizing vision, stakeholders' individual interpretations would be sustained, whereas common understandings would not be achieved. It was observed from the study that the clients of the IT cooperative, particularly those from the federal government, perceived that the mission statement of the IT cooperative required them to make substantial organizational changes. Yet, such a high degree of discontinuity of the organizing vision had no impact of the alignment of stakeholders' expectations of desirable IT behaviors from the IT cooperative.

This may be explained in light of the issues with the current mission statement of the IT cooperative, as well as the lack of consensus in the IT governance council. First, the mission statement was established before the IT cooperative was created. Since then, there have been changes in the network needs of some client entities. For instance, the mission statement states that the IT cooperative will manage Domain Name Servers (DNS) for all the client entities. However, entities from the federal government are now

managing their own DNS. Given these changes from the initial plan of the IT cooperative, the current mission statement is no longer accurate in defining the roles and responsibilities of the IT cooperative. This might also be the reason why most entities from the federal government felt that they had to make substantial organizational changes in order to leverage the IT cooperative's services specified in the mission statement. Furthermore, only a few people were involved in the process of establishing the mission statement, yet most stakeholders in the IT governance council were left out the process. Thus, their network needs have not been precisely captured in the mission statement.

An organizing vision is a community representation of the roles and responsibilities of the IT cooperative. It should be shaped by and should shape perceptions of individual in the community. Due to the failure to involve all relevant stakeholders in establishing the mission statement, the current mission statement is inadequate and does not really represent a community vision, and therefore has limited effect in influencing individuals' cognitions.

On the other hand, due to the lack of efforts to share common perspectives, the expectations of the common services to be provided remained misaligned within the IT governance council, despite the expressed meaningfulness of the organizing vision. This is another explanation for the non-effect of the discontinuity of the organizing vision. Until the mission statement of the IT cooperative is appropriately revised (which requires stakeholders in the IT governance council to reach consensus, the effect of the meaningfulness of an organizing vision may not be fully observed.

6.3 Inconsistent Relationships

The observed effects of control, coordination, and communication directionality in the IT cooperative, as well as the effect of expectation alignment, contradicted our propositions in one or more waves of the study. We will explore these inconsistent relationships and provide explanations in this section.

6.3.1 Control of the IT Cooperative

First, we suggested that when expected outcomes were made explicit to stakeholders in the IT cooperative, individuals' perceptions of the expected roles and responsibilities of the IT cooperative would be framed, and mutual understandings would be achieved amongst stakeholder groups through outcome control. This relationship was observed based on the first-wave study. However, the relationship was reversed in the third wave of the study, demonstrating that the use of outcome control increased the misalignment of stakeholders' expectations.

Through qualitative exploration, it was found that there was not a formal performance evaluation system in terms of the control of the IT cooperative. In other words, the IT cooperative was not rewarded if some job was done really well. The IT cooperative was not penalized either (except receiving complaints) if something was messed up. Thus, client stakeholders had no control over the IT cooperative. The lack of formal outcome control from the IT governance council might be one reason that the relationship was unstable.

Secondly, it was revealed that stakeholders in the IT governance council often gave requests as individuals rather than as a whole group. When individual entities pushed the IT cooperative to achieve certain outcomes, it was likely for stakeholders in the IT cooperative to add this request as one more role of the IT cooperative. However,

the same request may not be asked by another entity. Therefore, the expectation of stakeholders in the IT cooperative was continuously changing based on the requests from individual entities, while the expectation of other stakeholders remained the same. Thus, outcome control as given by individual entities resulted in a greater misalignment of stakeholders' expectations.

6.3.2 Coordination in the IT Cooperative

Stakeholders in the IT cooperative are from the same IT knowledge domain and have the ability to value, assimilate, and apply knowledge they receive from each other. Under such circumstances, IT stakeholders exchanging their expectations of the roles and responsibilities of the IT cooperative through personal coordination are subject to information overload (Meier, 1963), making it hard to achieve mutual understandings. Thus, an alignment of stakeholders' expectations will be more likely through impersonal coordination.

What was observed from the third-wave study, however, was that impersonal coordination tended to induce more misalignment of stakeholders' expectations in the IT cooperative. This surprising result could be due to the lack of established policies agreed on by all stakeholders. Relevant to the activities related to the IT cooperative, formal policies and procedures are lacking regarding what services should be provided and how those services should be provided. The impersonal coordination that is currently in place is primarily based on *ad hoc* procedures. However, *ad hoc* procedures do not provide a consensus understanding about what is expected from the IT cooperative, and thus may explain, at least partially, the lack of observed stakeholder alignment.

6.3.3 Communication Directionality

The research model proposed that through bi-directional communication, the cognitive differences amongst stakeholder groups involved with the IT cooperative would be identified and remedied before cognitions were transformed into actions. Therefore, bi-directional communication would help minimize the misalignment of stakeholders' expectations. The data, however, suggested a positive association between bi-directional communication and expectation misalignment. We explained in an earlier chapter that stakeholders might have thought they were in agreement. However, through dynamic and two-way communication, they would start to realize the differences in their cognitive perceptions.

Another explanation relates back to the fact that client entities work as individual entities, but not as a group. Through two-way communication between stakeholders in the IT cooperative and any client stakeholders, greater degree of mutual understandings would be achieved between these two groups of stakeholders. Yet, mutual understandings amongst all stakeholders were compromised because client entities all had different requirements. Under such circumstances, it is not counter-intuitive that bi-direction communication leads to greater expectation misalignment.

6.3.4 Outcomes of Expectation Alignment

Stakeholders have their own belief systems regarding the appropriate IT behaviors. Based on their individual cognitive structures, stakeholders in the IT cooperative engage in IT-related activities that are consistent with their perceived desirable behaviors. Shared interpretations of the roles and responsibilities of the IT cooperative enable stakeholders from diverse areas to develop greater knowledge of each others' needs, and subsequently, greater ability to meet those needs. Therefore, improved

performance of the IT cooperative is achieved when expectations of multiple stakeholders are effectively aligned.

Nevertheless, a positive association between expectation misalignment and perceived performance of the IT cooperative emerged from the third-wave study. A conjecture of this incorrect relationship is the changing role of the IT cooperative as a response to the lack of consensus within the IT governance council. As we mentioned earlier, stakeholders' expectations regarding the roles and responsibilities of the IT cooperative remained misaligned within the IT governance council because client entities continued to focus on their individual needs, without paying enough attention to the common needs of other entities. Under such circumstances, the IT cooperative had to attend to individual requirements, rather than concentrating on the common needs of all entities. As time goes on, the IT cooperative had better understanding of the needs of each client entity and was better able to address those needs. Thus, individual client entities became more satisfied with the services provided by the IT cooperative although stakeholders still had different opinions about the common services. Given this situation, the initial goal of the IT cooperative, which was to provide economies of scale and scope, is compromised.

6.4 Surfacing Unaccounted-for Factors

The previous discussions of the surprising findings all pointed to one major factor that was not included in the research model, i.e. the governance of the IT governance council. The research model was focused on the governance of the IT cooperative, and how the performance of the IT cooperative could be improved through appropriately architected IT governance and a meaningful organizing vision. Nevertheless, the results

of the study seemed to show that effective governance of the IT governance council itself was equally important. Especially in a context that involves multiple organizations, it is critical for the IT governance council to learn how to govern as a unified group.

Having representatives from multiple organizational entities is necessary, because it ensures that each entity has a voice on the council. However, what is more necessary is that when giving guidance or oversight of the IT cooperative, all the entities involved should speak in a coherent voice, rather than imposing individual requests onto the IT cooperative. Providing a uniformed direction will help the IT cooperative to obtain a consistent understanding of its roles and responsibilities and make its operation more efficient. Furthermore, it will also help all the stakeholders to reach a mutual understanding of the roles and responsibilities of the IT cooperative, and make it possible to achieve economies of scale and scope.

Literature on IT governance suggests that organizations with effective IT governance structures tend to have better performance ((Sambamurthy and Zmud, 1999)). What is further learned is that this is true for both the organization being governed and the organization that is governing. Because of the lack of effective governance of the IT governance council, some constructs in the research model are not operated as expected. We anticipate that once IT governance is improved, more relationships supporting the research propositions will be observed.

Another important factor that is not accounted for in the research model is the role of formal operational policies and procedures for the IT cooperative. Currently, a set of formal policies and procedures regarding what network services should be provided and how those services should be provided is lacking. Given the absence of such policies and

procedures, stakeholders in the IT cooperative are likely to be unclear about what is expected from them and client stakeholders are likely to be applying very different evaluative schemes. Therefore, formal outcome measures have, at best, a weak base to which they can be attached. In order to better understand the governance of the IT cooperative, the effect of formal policies and procedures of the IT cooperative should be taken into consideration.

6.5 Two Types of Expectation Misalignment

When measuring the misalignment between stakeholders' expectations, we examined it from two aspects: expectation misalignment within either the IT cooperative or the IT governance council, and expectation misalignment between the IT cooperative and the IT governance council. We suspect that the expectation alignment within any of the two groups should be in place before the expectation alignment between the two groups can be successfully achieved.

In the research propositions, we explored the effects of IT governance and the organizing vision on expectation misalignment as a whole construct rather than splitting along the two dimensions. Theoretically, we suggest the proposed relationships among most research constructs will hold for both dimensions. Yet, we do recognize that there may be a few exceptions.

First, regarding the IT cooperative's coordination of IT activities, we posited that impersonal coordination should be more effective than interpersonal coordination in aligning stakeholders' expectations. This is especially the case with expectation alignment within the IT cooperative, given that participative stakeholders are from the same knowledge domain. However, in terms of the expectation alignment between the

IT cooperative and the IT governance council, in order for stakeholders in the IT cooperative to better understand the requests and directions from the IT governance council, personal coordination might work better because of the involvement of multiple operation domains. Nevertheless, this conjecture did not receive empirical confirmation.

Secondly, regarding the communication structure of the IT cooperative, we proposed that vertical communication would induce more expectation alignment. This is true for expectation alignment within the IT cooperative. Regarding the expectation alignment between the IT cooperative and the IT governance council, given the absence of a formal authority of client stakeholders over IT stakeholders, communication occurs among peers rather than between supervisors and subordinates. Therefore, horizontal communication of the IT cooperative may induce more expectation alignment between the IT cooperative and the IT governance council. However, empirical evidence did not provide support for this speculation either.

6.6 Summary

In conclusion, consistent with research propositions, vertical communication between the IT operational staff and the IT leadership facilitates the exchange of individual perspectives and results in improved alignment of stakeholders' expectations. Greater communication of the roles and responsibilities of the IT cooperative also helps stakeholders to better understand the expectations of others. The extent to which the organizing vision of the IT cooperative is interpretable, realistic, and important further shapes individual perspectives and achieves mutual understandings of the roles and responsibilities of the IT cooperative. In addition, stakeholders are likely to make

changes in IT governance and the organizing vision in the realization of an expectation misalignment.

However, the proposed effects of control, coordination, and communication structure in the IT governance council, as well as the proposed effect of the discontinuity of the organizing vision, are not observed from the study. In addition, the observed effects of control, coordination, and communication directionality in the IT cooperative, as well as the effect of expectation alignment, contradicted our propositions. In exploration of these surprising results, several major issues have arisen from the study.

First and foremost is the effectiveness of the IT governance council that gives direction and guidance to the IT cooperative. In an inter-organizational context, stakeholders in the IT governance council are from multiple organizations, which all have different IT needs. In order to effectively govern the IT cooperative to generate economies of scale and scope, stakeholders in the IT governance council have to act as a coherent group. Specifically, these stakeholders need to go beyond their individual needs and make efforts to reach consensus about the common needs that should be addressed by the IT cooperative. Otherwise, the directions they give the IT cooperative will be diffusing, and the governance behaviors they enact in will be ineffective. In the long run, the IT cooperative may also end up with addressing each client entities' individual needs, compromising the purpose of an inter-organizational service provider.

Second, the organizing vision of the IT cooperative also needs to be revisited to become more meaningful for all the stakeholders involved with the IT cooperative. The establishment of the organizing vision should involve all relevant stakeholders, in order for it to be acceptable to the community. The involvement of

appropriate community parties also enables the organizing vision to capture any important individual perspectives. Furthermore, the organizing vision should be constantly revisited to ensure it accurately reflects the situations of the community. Without an accurate organizing vision, individual perspectives will not be influenced and an alignment of stakeholders' expectations becomes unlikely.

Lastly, to effectively manage stakeholders' expectations in an inter-organizational context, formal policies and procedures are also important. Formal control (e.g. outcome control) will clarify the expectations of client stakeholders, and enforce these expectations to be understood and pursued. In addition, appropriate policies and procedures will also help convey different stakeholders' expectations by codifying them in formal documents.

Chapter VII: Conclusion

In this chapter, major findings of this research will be summarized, followed by contributions to theories. Managerial implications will then be discussed, and limitations of this study will be identified.

7.1 Major Findings

Through three waves of action research, we are able to obtain a better understanding of how stakeholders achieve a shared perspective of the roles and responsibilities of an IT cooperative that provides services to multiple organizations. We found from a non-parametric sign test that appropriately architected IT governance and a meaningfulness organizing vision contributed to the decreasing misalignment of stakeholders' expectations regarding the roles and responsibilities of the IT cooperative, and consequently the improved performance of the IT cooperative. Specifically, consistent with our research propositions, the communication aspect of IT governance significantly influenced the shared expectations of multiple stakeholders. Particularly, mutual understandings are more likely to be achieved if stakeholders in the IT cooperative have greater degrees of vertical communication about the roles and responsibilities of the IT cooperative with their supervisors and subordinates. Through vertical communication, perspectives from different operational domains are shared with the operational staff in the IT cooperative, enabling them to understand the common needs of client entities. We also found that greater communication of the roles and responsibilities of the IT cooperative improved the alignment of stakeholders' expectations as well. Through greater communication, individual perspectives are frequently exchanged, and a gradual convergence of conceptions is facilitated. Through

this process, stakeholders from different knowledge domains are able to understand each other better.

In terms of the organizing vision, we found that a meaningful organizing vision played a major role in the alignment of stakeholders' expectations of the roles and responsibilities of an IT cooperative. Three dimensions of the meaningfulness of the organizing vision are particularly important: interpretability, plausibility, and importance. The organizing vision is a community idea that shapes individual points of view. When stakeholders perceived the organizing vision in terms of the roles and responsibilities of the IT cooperative to be more understandable, more realistic, and more important to their organizations, they are more likely to accept the organizing vision and adjust their individual perceptions. Under such circumstances, the organizing vision will help stakeholders from various domains to reach consensus and achieve shared understandings of the roles and responsibilities of the IT cooperative. On another note, we learned from the study that the establishment of the organizing vision should involve all relevant stakeholders to ensure it represents a community idea. In addition, the organizing vision should be constantly revisited so that it accurately depicts the factual situation of the community.

Across time, we also found a dynamic relationship between stakeholders' expectation alignment and the design of IT governance, as well as between stakeholders' expectation alignment and the organizing vision. Specifically, when stakeholders realized that there were misalignments between their understandings of the roles and responsibilities of the IT cooperative, they tended to change the way they control and communicate IT-related activities. Stakeholders also tended to have different

perspectives about the meaningfulness of the organizing vision. Although the directions of these relationships were mixed, results suggested that over time, the extent to which stakeholders' expectations of desirable IT behaviors were aligned were incorporated into the design of IT governance and the organizing vision, so as to find ways to influence others with different opinions and to get their own perspectives accepted by others.

Furthermore, we found that the effects of outcome control, impersonal coordination, and bi-direction communication contradicted our propositions. Also, unlike proposed, expectation misalignment was positively associated with stakeholders' satisfaction with the IT cooperative. With exploration of the research context, we realized that the extent to which the IT governance council of the IT cooperative is effective in providing directions and guidance might be a contingency factor that moderates the relationships amongst research constructs. We observed from the study that a consensus was lacking amongst the stakeholders in the IT governance council regarding the common services to be provided. Client stakeholders focused on their individual needs and did not make any effort to reach an agreement across all entities about the expected roles and responsibilities of the IT cooperative. In a context where the IT cooperative's clients involve multiple organizations, when stakeholders in the IT governance council are not acting as a coherent group, individual expectations are likely to remain divergent despite appropriately architected control, coordination, or communication.

7.2 Theoretical Contributions

The contributions of this dissertation are four-fold: 1) it examines the nature of IT governance in an inter-organizational context, 2) it begins to open up the "black box" of

IT governance, exploring the control, coordination, and communication aspects of IT governance, 3) it explores the nature of the alignment of expectations amongst multiple stakeholders and relates the alignment of stakeholders' expectations of the roles and responsibilities of an IT cooperative to the effectiveness of IT governance design, and 4) it suggests the ways an organizing vision could be leveraged to promote shared understanding, consequently improved organizational performance.

First, the research primarily advances the field of IT governance by unfolding the nature of IT governance in an inter-organizational environment. The proposed control and coordination roles of IT governance did not receive support from the study. However, this research identifies that IT governance plays a major role of communication in aligning expectations amongst multiple stakeholder groups. Specifically, through vertical communication between the operational staff and the IT leadership of the IT cooperative, stakeholders' perspectives are shared across organizational boundaries and consensus is reached regarding the roles and responsibilities of an IT cooperative. Also, through greater communication about the roles and responsibilities of the IT cooperative, individual perspectives are effectively exchanged, resulting in improved expectation alignment as well.

As another contribution to the IT governance literature, the study draws the attention to the importance of an IT governance council. In order to leverage appropriately architected IT governance, an IT governance council has to be effective in giving guidance and oversight of the IT cooperative. In an inter-organizational context, the IT governance council often involves stakeholders from multiple organizations. In addition to representing their own organizations, these stakeholders also need to act as a

coherent group when giving directions to the IT cooperative. Particularly when the objective of the IT cooperative is to achieve economies of scale and scope, it is critical for client stakeholders governing the IT cooperative to go beyond individual needs and understand the common needs of all entities. Without acting as a unified group, stakeholders in the IT governance council will be ineffective in governance, and the purpose of the IT cooperative will be compromised. Furthermore, the lack of the effectiveness of the IT governance council is likely to impair the value of control, coordination, and communication.

This research also contributes to the literature of organizing vision, by examining the extent to which a meaningful organizing vision helps achieve shared understandings of desirable IT behaviors and consequently superior organizational performance. By relating an organizing vision to IT governance and to subsequent organizational performance, the IT governance literature is enriched as well.

7.3 Managerial Implications

For practitioners involved with a similar phenomenon, i.e. an inter-organizational IT cooperative, this research suggests a set of key lessons learned. First, we have learned in an inter-organizational context where an IT cooperative generates services to multiple clients, effective communications of the roles and responsibilities of the IT cooperative are critical in achieving an alignment of stakeholders' expectations of desirable IT behaviors. Particular cautions are needed for the communication between the operational staff and the IT leadership of the IT cooperative, where the IT leadership serves as a boundary spanner between the IT cooperative and client entities.

To reach an alignment of stakeholders' expectations, we have also learned that a meaningful mission statement of the IT cooperative should be defined to provide a platform to shape individuals' perceptions. Particularly, the mission statement should be interpretable, realistic, and important to all client entities. In order for the mission statement to be meaningful, the establishment process of the mission statement should involve all relevant stakeholders. The mission statement is not a community idea and will not shape individual perspectives unless opportunities to provide input are given to those who are affected by the mission statement. Furthermore, the mission statement should be constantly revisited to ensure that it connotes any on-going changes in activities related to the IT cooperative.

A third lesson that we have learned is that in order to effectively manage stakeholders' expectations in an inter-organizational context, formal policies and procedures are important. Formal policies and procedures help convey different stakeholders' expectations by codifying them in formal documents. With these formal documents, the expectations of client stakeholders will be clarified, and stakeholders in the IT cooperative will be enforced to understand and pursue these expectations. Therefore, as a good managerial practice, formal policies and procedures for the IT cooperative should be established to specify the services to be provided and the procedures of carrying out the expected services.

Lastly, we have also learned about the importance of the IT governance council of the IT cooperative. The IT governance council is usually composed of representatives from client entities, and the purpose of this council is to give direction and oversight of the IT cooperative. Given client entities all have different IT needs, it is important for

stakeholders in the IT governance council to go beyond their individual needs and recognize the common services required by all entities. Only by acting as a coherent group, can the IT governance council be successful in governing the IT cooperative. Without the effective governance, satisfactory outcomes are unlikely to achieve despite other managerial actions taken.

7.3 Limitations

A major limitation of this research is that due to time constraint, potential changes at the research site could not have been captured. Specifically, the leadership of the IT governance council is currently in the process of taking actions to revise the mission statement of the IT cooperative. However, the outcome of this action will not be observed until some time in the near future. Also, the inefficiency in the governance of the IT governance council is observed toward the end of the study. Changes in the governance of the IT governance council may also be anticipate after the findings are provided to the research site. Yet, to what extent the behaviors of the IT governance council will change will remain unknown until these actions transpire and future waves of data are collected.

Secondly, we did not study the governance of the IT governance council itself. As discussed earlier, the extent to which stakeholders in the IT governance council are effective in governing itself seemed to be a critical construct in the web of relationships being conceptualized with regard to the governance of an inter-organizational IT cooperative. This factor should be integrated into the research model in a future study.

Another limitation of this study is related to the single research site. Although theoretically, the findings should apply to any inter-organizational contexts, an empirical

examination of the research model at other research sites is desirable. In addition, this study involves a small sample size, limiting the power of detecting the actual relationships between research constructs. Therefore, a replication of the study using a larger sample is also preferable.

7.3 Conclusion

In conclusion, this dissertation has focused on an inter-organizational IT cooperative that provides services to clients from multiple organizations. The study involves the examination of the effects of IT governance and organizing vision on the alignment of stakeholders' expectations of the roles and responsibilities of the IT cooperative, which consequently influences the perceived performance of the IT cooperative. Three waves of action research were conducted, and findings suggest that the communication aspect of IT governance and the meaningfulness of an organizing vision play major roles in aligning stakeholders' expectations. Dynamic relationships between expectation alignment and IT governance, as well as between expectation alignment and organizing vision, were also observed.

In addition to the governance of the IT cooperative, the findings of the study also pointed to the governance of the IT governance council. Given the different needs of client entities, it seems to be important for stakeholders in the IT governance council to go beyond individual needs and recognize common services required by all entities. Acting as a unified group will allow the IT governance council to effectively govern and IT cooperative and maximize mutual benefits for all organizations.

Furthermore, formal policies and procedures for the IT cooperative have been identified as important. By codifying different stakeholders' expectations in formal

documents, policies and procedures set out clear guidelines for the IT cooperative and help achieve a mutual understanding of the roles and responsibilities of the IT cooperative.

In conclusion, this dissertation explores the factors contributing to improved performance of an inter-organizational IT cooperative, by unfolding the roles of IT governance and organizing vision in aligning the expectations of different stakeholders. Given the increasing prevalence of multi-organizational IT-enabled business platforms, this research is especially timing today. The findings were supportive of certain of the posited propositions, but also surfaced other factors there were not included in the original conceptual model. Initial progress in studying an inter-organizational IT cooperative that provides shared services to multiple organizations has been made. However, in order to comprehensively understand the phenomenon, more future study is needed. We hope this research will be found interesting and useful by scholars interested in technology and information systems management.

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