INTERDISCIPLINARITY AS COMMUNICATION DESIGN PRACTICE

by

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ABSTRACT OF THE DISSERTATION

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Across scholarly and professional accounts of organizing for interdisciplinarity communication is understood to be the foundation of its achievement, yet these accounts typically present a cursory view of communication principles and processes. Increasingly, interdisciplinary spaces are presented as the solution for facilitating interaction and integration across disciplines in higher education. This dissertation examines the case of a newly designed organization that privileges communication in distinct ways in order to achieve interdisciplinary practice enabled primarily through the design of a physical and administrative structure, and the generation of new routines and rituals.

This research is a single case study that uses qualitative field methods for data collection including observations, informal conversations, and interviews, as well as document and artifact analysis to investigate the research questions posed. The theoretical and methodological framework, which informs both data collection and analysis, is derived from Communication as Design (CaD) (Aakhus, 2007; Jackson & Aakhus, 2014) and Grounded Practical Theory (GPT) (Craig & Tracy, 1995, 2014). Both offer a productive way to articulate, critique, and ultimately inform practice through the investigation of the communicative tensions and dilemmas that arise, as well as the

premises that shape the communicative action of members of a practice (Aakhus, 2007; Craig & Tracy, 2014). In taking a 'design stance' and using a practice lens to develop the case, this dissertation frames the achievement of interdisciplinarity as a communication design practice and attends to the constitutive nature of organizing by examining how the ideas and principles of practice (i.e., interdisciplinarity) are turned into physical, administrative, and social structures and how these are embraced or resisted in various ways generating new conditions that must be worked out.

Findings reveal how there are different practical theories at play regarding the kind of communication that best enables interdisciplinary practice, and these differing perspectives open a disagreement space concerning the design of communication. A key empirical outcome of this case is the articulation of the discourse about communication needed to achieve interdisciplinary practice. In response to problems and tensions arising in practice, the discourse in this case shifts from a thin theory of communication offered by the founders to a struggle for a shared understanding of interdisciplinary practice and the nature of communication for its development. Findings highlight the importance of surfacing the underlying assumptions about communication embedded in physical and administrative structures or found in every day interactions and the implications this has for organizing and makes explicit the ways in which the physical environment becomes implicated in communication design.

Additionally, this study demonstrates how the principles of language and interaction used as heuristic for thinking about designs for communication and the achievement of interdisciplinarity is a productive approach in that it surfaces tensions not always evident. It also illustrates how practices develop over time and therefore

designing for interdisciplinarity is never complete, that is organizing in general and interdisciplinarity specifically requires a continuous process of engagement among organizational members. Together, these demonstrate a need for a distinct approach grounded in design for organizing, managing, and leading interdisciplinary organizations (Yoo, Boland, & Lyytinen, 2006).

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CHAPTER ONE. INTRODUCTION AND RATIONALE

As noted in the National Academies (2005) report on interdisciplinary research, "the heart of interdisciplinarity is communication—the conversations, connections, and combinations that bring new insights" (p. 19). Interdisciplinary spaces are increasingly offered as a solution to facilitate interaction and integration across disciplines in higher education. Examples include Stanford's Bio-X programme at the Clark Center (2003), Wisconsin's Institute for Discovery (2010), and Penn State's Millennium Science Complex (2011). A number of positive outcomes are associated with interdisciplinary organizations including increases in cross-institutional co-authorship and international co-authorship (Bishop, Huck, Ownley, Richards, & Skolits, 2014), as well as providing symbolic value in that the organization legitimizes interdisciplinary activities for members (Friedman & Worden, 2016). Additionally, research showing increases in interdisciplinary connections after the founding of a center, and a corresponding preference for interdisciplinary collaboration through informal face-to-face interaction, lend support for the idea that co-locating multiple disciplines in a physical center can serve as a productive integrating mechanism (Rhoten, 2003). Nevertheless, others contend there are multiple factors ranging from peer review practices, disciplinary and university norms and reward mechanisms, as well as national and international science policies, that afford unique opportunities but also create barriers for scientific collaboration (Sonnenwald, 2007). In response to the literature, which lacks a nuanced understanding of communication and the intersection of the physical, social, and administrative structures that enable and constrain the achievement of interdisciplinarity, this case study addresses this gap through the investigation of a recently formed

interdisciplinary institute which advances specific ideas about how communication works, or ought to work for the achievement of interdisciplinary practice.

In recognizing communication as a practical discipline (Craig, 2006) the case presents an opportunity to provide applicable knowledge for practitioners as well as insights that advance communication theory. This research takes a 'design stance' and uses a practice lens as a general starting point to develop the following case, which frames the achievement of interdisciplinarity as a communication design practice. Four points underlie the approach taken here. First, all designs, including the design of physical environments, administrative structures, and routines and rituals of practice, are rhetorical in that they present arguments about how they should be taken up in practice (Buchanan, 1985). Second, communication designs are hypotheses about communication, which are tested in practice and sometimes refined and redesigned in response to problems that arise for collectives (Aakhus, 2007; Jackson & Aakhus, 2014). Third, all practices, disciplinary or otherwise, are provisional—constantly emerging or under construction often in response to conflicting perspectives about organizing and communication practice, thus highlighting their designability. Finally, there is an important layer to practice often left unexamined, which is attention to the metacommunication or discourse about communication. This dissertation takes this gap as a starting point for examining the achievement of a new interdisciplinary practice.

Overview of the Case

This investigation centers on a newly designed institute that privileges communication in distinct ways in order to achieve interdisciplinary practice. The organization design constituted through its physical and administrative structures, and the

generation of new routines and rituals is an intervention into the given state of interdisciplinarity at the university grounded in ideas about how communication works and ought to work (Aakhus, 2007). A key part of the institutes organizing strategy is its physical environment, a three-story, 80,000 gross square-foot building. The organization seeks to become a national model for addressing issues related to food, nutrition, and health and represents an argument for an approach to achieving interdisciplinarity (Buchanan, 1985; Tompkins, Tompkins, & Cheney, 1989).

A number of university leaders shared a vision for creating a way to bring together those interested in addressing challenges related to food, nutrition, and health. Beginning with informal conversations, university leaders shared this idea with other constituents to assess the level of interest and achieve buy-in from stakeholders. The goal was to capitalize on the university's disciplinary strengths by creating a hub for interdisciplinary research, community outreach programs, and other cross-discipline initiatives. From early on the idea was to build a physical infrastructure that could support collaborative activities through the use of shared space and technologies. In 2008, the institute was formalized with a $10 million capital award from a philanthropic organization whose mission aligned with the institute. Additionally, the institute was awarded a $35 million grant from a state initiative to finance higher education capital projects. A national search was undertaken to find a director willing to take on the initiative and in 2010, a director was hired to operationalize the concept and oversee the design and construction of the enterprise. In 2013, the university broke ground for a new building, and in October 2015 the institute officially opened its doors. As one of the founders noted, the intended outcome was somewhat unclear, but through collaboration

with university leaders and stakeholders, the new director, and a team of architects, what was once a vision, became a reality.

Taking a Design Stance

In taking a design stance, this dissertation research advances a novel way to view interdisciplinarity in terms of communication design (CaD) (Aakhus, 2007; Aakhus & Jackson, 2005; Jackson & Aakhus, 2014). Consistent with Schön's (1983) claim that design is fundamentally "a reflective conversation with the situation," (p. 76) communication design in particular focuses on the ways individuals, groups, and organizations intervene in their situations by altering the conditions of communication to change the given situation into a preferred situation (Aakhus, 2007; Aakhus & Jackson, 2014). CaD is concerned with what a given practice assumes about how communication works and how it ought to work by attending to the orchestration of language and social interaction in an attempt achieve particular qualities of communication for joint action (Aakhus, 2007; Barbour, Gill, & Barge, 2018). This present study takes interdisciplinarity as a case of a practice under construction and observes choices about the uses of language and interaction to achieve a particular quality of communication deemed critical for achieving the organization's objectives. The analysis attends to the practical theories about the design of communication to realize interdisciplinarity to highlight what counts as a problem in practice (e.g., tension or dilemma) and what counts as an effective and legitimate solution to the problem (Barge & Craig, 2009; Craig, 1999). What is evident here is that there are different practical theories at play regarding the kind of communication that best enables a practice, and these differing perspectives open a disagreement space about the design of communication for a practice (Aakhus &

Rumsey, 2010). A key empirical outcome of the analysis is the articulation of the discourse about communication where practical theories about communication design clash as a community comes to terms with constructing their interdisciplinary practice. What is noteworthy is that, in response to problems and tensions arising in practice, the discourse shifts from a thin theory of communication offered by the founders to a struggle for a shared understanding of interdisciplinary practice and the nature of communication for its development. These results provide a basis for understanding the designability of interdisciplinary practice and how it evolves and emerges over time.

In highlighting the ways interdisciplinarity is fundamentally a communicative accomplishment this dissertation contributes to the scholarly and practical conversation about the limits of privileging the physical environment as an intervention for interdisciplinary collaboration. The clash of practical theories about communication revealed in the pages that follow highlight how the administrative structure and routines must also be worked out, that is redesigned. The analysis advances the growing literature examining communication design work in various contexts including group decision support systems (Aakhus, 2001), divorce mediation (Jacobs & Aakhus, 2002), online support groups (Aakhus & Rumsey, 2010), the safety oversight of nuclear power plants (Barbour & Gill, 2014), health campaigns (Harrison, 2014), and participatory design processes (Thompson, Steier, & Ostrenko, 2014). More broadly, it contributes to the discussion in organizational communication concerning the intersection of communication, the physical environment, and the materiality of language and interactivity generally and in regard to interdisciplinarity in particular.

Research Questions

In light of the organization's particular view of how to realize its objectives through communication facilitated through the physical and administrative structure and the generation of new routines and rituals to encourage interaction across disciplines in particular ways, of interest here are the practical theories about how communication works and ought to work to achieve interdisciplinarity. The research is guided by an overarching question: *What are the assumptions about how communication works and ought to work to achieve interdisciplinarity at the research site*? The following two research questions inform both data collection and analysis:

RQ1. How do formal rules/procedures (e.g., administrative), routines and rituals (e.g., everyday interaction), and the physical structure (e.g., architectural layout) enable and/or constrain the pursuit of interdisciplinarity?

RQ2. In what ways do members redesign interactivity to overcome challenges or realize new opportunities for interdisciplinarity?

To answer these questions, the case examines practitioners' assumptions about communication and how communication dynamics are shaped by the physical infrastructure, formal rules and procedures as well as the routines and rituals of practice, as well as the communicative interventions offered and implemented by members in an attempt to manage problems that arise. Understanding how communicative problems are described, the solutions offered, and justifications given for solutions, reveal the practical theories of communication at work and informs our understanding of the ways in which members' interdisciplinary activities are enabled or constrained (Craig & Tracy, 1995, 2014). In the end, this dissertation establishes that the management of differences of

opinion, conflicting background assumptions and competing values, as well as resistance stemming from various dilemmas and divergent goals among members—revealed and resolved through communication—are fundamental to understanding the successful achievement of interdisciplinarity in this and similar types of organizations.

Organization of the Dissertation

This case is organized across seven chapters beginning with a select review of the literature related to interdisciplinarity in chapter two to understand its ideals, the challenges of organizing to accomplish interdisciplinarity more broadly, and the context of higher education in particular. The review calls attention to ideas about communication across the literature, which articulates a stance that this case responds to in that the design of the institute presents an argument about communication, how it works, and the role it plays in organizing for interdisciplinarity.

Chapter three presents the guiding theoretical framework and presents a rationale for taking a design approach informed by practice theory (Nicolini, 2012, 2017), CaD, and Grounded Practical Theory (GPT) (Craig & Tracy, 1995, 2014). These metatheoretical perspectives inform the research methodology including data collection and analysis. The research site and participants are explained and the research questions that guide this investigation are discussed further.

Chapter four outlines the case in more detail first by articulating the founders' vision for the organization through an analysis of the exigency, problem, orchestration and rationale that inform its organizing logics. This is followed by an examination of the early design process, the underlying organization strategy and administrative structure, as well as ideas about membership and the role of organization culture in realizing its

interdisciplinary aims. In that the solution for orchestrating interdisciplinarity in this case was to design and build a physical structure, the chapter concludes with an examination of the building as a design for disciplining and shaping communication.

Chapter five continues the examination of the physical structure by attending to how it has been taken up in practice by the members of the organization. It shows how the intersection of the routines and rituals of practice and the physical aspects of the environment come together in ways that both enable and constrain the pursuit of interdisciplinarity. These realities generate tensions and the opening of a 'disagreement space' that members and administrators must address. An example this is taken up in chapter six.

Chapter six 'zooms in' (Nicolini, 2009) on a disagreement space (van Eemeren, Grootendorst, Jackson, & Jacobs, 1993, p.95) to examine a particular instance of communication design work where members attempt to overcome challenges in an effort to realize the ideals of interdisciplinarity. The chapter reconstructs an instance of collective communication design revealing competing logics, highlighting how the fit, function, and fragmentation of communication design logics are impediments to the realization of interdisciplinary aims (Barbour, Gill, & Barge, 2018b).

Chapter seven describes the nature of interdisciplinarity at the research site and addresses the research questions posed by focusing on the various principles of language interaction not explicitly considered by organizational members but nonetheless critical for understanding the ways in which interdisciplinarity is enabled and/or constrained.

Chapter eight concludes the dissertation with theoretical and practical implications, the limitations of this study, and offers ideas for future research. It outlines

a number of design principles to inform reflection and the redesign of interdisciplinary practice with regard to this case in particular, and for future interdisciplinary endeavors.

Chapter One Summary and Conclusion

Interest in organizing for interdisciplinarity in higher education continues to grow and there is a range of ideas concerning effective organizing practices. In that communication is fundamental to interdisciplinary achievements as will be demonstrated in the literature review that follows, communication scholars have a unique opportunity to contribute meaningful research for practice. Consistent with calls for applied scholarship that addresses the practical needs of organizations (Tracy, 2016) this dissertation seeks to contribute to a body of actionable knowledge to improve both organizing processes and interdisciplinary practice (Barbour et al., 2018b). The findings here provide material for reflection in the form of practical knowledge useful for managing existing enterprises as well as informing the development of future organizational arrangements for interdisciplinary collaboration.

There are a number of contributions this dissertation intends to offer: First, is to advance the practice of interdisciplinarity at this research site and similar types of organizations through the presentation of a more nuanced communication-oriented understanding of interdisciplinarity by revealing the ways in which practical theories of communication are the oftentimes hidden sources of conflict in organizations in general and with regard to interdisciplinarity in particular. Second, is to show how a primary aspect of management and leadership for interdisciplinarity centers on the coordination of differences of opinion about communication that can make individual and collective action more difficult. A design approach taken here attempts to advances theory about

interdisciplinarity through critique, but also offer principles that can guide organizing processes that advance interdisciplinary initiatives (Aakhus & Bzdak, 2015, p. 198). Finally, this dissertation demonstrates how organization design, traditionally positioned as the implementation of a well-developed strategy and structure, is more productively understood as an iterative design process grounded in communication. What is unique about this dissertation is that it attends concurrently to ideas about communication from the conception of building a physical structure, through the initial uses of the building where members work out formal and informal routines, rituals, and norms of communication and the consequences this has for organizing for interdisciplinarity. Evident here is that constructing a physical structure is not enough to facilitate interdisciplinary interaction and integration because the administrative structure and routines and rituals practice become implicated in organizing processes, creating various tensions that need to be resolved through communication design activities.

CHAPTER TWO. LITERATURE REVIEW

There is a wide range of practical, theoretical, conceptual and empirical examinations of the topic interdisciplinarity—which in itself is interdisciplinary—produced across fields ranging from health services, environmental science, research policy and evaluation, research and development management, to higher education. Because of the extensive body of literature (see Klein, 1990, 2010) for a comprehensive examination of interdisciplinarity) this chapter attempts to articulate the practical theory of interdisciplinarity. The goal is to present a broad synthesis of the extant literature with attention given to reconstructing a sense of interdisciplinarity as a communicative practice and illustrate the apparent commitments to how communication works and ought work in realizing interdisciplinarity evident in the literature. Toward this end, the chapter serves several purposes. First, the review creates a starting point for the critical engagement with the concept of interdisciplinarity that follows in the remaining chapters. For this purpose, the first part of the review is organized according to the multiple levels of analysis typical for organizational scholarship—individual, group, organization, and field. Second, the review introduces *administrative structures*, *routine and ritual practices of interdisciplinarity*, and *physical structures* as key concepts from the literature that emphasize how interdisciplinarity is achieved in higher education organizations. These concepts are used in framing the specific research questions addressed in this dissertation. Third, the review articulates ideas about communication from the literature that represent key ideas as to how communication should be disciplined to achieve interdisciplinary practice. For this purpose, the review draws on elements of the overarching methodology of the research project, which will be discussed in more detail

in chapter three, by considering the particular *exigencies* interdisciplinarity seeks to address, the *problems of communication* associated with organizing for interdisciplinarity, and the *communicative solutions* offered to address these problems. Thus, as noted in the first chapter, the primary objective of this dissertation research is to understand interdisciplinarity as a communication practice to be designed. This review begins to surface beliefs and commitments about communication that oftentimes remain tacit in academic and professional perspectives on interdisciplinarity.

What is Interdisciplinarity?

To understand interdisciplinarity and how it is rationalized across the literature it is important to first understand disciplinarity. Both interdisciplinarity and disciplinarity are modes of knowledge production that differ in primary intentions. Whereas a principal concern of disciplinarity is the development of theoretical knowledge, interdisciplinarity focuses on the development of application-oriented knowledge (van den Besselaar & Heimeriks, 2001). A discipline is a "specific body of teachable knowledge with its own background of education, training, procedures, methods and content areas" (Berger, 1972) and affords an organizing structure for knowledge production in higher education (Menand, 2001). Disciplines enable the accomplishment of a number of things: a division of labor in academic institutions (Jacobs, 2017), the management of resources through an internal and external market, a shared understanding through a common language and rules for discourse, the shaping of behavioral norms and practices, and providing its members with autonomy and legitimacy (Turner, 2017). Some have defended the benefits of disciplinarity (Jacobs, 2009, 2017) while others suggest it reflects closed, conventional, artificial, and restrictive practices (Barry, Born, & Weszkalnys, 2008).

Gibbons et al. (1994) contrast the difference between what they call Mode 1 (disciplinary based), and Mode 2 (transdisciplinary) knowledge production. Mode 1 is synonymous with traditional academic research and disciplinary knowledge production operating within a rigid hierarchical structure, while Mode 2 is framed as problem centered, context dependent, heterarchical, and dynamic. A widely accepted definition of interdisciplinarity is the one advanced by the National Academies: The integration of "information, data, techniques, tools, perspectives, concepts, and/or theories from two or more disciplines to advance fundamental understanding or to solve problems whose solutions are beyond the scope of a single discipline (National Academies, 2005, p. 2).

The Idealization of Interdisciplinarity

The headline "Scientists must work together to save the world," published in a 2015 issue of *Nature* highlights an overarching significance for this study. Interdisciplinarity is increasingly viewed as an *antidote* to traditional disciplinary practices, framed as unable to address complex issues or solve intractable problems satisfactorily (Bruhn, 2000). Four exigencies—that which motivates action—provide the rationale for encouraging interdisciplinarity: "the inherent complexity of nature and society, the desire to explore problems and questions that are not confined to a single discipline, the need to solve societal problems, and the power of new technologies" (National Academies, 2005, p. 40).

The 2005 National Academies report, *Facilitating Interdisciplinary Research* touts the benefits of interdisciplinary research stating, "as a mode of discovery and education, it has delivered much already and promises more—sustainable environment, healthier and more prosperous lives, new discoveries and technologies to inspire young

minds, and deeper understanding of our place in space and time" (p. 1). More than a decade later, it is still viewed as the most promising approach for dealing with the complex interdependencies associated with intractable problems. In fact, the National Institutes of Health (NIH) positions interdisciplinarity as a vital contributor to health science and has made the promotion of interdisciplinarity a priority, stating:

> …integrating the analytical strengths of two or more often disparate scientific disciplines to solve a given biological problem . . . behavioral scientists, molecular biologists, and mathematicians might combine their research tools, approaches, and technologies to more powerfully solve the puzzles of complex health problems such as pain and obesity (Para 9).

Since the 1950s there has been a significant increase in support for interdisciplinary activities in both the natural and social sciences (Van Noorden, 2015). The publication of Organization for Economic Cooperation and Development's (OECD) 1972 report on interdisciplinary research and education generated great interest in such activities as well. In 2012, the National Science Foundation (NSF) increased the number of grants awarded to researchers working across disciplines in an effort to stimulate interdisciplinary research across the sciences (Basken, 2012). For example, in 2015 the NSF awarded $74.5 million to support interdisciplinary cybersecurity research across 257 new projects, which included researchers from 37 states (National Science Foundation, 2015, October 7). In 2016 Lehigh University hired its first vice provost for creative inquiry to oversee the university's interdisciplinary, problem-based learning program (Monaghan, 2016, September 18). Despite this idealization of interdisciplinarity as the obvious approach for addressing complex intractable problems, numerous organizational challenges exist as discussed below.

Organizing for Interdisciplinarity—Challenges at Multiple Levels

Interdisciplinarity concerns three interacting levels: the *scholarly*, the *social*, and the *administrative* (Maasen, 2000), each advancing a particular logic concerning how to achieve objectives. The *scholarly* level reflects a desire to develop new knowledge or solve a particular problem viewed as most productively addressed through multiple disciplinary perspectives, requiring interaction across disciplines. The *social* relates to the development of a nurturing environment that supports intensive interactions during all phases of the interdisciplinary project. Finally, the *administrative* level refers to the support (i.e., leadership, administrative structures, resources, etc.) that is necessary for organizing and managing interdisciplinary processes (Maasen, 2000).

Despite the extensive enthusiasm for interdisciplinarity barriers to its success can be formidable—inconsistent funding, disciplinary bias, failure to adequately reward members, personnel matters, leadership failures, mismatched skill sets, and project organization and team dynamic difficulties (Klein & Porter, 1990; Siedlok & Hibbert, 2014). Many view interdisciplinarity as an organizational problem (Feller, 2002; Rhoten, 2004; Sá, 2007) requiring various strategies and the redesign of organizational structures to motivate and support such initiatives. Calls for systemic reform and restructuring of academic institutions have been issued to address challenges related limited resources, restrictive academic reward systems, differences in cultures, lack of program evaluation, different departmental policies, and procedures, and protracted startup times (National Academies, 2005). Rhoten (2004) notes “that the transition to interdisciplinarity and consilience does not suffer from a lack of extrinsic attention at the “top” or intrinsic motivation at the “bottom,” but, rather, from a lack of systemic implementation in the

"middle" (p. 6). She contends:

> "the persistence of old structures created real or perceived disincentives to and penalties for pursuing interdisciplinary work . . . lack of systemic implementation taken in order to re-design and not just rename these structures and thus actively support interdisciplinary research has actually created initiatives that are inherently incapable of achieving the very goals they seek to accomplish and unfortunately unable to serve the very constituents they hope to support" (p. 9).

Similarly, Sonnenwald (2007) identifies multiple factors across scientific disciplines ranging from peer review practices, disciplinary and university norms and reward mechanisms, as well as national and international science policies, which afford both unique opportunities, as well as create barriers for scientific collaboration.

Interdisciplinarity is stimulated either from the top-down as with institutions and funding agencies initiating and supporting interdisciplinarity activities; or the bottom-up as is the case with researchers from different disciplines choosing to collaborate (National Academies, 2005). Interdisciplinarity requires various mechanisms to organize and integrate activities ranging from institutional commitment, leadership and administrative structures, physical environments, cultures to nurture collaborative practices, effective communication, and team building (National Academies, 2005). However, a review of the literature offered by Siedlok, Hibbert, and Sillince (2015) notes, "a gap exists in our knowledge of how such collaborations are accomplished and the kinds of emergent organizational forms in which it occurs" (p. 96). The following examines a number of constraints across the individual, group, organization, and field levels.

Individual level. At the individual level, the literature highlights a number of challenges beginning with the scholars themselves who in some cases defend discipline based research and are skeptical of the value and quality of interdisciplinary projects

(Jacobs, 2009; Jacobs & Frickel, 2009; Winkler, 1987). Additionally, Bozeman and Corley (2004) find that most researchers have a tendency to work with the people in their own work group or same university. There are also marked epistemological differences across disciplines that shape how research questions are developed and the methodologies used to investigate those questions (Bracken & Oughton, 2006; Massey, 2006). Bruhn (2000) notes that there is a tendency among researchers to "replicate the methods they learned from their teachers. As a result persistence is valued-more than risk-taking" required for interdisciplinarity to flourish (p. 64).

Researchers often have unique characteristics related to degree, field of training, work experience, career stage, and administrative role, and these likely influence collaborative activity (Bozeman, Fay, & Slade, 2012). For example, in the humanities and social sciences Aram (2004) finds that among academics there are different understandings of interdisciplinarity and the degree of knowledge integration required, the various aims of interdisciplinarity, and assumptions about the nature of reality and these differences shape collaborative practices. As Dougherty (1992) notes, when people who inhabit different "thought worlds" attempt to connect and collaborate their different "interpretive schemes" create barriers. There are both intrinsic and extrinsic reasons for wanting to collaborate across disciplines and can be highly personal (Siedlok & Hibbert, 2014). Melin (2000) suggests that matters of "personal chemistry" and friendship come into play and finds there is a "pragmatic attitude to collaboration—when there is something to gain, then a particular collaboration will occur, otherwise it will not" (p. 39). Her research shows that tapping into unique expertise or gaining access to special data or equipment is offered as the most common reasons for deciding to collaborate

across disciplines.

Group level. At the group level, bridging differences to accomplish shared objectives becomes the primary concern. Interdisciplinary activities include team development, problem framing, coordinating participation, integrating results, managing expectations, monitoring progress, overcoming conflicts, facilitating cooperation, negotiating goals, designing and monitoring internal and external communication, and negotiating rights, duties, and evaluative criteria (Defila & di Giulio, 2017). As noted above, interdisciplinary teams are comprised of individuals with unique characteristics and while these differences can contribute to novel outcomes, they can present challenges for effective collaboration. Norms and practices regarding collaboration likely differ across disciplines (Bossio, Loch, Schier, & Mazzolini, 2014). This makes interdisciplinary work a challenging and time consuming endeavor that encompasses a multitude of activities to facilitate integration and consensus around ideas, theoretical frameworks, and methods throughout the lifecycle of a project. Sufficient time must devoted to group development among individuals with different backgrounds who must learn new methods, languages, and disciplinary cultures in order to develop an effective collaborative model that facilitates technical and social integration (Lefroy, 2013; National Academies, 2005). Tress, Tress, and Fry (2007) find that among researchers in their study, time demands were the most frequently identified barrier to interdisciplinary work, followed by lack of common terminology, coping with different academic traditions, and agreement around the formulation of a problem. Importantly, without a unifying problem researchers are unlikely to productively unite (Rhoten, 2004). Finally, research in general has both a constructive and critical dimension—one to generate new

knowledge and the other to test this knowledge. In interdisciplinary teams an overly critical orientation can derail collaborative efforts (Pickett, Burch, & Grove, 1999).

While disciplinary knowledge is an essential condition for research, the integration of multiple disciplinary identities can make collaboration difficult in that the various socialization processes of academics reinforces the segmentation of disciplinary worldviews (Defila & di Giulio, 2017). Barbour and James (2015) find identity tensions complicate matters in collaborative groups in that disciplinary identities influence the importance placed on certain activities resulting conflict and power struggles. Therefore they propose that interdisciplinary collaboration requires the surfacing and negotiation of identity tensions and related competing premises about the work of the group. Nevertheless, even when scholars attempt to enact an identity consistent with interdisciplinarity it can be challenging to maintain because of constraints of traditional department structures (Watrall, 2010). Herbert Simon, a notable interdisciplinary scholar, has been quoted as saying "Psychologists think that I am an economist, but economists think I am a psychologist. In fact, I feel allegiance to none of these academic tribes, but regard myself as a citizen of the world—a behavioral scientist" (Crowther-Heyck, 2006, p. 312).

Matters related to gender are at play as well. Women are more likely to engage in interdisciplinary collaboration than men (Rhoten & Pfirman, 2007; van Rijnsoever & Hessels, 2011) and non-tenure track women have 84 percent of their collaborations with women (Bozeman & Corley, 2004). Finally, international research collaborations further complicate matters, as teams must deal with not only disciplinary language barriers, but barriers related to national language as well. Members from the dominant culture have

the luxury of communicating in their native language, while those from other cultures must speak in a second language (Bournois & Chevalier, 1998).

Organization and field level. At the organization and field level, traditional ways of organizing in academic institutions (i.e., by discipline) and the policies that govern hiring, promotion, tenure, and resource allocation create barriers (National Academies, 2005; Siedlok & Hibbert, 2014). As researcher Laura R. Severin, quoted in a 2014 Chronicle of Higher Education article states, "Our whole structure that's a thousand years old, of dividing people into departments and disciplines, is working at cross-purposes to that endeavor" (Mueller, 2014). Bruhn (2000) argues that interdisciplinary research will never be mainstream because "bureaucratic organizations will discourage it because activities that cross boundaries are politically and economically difficult to manage" (p. 64). The National Academies (2005) notes that a limited understanding of the underlying complex social and intellectual processes and the ways in which general matters of culture complicate interdisciplinary processes impede the successful creation and subsequent management of interdisciplinary initiatives. Finally, universities struggle to reconcile new configurations required for successful interdisciplinary research with the traditional and sometimes "rigid organizational structures" of academic institutions (Bruhn, 2000). Complicating matters further, while interdisciplinarity is framed as a solution to address the intractable problems that plague society at large, academic institutions have been largely ineffective with engaging the public and policy makers in "formulating questions, collecting data, and communicating outcomes" (Whitmer et al., 2010, p. 314). Finally, despite the repeated calls for interdisciplinarity, the traditional ways of organizing of funding agencies, professional societies, and journals often run

counter to interdisciplinary efforts (National Academies, 2005).

What the discussion above highlights is how organizing for interdisciplinarity requires an understanding of various factors that enable and/or constrain the achievement of interdisciplinarity at multiple levels. These include but are not limited to disciplinary identities and practices, differing norms of and goals for collaboration, and administrative and institutional structures that work at cross purposes. This presents a challenge for those seeking to design and launch interdisciplinary programs, centers, and institutes in higher education, which remains fixed in traditional ways of organizing. The context of higher education is taken up below and three aspects of organization design are discussed—administrative structure, physical structure, and routines and rituals of practice to examine their part in the configuration of new forms of interdisciplinary practice.

Realizing Interdisciplinarity in Higher Education

University-based research centers and institutes, often called organized research units (ORUs), are considered to be effective models for creating an interdisciplinary environment (Klein & Porter, 1990). In the U.S. this type of higher-education organization has increased significantly over the past 50 years. Whereas the primary focus for most ORUs is research, many support the university mission in other ways such as providing undergraduate and graduate education, engaging in community outreach, and offering services for students and university members (Mallon & Bunton, 2005).

Some academics laude their ability to strengthen the university research system and promote “big science” (Stahler & Tash, 1994), while others criticize their inability to actualize interdisciplinary collaboration (Bruhn, 2000; Hays, 1992; Rhoten, 2004).

Whitmer et al. (2010) assert, "Academic institutions have enormous potential to transform the interface between science and society, but realizing this potential is hindered by institutional structures, review and reward systems, and funding mechanisms" (p. 314). Bruhn (2000) cautions that despite concerted efforts to facilitate interdisciplinarity it "appears to survive but not flourish" in higher education (p. 58). Rhoten (2004) attributes part of the failure to the absence of well-defined problems that groups can coalesce around and initiatives that are merely branded as interdisciplinary, that is "traditional modes of work patched together under a new label—rather than actual reconceptualizations and reorganizations of new research" (p. 6). Furthermore, there is some evidence to suggest that even in cases where interdisciplinarity has developed, over time research activities shift to multidisciplinary research or "parallel problem solving" (Raasch, Lee, Spaeth, & Herstatt, 2013). Nevertheless, a number of strategies have been shown to be effective in fostering interdisciplinarity, including incentive grants, steering structures, and new faculty recruitment and evaluation models (Sá, 2007).

Across the literature there are various ideas about how to create the conditions for interdisciplinarity to flourish, which include changing administrative structures (e.g., matrix structures), developing new routines and rituals of practice (e.g., cross-discipline workshops), and designing physical structures and spaces (e.g., centers and institutes) that condition the way members engage with each other and with the practice of interdisciplinarity more specifically. Additionally, given the prominence placed on communication in relation to these aspects of organization design, the related literature is discussed below to inform the development of the research questions discussed in chapter three.

Administrative Structures

Administrative structures shape the possibilities for organizational members by delineating lines of authority, designating roles with certain rights and obligations, articulating rules and managing resources, as well as and managing the flow communication and information. Scholars have classified administrative structures according to their complexity, ranging from simple arrangements coordinated through direct supervision, to adhocracies which are loosely organized and flexible structures that function through mutual adjustment among organizational members (Mintzberg, 1980).

As noted in the literature interdisciplinarity requires moving beyond traditional organization design (i.e., direct supervision, or the standardization of processes, outputs, or skills) (Mintzberg, 1980), towards new forms of administrative structure such as adhocracies or matrix organizations. Matrix structures, where individuals report to multiple areas of the organization, were created in response to increasing complexity and the need to better integrate functional and project activities (Galbraith, 1971). Klein and Porter (1990) suggest matrix structures can be effective for managing interdisciplinary research in that it combines both hierarchy and project organization and thus "can facilitate a balance of power and increase intrateam communication and decision making, through lateral channels" (p. 15). Sá (2007) as well notes the similarities between matrix organizations and research institutes, which differ from established academic structures in which they are embedded, in that they house faculty from different departments who maintain ties to both their department and the institute, and engage in thematic projects that cross departmental boundaries. Not surprisingly, similarities exist between the challenges associated with organizing for interdisciplinarity and those identified in

research on matrix organizations but there is a lack of research in this area (Sa, 2007). Vasconcellos (1990) examination of matrix organizational structures in Brazilian R&D institutes, finds formalization of responsibility and authority, and communication patterns to be related to conflict and performance. Data show low levels of formal authority are related to low performance levels and higher performance and degree of interdisciplinarity related to communication practices and the degree to which project managers communicate directly with teams and keep functional managers informed. In contrast, when functional managers were not kept informed conflict was greater and commitment weaker. This highlights the important role that administrative structure and leadership play in realizing interdisciplinary objectives.

According to the literature, effective leadership for interdisciplinarity requires multiple competencies including disciplinary knowledge and knowledge of related areas, skill in problem solving, management of schedules and core tasks, budgeting, performance monitoring, communication and public relations (Klein & Porter, 1990). Additionally, a range of interpersonal skills is needed to motivate and integrate intellectual contributions (Porter, Roessner, Cohen, & Perreault, 2006). Leaders of interdisciplinary organizations are responsible for internal dynamics as well as navigating the boundaries of the external environment. Benoliel and Somech (2014) find that performance is contingent upon the leaders attending to internal team processes, while innovation is contingent upon external relating, "communicating and coordinating with key constituencies outside the team" (p. 89).

Lengwiler (2006) finds that cognitive coupling—a combination of administrative structure, social interdependence, and theoretical and methodological integration across

disciplines—influences interdisciplinary collaboration. In cases where structure, interdependence, and integration are weak or non-existent, collaborations are more likely to fail or never get off the ground. The study identifies four approaches to interdisciplinarity (ID), which vary in degrees of administrative structure and cognitive coupling—charismatic, methodological, pragmatic, and heuristic. Methodological ID is characterized by high degrees of formal structure (sometimes matrix) and tight cognitive coupling realized through the use of modeling to integrate theories and methods across disciplines. Charismatic ID is characterized by an informal and decentralized structure, but with a strong informal interpersonal network that contributes to a high degree of cognitive coupling. Heuristic ID is characterized by a high degree of formal structure, and weak cognitive coupling in which project management skills take precedence over disciplinary matters. Pragmatic ID is considered the weakest form of ID and subject to a high degree of failure because both administrative structure and cognitive coupling are weak or non-existent resulting in a decentralized research culture and a lack of shared theoretical and methodological approaches. The study concludes, "When a director with charismatic authorities is absent, interdisciplinary cooperation loses its integrating factor and risks disintegrating into parallel multidisciplinary projects" (Lengwiler, 2006, p. 431).

This highlights how leadership is critical for the development and nurturing of a culture that supports interdisciplinarity. König, Diehl, Tscherning, and Helming (2013) suggest it is accomplished through mentoring and facilitating. Mentoring involves recognizing the various needs of team members, building commitment, motivating members and maintaining morale and is dependent on communicative practices such as

encouraging open and transparent discussion and decision making, creating a climate of fairness, and maintaining professional ethical standards. Leaders are also responsible for team building, facilitating discussion, participation and translation, encouraging knowledge exchange, and balancing "democracy and transparency against information overflow and chaos" (p. 266). Additionally, leaders must engage in various project coordination functions such as guiding, monitoring, and supporting research output, goal clarification and providing direction, managing the external environment, maintaining routines, balancing project management and deadlines, and creating the conditions for plurality and creativity to thrive.

As evident in the discussion on administrative structure and leadership above are various ideas concerning ways of organizing to achieve interdisciplinarity. These include supporting and managing intrateam communication and decision making, balancing degrees of formal authority and responsibility with flexibility and informal processes, integrating intellectual contributions, and managing interpersonal relations and dealing with conflict. Notable is the importance placed on communication processes, and the ways in which administrative structure and leadership shape the communicative aspects of organizing for interdisciplinarity. This highlights a need to examine the connection between administrative structure and communication further, informing the direction of this dissertation.

Routines and Rituals of Interdisciplinary Practice

Fundamental for the achievement of interdisciplinarity is the reshaping of disciplinary routines and rituals of practice. Routines are "a set of possible patterns-enabled and constrained by a variety of organizational, social, physical, and cognitive

structures—from which organizational members enact particular performances" (Pentland & Rueter, 1994, p. 491). Rituals are more formalized performances related to the display and enactment of values and/or identities, which contribute to the development of an organization's culture and a shared interpretation of reality (Islam & Zyphur, 2009). Routines and rituals are enacted through both informal and formal interventions that create the conditions for certain qualities of communicative practice to happen and are central to the achievement of interdisciplinarity.

For example, Siedlok et al. (2015) show how traditional disciplinary rituals such as symposia, workshops, and conferences can contribute to bringing individuals from different disciplines together. The program studied is *Bridging the Gap* (BTG) used various interventions ranging from a university-wide research day, to speed-networking events to stimulate collaboration across various departments. Of those who participated in the study, 95 percent report that the program facilitated engagement with researchers from other disciplines. These ritualized events facilitated a number of specific practices—practices of enquiry (exploring interdisciplinarity collaboration), practices of engagement (developing rapport to enable interdisciplinarity to begin), and practices of enactment (sustaining collaboration beyond the completion of projects). Each are characterized by sets of communicative activities—enquiry centered on meaning making, engagement centered on the negotiation of norms, and practices of enactment focused on what to do and how, including activities like maintaining procedural justice, nurturing relationships, including others, and brokering connections.

Another example of generating new routines and rituals is the example of the Evans Center for Interdisciplinary Biomedical Research at Boston University, founded in

2009. It is a virtual organization (i.e., without a physical location) that promotes scientific rigor through various techniques of engagement, peer review of ideas, and financial support for accepted ideas. The center is organized around interdisciplinary research groups, or affinity research collaboratives (ARCs) with members from at least two disciplines across a number of academic departments. These ARCs emerge from the ground up through a faculty initiated "self-assembly and selection" process and then peer reviewed for funding and administrative support (Ravid, Faux, Corkey, & Coleman, 2013). In early phases of the formation of an ARC, or pre-ARC members are identified, goals are refined, and decisions are made whether to submit a formal application for funding. Incentives for forming an ARC include financial support, as well as "access to shared knowledge, ideas, and technologies" (p. 181). ARCs undergo a yearly review by a panel of university investigators and if approved, $40,000 to $75,000 per year is provided to cover research supplies or partial support of trainees to carry out pilot studies. The center facilitates the bringing together of members through various educational activities, seminars, workshops, symposium and discussions run by either ARC directors or center leadership. ARC members meet monthly for member meetings and quarterly for ARC director meetings, and participate in an annual retreat that gives members the opportunity to present data and formulate collective plans.

What the examples above highlight is the importance of generating new routines and rituals of practice and the role of communication design—that is the creation of various activities that generate engagement and interdependence across disciplines. The communicative activities highlighted above include questioning and investigating, developing and nurturing interpersonal relations, and developing new norms for interdisciplinary practice. Notable, in the examples cited is how these activities are

developed and supported primarily without a dedicated physical location. The following section considers the nature of physical structures and the potential for these environments to enable and/or constrain the achievement interdisciplinary practice, the primary interest of this dissertation.

Physical Structures for Interdisciplinary Practice

Lange (2016, August 7) states "Where once the campus amenities arms race was waged over luxury dorms and recreation facilities, now colleges and universities are building deluxe structures for the generation of wonderful ideas" (para 1). He argues that the celebrated history of buildings like M.I.T.'s Building 20, which began as a temporary structure in 1943 and ended up serving as an interdisciplinary incubator until replaced in 1998, provide compelling evidence for the value of physical environments for interdisciplinarity. As Ruben and Soleri (1979) note, although architecture "has purpose as a medium it has even greater purpose as a message" (p. 217). These building and their associated mythologies are messages that signal an institution's commitment to interdisciplinary initiatives and help to generate further interest in designing similar specialized facilities that can enable and support creative interaction. Organizations such as the National Academies (2005) also promote the benefits of having dedicated physical structures stating, "interdisciplinary projects flourish in an environment that allows researchers to communicate, share ideas, and collaborate across disciplines" and the co-location of researchers and shared instrumentation "enhance chance meetings between researchers" (p. 172). Despite such enthusiasm, Rhoten (2004) argues that these physical environments for interdisciplinary activities must be supported by funding, a vision, and "well-articulated organizing principles" (p. 10).

The notion that physical environments facilitate interdisciplinarity is grounded in a theory of proximity—that is the co-location of individuals from various disciplines will result in more frequent interaction (Porter et al., 2006). A positive relationship between proximity and communication has been demonstrated in numerous studies, with some reporting increases in face-to-face communication as a result of increased proximity (Allen, 1977; Allen & Fustfeld, 1975; Festinger, 1951; Knoben & Oerlemans, 2006; Kraut, Egido, & Galegher, 1988); and more recently others noting a significant decrease (Bernstein & Turban, 2018). Early research investigating communication patterns in R&D laboratories showed support for the idea that proximity influences communication patterns among individuals who were moved to a new facility designed with spaces to encourage interaction such as lunchrooms, coffee stations, and copying machines (Allen & Fustfeld, 1975). The study found increases in intergroup communication among three groups, but surprisingly found that shared laboratory spaces did not promote intergroup communication. More recently, Rhoten's (2003, 2004) investigation of interdisciplinary institutes finds 71 percent of researchers in the study favored face-to-face communication for information sharing and knowledge creating within and across disciplines, concluding that "the creation of new knowledge are dependent on the interpersonal, spontaneous interactions of researchers—a class of interaction generally hindered by traditional disciplinary departments and so often unrealized by new interdisciplinary centers" (p. 10). The study also finds an average of 84 percent of interdisciplinary connections were made after the founding of a center, supporting the claim that they can serve as integrating mechanisms. However, network and fieldwork data reveal that collaborations tend to be more multidisciplinary rather than interdisciplinary. Bishop, Huck, Ownley,

Richards, and Skolits (2014) found that affiliation with an interdisciplinary center was positively associated with increases in cross-institutional co-authorship as well as international co-authorship. Friedman and Worden (2016) found that physical centers have symbolic value in that they help to legitimize interdisciplinarity for members. In contrast, Mallon and Bunton (2005) find that while physical centers have greater funding and are more likely have directors identified through a search committee process, there is little difference in staffing, faculty affiliations, reporting relationships, and the directors role in institutional governance in virtual centers as compared to physical centers.

As the examples above highlight there are inconsistent outcomes related to the impact physical environments have on interdisciplinary practices. On one hand they appear to enable interdisciplinarity to develop and flourish, while on the other hand there appears to be little difference between physical and virtual interdisciplinary organizations. As noted previously, the role of communication underlies many of these ideas concerning how to generate interdisciplinarity. Administrative structures, the routines and rituals of practice as well as physical infrastructure are configured in ways that scaffold particular kinds of action and communication and discourage others. The following section presents a deeper examination of the ideas about communication in the extant literature.

Ideas About Communication Across the Literature

As noted in the National Academies (2005) report on interdisciplinary research, "the heart of interdisciplinarity is communication—the conversations, connections, and combinations that bring new insights" (p. 19). To better understand interdisciplinarity and how communication is understood across the literature, this section aims to articulate the

ideas about interdisciplinarity that relate to communication. It gives particular attention to the various practical theories concerning how communication works and ought work for realizing interdisciplinarity, which inform the development of solutions and techniques to deal with perceived communication problems. These include the need to facilitate interaction and integration, understanding the nature of questioning, discourse and language, and interpreting, translating and inventing languages, and developing collective communication competence. Taken together they highlight the nature of interdisciplinarity as a communicative practice and illustrate the apparent commitments to how communication works and ought work in realizing interdisciplinarity throughout the literature.

Interaction and integration. The most fundamental idea across the literature that informs solutions for interdisciplinarity is the importance of interaction and integration achieved through dialogue across disciplinary boundaries. Recently, Klein (2017) offered an analysis and a more nuanced typology identifying multidisciplinarity, interdisciplinarity, and transdisciplinarity activities across various research contexts, reflecting a continuum ranging from interaction to integration. Multidisciplinarity she notes, exhibits the weakest degree of interaction and includes the "[j]uxtaposition of various disciplines" (Apostel, 1972, p. 25), sequencing of parallel disciplines, and coordination among aligned disciplines (Burns, 1999). In contrast, interdisciplinarity has a broader range of interaction and integration such as the borrowing of a method or concept, integrating propositions across disciplines, bridge building across disciplines, restructuring to create new hybrid interdisciplinary fields, and interdisciplinarity for instrumental purposes (Klein, 2017). Finally, transdisciplinarity, the establishment of "a

common system of axioms for a set of disciplines" requires the highest degree of interaction and ultimately integration (Berger, 1972, p. 25).

Interaction. The first formal typology of disciplinary interactions was offered in 1972 by the Organization for Economic Cooperation and Development (OECD) (Klein, 2017), defining interdisciplinarity as: "the interaction among two or more different disciplines. This interaction may range from simple communication of ideas to the mutual integration of organizing concepts, methodology, procedures, epistemology, terminology, data, and organization of research and education in a fairly large field" (Berger, 1972, p. 25). Paxson (1996) as well presents a taxonomy of degrees of interaction between disciplines according to the impact of one discipline on another. This includes: 1) taking notice with no engagement; 2) contact with another discipline with a modification to one; 3) shared engagement and insight concerning a general phenomena of shared interest; and 4) interaction that ranges from "sharing some key concepts all the way to the joining of two disciplines into one more comprehensive discipline" (p. 83). Similarly, Aboelela et al. (2007) notes how common understandings of interdisciplinarity concern "the degree of cooperation or interaction between members of the collaborative teams, the amount of contact between team members and the degree of sharing of information" (p. 338).

Integration. McDonald, Bammer, and Deane (2009) define integration as a synthesis of knowledge across disciplines and stakeholders in an attempt to understand a particular problem. Petts, Owens, and Bulkeley (2008) suggest that that interdisciplinarity is best understood as a continuum of integration, stating, "at its weakest, interdisciplinarity constitutes barely more than co-operation, while at its strongest, it lays

the foundations for a more transformative recasting of disciplines" (p. 597). Mansilla (2006), as well highlights the integration of disciplines stating that interdisciplinary research is:

> a form of inquiry that integrates knowledge and modes of thinking from two or more disciplines (eg history, physics) or established fields of study (eg ethics, law, the visual arts) to produce a cognitive or practical advancement (eg explain a phenomenon, create a product, develop a method, find a solution, raise a question) that would have been unlikely through single disciplinary means (p. 18-19).

Rossini and Porter (1979, 1981) identify four ways that interdisciplinary teams can achieve integration: 1) group learning through intensive group interaction; 2) modeling or creating a boundary object that individuals can contribute to and use; 3) negotiating across intellectual boundaries; and 4) leadership that facilitates and integrates interaction across the group to assimilate individual contributions.

Questioning. Lattuca (2001, 2003) argues that interdisciplinarity should not be assessed by the degree of integration realized, but rather the nature of the questions being asked. She offers a typology that includes informed disciplinarity (i.e., borrowing methods or reinterpreting concepts from other disciplines to answer a disciplinary based question), synthetic interdisciplinary (i.e., addressing questions located in either the intersection of, or gaps between disciplines), transdisciplinary (i.e., questions that are relevant across disciplines for example those related to general systems theory or sociobiology), and conceptual interdisciplinarity (i.e., questions that have no inherent disciplinary basis and can only be answered through multiple disciplines, such as cultural studies or postmodernist approaches). Although the typology is organized according to the types of questions asked, it nevertheless reflects varying degrees of interaction and integration.

Translation, interpretation, and invention. Holbrook (2012) offers an alternative to the widely accepted view of interdisciplinarity as integration, arguing that it presents a restricted view of communication, the foundation of interdisciplinarity activities. In his philosophical discussion of the subject, he offers two alternative understandings — interdisciplinarity as incommensurability, and interdisciplinarity as invention. Informed by Kuhn (2000) and MacIntyre (1988, 1990) he argues that disciplinary languages are unintelligible to those outside (i.e., incommensurable) and therefore the aim of interdisciplinarity is to gain access to knowledge and a disciplinary language that is inaccessible within one's field. Through interaction across disciplines, interdisciplinarity is achieved through translation and interpretation and the development of the ability to "talk-the-talk" of another discipline, not integration. Extending his argument to Bataille (1988) and Lyotard (1988) he posits that incommensurability is only revealed through communication failures. In such cases what matters is not the integration of disciplinary languages, but rather the invention of a new language that allows collaborators to productively move forward, what he calls the co-creation of "a new, shared genre of discourse" (p. 1878).

Dialogue and language. Dialogue and language are fundamental to interdisciplinary practice and the success of interdisciplinary collaboration requires a space for dialogue and time devoted to managing difference and creating common ground (Ôberg, 2009). Languages that are part of a disciplinary domains are complex systems of words, symbols, and meanings and are often intelligible across boundaries (Holbrook, 2012). Monteiro and Keating's (2009) ethnographic investigation of interdisciplinary team collaborative practices identified instances of "productive misunderstanding" they

describe as “productive sites for the identification of erroneous interpretations, illumination of unshared premises (which can then be mitigated) and development of shared understandings of what the common goals of the project are” (p. 25). Communication practices included questioning the nature and validity of knowledge, resolving partial understandings through negotiation, and translation and interpretation processes to enable understanding across different representational systems. They depict the sensemaking process as “registration” or the superimposing of one idea over another through “communication, translation, contextualization, managing, and establishing different sets of definitions and partial understandings” (p. 24).

Other aspects of language and dialogue including dialect and the use of metaphor also contribute to increased understanding across disciplines (Bracken & Oughton, 2006). Jeffrey (2003) finds various communicative tools and techniques such as storylines, metaphor, hybrid vocabularies, negotiation, and use of an intermediary to maintain the collaborative process, increase understanding, and integrate knowledge. Simile, analogy, and metaphor enable the integration of discipline specific terms to create a hybrid vocabulary. Factors that contribute to the development of a hybrid vocabulary include a small group size, an intermediary with expertise in multiple disciplines, focused working sessions, a willingness to listen, the collective development of a model, and a respect for the limits of understanding. Storylines as “generative narratives” (Hajer, 1996, p. 56) increased understanding of a problem and strengthened the discursive competence of members. The presence of an intermediary, viewed as credible and competent, helped to maintain the collaborative process, preserve relationships, and facilitate the development of a common vocabulary. Group members also identified negotiation as a prominent tool

used throughout the process. Noted in the study is that while negotiation was not always a productive way to search for agreement, it was beneficial in that it served to maintain contact among group members. McDonald et al. (2009) propose using various "techniques of dialogue" to achieve integration (p. 2). Using Franco's (2006) definition of dialogue—the use of conversation to "jointly create meaning and shared understanding" they identify various techniques divided into two categories (p. 814). Dialogue methods for understanding particular aspects of a problem with the goal of integrating judgments, and dialogue methods for understanding particular aspects of a problem with the goal of integrating differing visions, worldviews, interests and values. A sample of the various facilitative techniques they recommend include: citizens' jury, Delphi technique, nominal group technique, scenario planning, and appreciative inquiry. Similarly, Ôberg (2009) argues that surfacing tensions and creating awareness of the various challenges that derail interdisciplinary collaborations is key to success. She offers a framework comprised of five questions that deliberately surfaces areas of disagreement concerning perceptions of quality and credibility across of disciplines and facilitates the development of common understanding.

Communication competence. Thompson (2009) case study of an interdisciplinary academic team identified a number of key communication processes related to the development, maintenance, as well as deterioration of collective communication competence. Communication competence relates to the "numerous interrelationships among communicators, contexts, goals, and the participants' abilities to simultaneously be appropriate and effective" (p. 281). Findings show that trust, demonstrating presence, using humor and a positive tone when challenging others, and opportunities for backstage

and reflexive talk, engaging in shared learning and shared language use, helped to strengthen CCC. Communicative processes that weakened CCC included sarcasm, inattentiveness or displays of boredom, and being judgmental or challenging the expertise of others. This highlights the need for interdisciplinary teams to be thoughtful about communication process and negotiate communication norms before engaging in collaborative problem solving.

Clearly various aspects of communication play an important role in enacting interdisciplinary activities. Interaction is foundational, but not sufficient to achieve integration, which requires a variety of communication activities—questioning, translation, interpretation, the invention of new languages, dialogue, and collective communication competence. Communicative interventions are important as well, such as the use of facilitators and intermediaries. The use of communicative techniques like storylines, metaphors, hybrid vocabularies, and negotiation, are also noted as important to maintain collaborative processes, increase understanding, and integrate knowledge.

Chapter Two Summary and Conclusion

This chapter has articulated the many communication issues underlying much of the ferment about interdisciplinarity through the reconstruction of the communication and organizing logic of interdisciplinary practice (Aakhus & Bzdak, 2015). It identifies the exigence or situation at the societal level that motivates attention and the design of interventions to address the issue—that is to address complex issues or solve intractable problems (Bruhn, 2000). The communicative problem related to the exigence is the failure to bring people with different disciplinary strengths together in a coherent and productive manner to engage around complex issues and develop workable solutions. The

solutions discussed above include designing new administrative structures, building physical environments with shared space and resources, and developing new interdisciplinary routines and rituals grounded in various communication practices based on practical understandings of the way communication works or ought to work to achieve interdisciplinarity. Finally, the rationale underlying these solutions is that the problems are so complex that no single discipline can productively develop useful approaches to address the numerous 'wicked problems' confronting society.

Evident here is that there is no single grand theory, rather there are notable families of ideas about communication at play across the literature, each reflecting a particular view of what counts as a communication problem and what counts as a communication solution for achieving interdisciplinarity. Each is grounded in rationales that presuppose design theories about achieving one form and not some other form. Interdisciplinarity at its core is a communication practice that is accomplished through various forms of engagement—for example, the exploration of collaborative opportunities, the development of rapport with others, and the sustainment of collaborative activities. In offering this review, it helps define the terrain of thinking about interdisciplinarity at large, and how ideas about interdisciplinarity and its achievement come into play at the local site of the proposed study.

The following chapter outlines the theoretical and methodological framework, which informs the case study presented here. The framework is grounded in design and uses a practice lens to guide the investigation of an organization designed as an intervention into the given state of interdisciplinary practice at large research university. Practice theory (Nicolini, 2012), Communication as Design (Aakhus, 2007; Jackson &

Aakhus, 2014), and Grounded Practical Theory (Craig & Tracy, 1995, 2014) inform the methods and analytic approach as discussed in the following chapter.

CHAPTER THREE. THEORETICAL AND METHODOLOGICAL FRAMEWORK AND RESEARCH DESIGN

"So design knowledge is of and about the artificial world and how to contribute to the creation and maintenance of that world" (Cross, 2001, p. 54).

The literature reviewed in chapter two examines interdisciplinarity and highlights various ideas concerning the importance of communication for the achievement of interdisciplinary practice. Notable, however, is the limited attention given to communication as an object of design and the sometimes-unpredictable ways it unfolds in relation to the structuring of the physical, social, and administrative aspects of an organization. This dissertation addresses this gap by taking a *communication design stance* towards understanding the development of interdisciplinarity as a communication design practice.

The focal point of this investigation is an organization—a new research institute—designed to intervene into the given state of research practice at large research university to achieve a preferred form of interdisciplinary practice. The intervention privileges communication in distinct ways and structures the physical, social, and administrative aspects of the organization relative to its approach to communication, thus providing an important case for inquiry into how ideas about communication are realized in practice. Given the organization's explicit ideas about communication and beliefs concerning how the design of the physical and administrative structures, and the routines and rituals of practice would shape interdisciplinary practice, the investigation is guided

by an overarching question: *What are the assumptions about how communication works and ought to work to achieve interdisciplinarity at the research site*? Two research questions inform both data collection and analysis:

RQ1. How do formal rules/procedures (e.g., administrative), routines and rituals (e.g., everyday interaction), and the physical structure (e.g., architectural layout) enable and/or constrain the pursuit of interdisciplinarity?

RQ2. In what ways do members redesign interactivity to overcome challenges or realize new opportunities for interdisciplinarity?

In answering the above questions this dissertation advances our understanding of the communication design work underlying interdisciplinary practice, thus providing practical advice for practitioners as well as advancing communication theory. The following section presents the theoretical and methodological framework that informs the research approach taken here by first discussing designable nature of practices and how interdisciplinarity is productively understood as a communication design practice. This is followed by a discussion of two metatheoretical and methodological approaches, Communication as Design (CaD) (Aakhus, 2007; Jackson & Aakhus, 2014), and Grounded Practical Theory (GPT) (Craig & Tracy, 1995, 2014) used to develop the research design, data collection, and analysis.

Interdisciplinarity as a Communication Design Practice

A practice lens, informed by a family of theoretical approaches, views ordinary action as "bundles of practices and material arrangements" and takes these to be the starting point for understanding social phenomena (Nicolini, 2017, p. 21). A design stance views action similarly but highlights that practices and material arrangements are

designs with consequences for action and meaning. As Lyytinen (2004) explains, design should be understood "not as a singular technical activity but as a joint weaving of the tapestries of thinking, communication, and acting" (p. 226). Designing action involves empirical and normative matters of communication practice concurrently (Aakhus, 2007) and a communication design stance highlights the ways people organize and reorganize action by shaping or disciplining their communication practice and material arrangements. In this way interdisciplinarity is a sociomaterial practice that can be designed to discipline communication in particular ways to generate a particular quality of communicating, thinking, and acting through the structuring of the physical environment, administrative structures, or routines of a practice. And key to any practice is the design of communication because that is what connects meaning with action, thus is fundamental.

Generally a 'practice' consists of broad and coherent set of activities, "an organized constellation of actions" (Schatzki, 2002, p. 71) that is meaningful for members of a particular group and informs how they think, talk, and act (Craig, 2006; Nicolini, 2012; Reckwitz, 2002). This includes the use of objects and engagement with the material world through the body, as well as mental activities such as approaches to knowing the world, background knowledge (i.e., understanding), practical knowledge, emotion states, and motivations (Reckwitz, 2002; Schatzki, 2005). Within this constellation of "doings and sayings" (Schatzki, 2002) implicit meanings and norms are situated within the practices themselves, not the minds of its members (Taylor, 1971). The coherence of a practice comes about through a generally agreed upon ways of doing things, rules regarding what counts, what should, could or must be, and various desired

end states (Schatzki, 2012). However, as Nicolini (2009) makes clear all practices are provisional in that they "embody different interests and are hence internally fragmented, subject to multiple interpretations, and open to contradictions and tensions" (p. 1393). Practices generate complexity in that they unfold through time, concern multiple and at times competing goals, are materially constrained by various conditions that individuals must deal with, influenced by environmental factors, and shaped by previous practices and events that come to function as an interpretive resource for groups (Leonardi, 2015). Thus a practice is designable in the sense that it involves multiple actors working through, and working out their joint conduct through communication processes in an attempt to realize coherence. Important to understanding a practice is recognizing the empirical and normative assumptions at work, in that there different ideas concerning ways to organize and ways to do things, which includes ways of communicating.

A practice approach presents a way to interrogate the ways of doing things, the rules and various desired end states, as well as the spatial site of interdisciplinary practice, critical for understanding the 'space of intelligibility' in which members act. However, practice theory generally considers communication to be but one aspect and therefore does not give preeminence to discourse and language (Reckwitz, 2002). As Mumby (2011) argues nevertheless, "the discursive and material are inextricably entwined" (p. 1149) and "constituted in a dialectical relationship to each other" (Putnam, 2015, p. 706). In light of the case presented here and the organization's particular view of how to realize interdisciplinarity by enabling a particular quality of communication across disciplines through the structuring of the physical, social, and administrative aspects of an organization, there is a need to place communication to the forefront and

call attention to the practical theories about how communication works and ought to work to achieve interdisciplinarity.

To accomplish this goal, two metatheoretical and methodological approaches, Communication as Design (CaD) (Aakhus, 2007; Jackson & Aakhus, 2014), and Grounded Practical Theory (GPT) (Craig & Tracy, 1995, 2014), are used to develop the research design, data collection, and analysis. They are complementary theoretical stances toward communication, which get at the empirical and normative assumptions at work—GPT with its emphasis on reconstructing communication practice as it happens and CaD with its emphasis on designing/redesigning communication practices that people undertake. CaD focuses on *techné*, the practical art of making or crafting means of communication and GPT focuses on *praxis*, determining the kind of communication that is valuable (Craig & Tracy, 2014). Taken together, these approaches offer a way to examine and articulate the nature of communication and the structuring of interactivity with regard to interdisciplinary practice and the ways communication is disciplined through non-interactional arrangements (i.e., the physical environment, routines and rituals of practice, and administrative structures), which have consequences for language use and the achievement of interdisciplinarity. These approaches offer a productive way to articulate, critique, and ultimately inform interdisciplinary practice through the investigation of the communicative tensions and dilemmas that arise, as well as the premises that shape the communicative action of members of a practice (Aakhus, 2007; Craig & Tracy, 2014). What follows is a discussion of both CaD and GPT to advance the argument as to their value in the design of this research.

Communication as Design

This section explains the research approach taken here by discussing CaD and its underlying guiding principles, the reconstruction of communication design logics, the materiality of language and related contexts in which interaction unfolds, and the relationship between normativity and breakdowns in interaction and organizing.

CaD positions communication as the locus of "cooperative activity," and the way organizations (and practices) are accomplished (Winograd, 1987, p. 6). It is concerned with *techné*, the practical art of making or crafting means of communication (Craig & Tracy, 2014) and the aspects of practice in which groups attempt to shape the form and qualities of their communication. CaD provides a method to investigate the "consequences design features hold for the direction, content, and outcomes of interaction" (Aakhus, 2001, pp. 364-365) and organizing more broadly by attending to the communicative work practitioners engage in and the interventions they design to shape and discipline communication—they ways meaning, action, and coherence are co-produced (Aakhus, 2007; Aakhus & Jackson, 2005 ; Jackson & Aakhus, 2014). In taking a pragmatic view of organizing it is concerned with what people do, or attempt to do, through language and interaction as they endeavor to shape existing conditions into those deemed more suitable for their needs, values, or interests. A CaD stance recognizes that through the design and implementation of communicative procedures, rules, technologies, and infrastructures, a practice can be transformed (Aakhus, 2007; Aakhus & Jackson, 2005; Jackson & Aakhus, 2014). Thus, it advances a constitutive view of communication as organizing, grounded in principles of design, which call attention to the ways in which joint action is "materially mediated" and "organized around shared

practical understanding" (Schatzki, 2001). A number of fundamental principles about communication design articulated by Aakhus and colleagues are relevant for this research and outlined below (Aakhus, 2007; Jackson & Aakhus, 2014).

Principles of communication design. First, communication design is a natural activity in which individuals and collectives use the materials of language (e.g., the sequence of speaking turns, identity claims, and commitments to future action) to transform the situations they experience (Aakhus, 2007; Aakhus & Jackson, 2005). As they work out their problems through communication, including their problems of communicating, they use language to express thoughts and feelings, make propositions to achieve some effect, and invent protocols and interaction formats in an attempt to reshape situations and their standings within it (Aakhus, 2007; Jackson & Aakhus, 2014; O'Keefe, 1988). Second, communication design is hypothetical in that individuals and groups draw on personal understandings about explicit rules and tacit norms concerning the uses of language and the social interaction conventions considered effective and appropriate for a particular communicative context. Third, communication design is theoretical in that these hypotheses about the way that communication works or ought to work are tested in practice resulting in a body of practical knowledge based on "the accumulation of successful and unsuccessful designs" (Aakhus & Jackson, 2005, p. 412). Finally, communication design is context specific and outcomes are often unpredictable, highlighting a need for critique and reflection to understand intended and unintended consequences to advance a productive path forward (Jackson, 1998). As Harrison and Morrill (2004) note, "Uncovering discrepancies between the ideal and the real thus provides a mechanism for identifying ways to reengineer the system" (p. 322). Critique

and reflection enables practitioners to question assumptions concerning communication, propose hypotheses in the form of redesigned interventions, and further test these design in practice (Harrison, 2014).

Investigating the normative dimension of practice. Underlying all communicative interventions, including physical environments, administrative structures, and routines and rituals of practice, is a normative foundation made up ideas about how to shape and structure human experience. It is through engagement with these assumptions and the practical ideas about communication that one comes to understand the communication logics that shape organizing (Aakhus & Laureij, 2012). A design approach attends to what messages and communicative interventions "presuppose about communication," and the consequences of their use in practice (Aakhus, 2007). Communicative contexts, shaped by the routines, rituals, rules, administrative and physical structures influence the meanings people make, and actions they take (Aakhus, 2007; Aakhus & Jackson, 2005). CaD attends to the choices individuals and groups make concerning how they should communicate and the implementation of these choices to achieve individual and shared goals (Barbour, Gill, & Barge, 2018a).

Examples of research examining practitioners' ideas about how communication works or ought to work, revealed through analysis of the normative dimensions of practice and communication logics that underlie strategies and techniques for managing interactivity include various studies. Aakhus (1999) study of "Science Court," a communicative intervention designed to help experts and non-experts engage in policy deliberation. The study finds that the underlying premises, which inform the design of the intervention actually inhibits successful deliberation. The findings provide material for

reflection in the form of recommendations for thinking more intentionally about the design of deliberative processes and argues for designs that are derived more intentionally from the issues at hand and appropriate for the nature of the deliberative activity. The findings advise designers of deliberative activity to: a) recognize the existence of multiple goals, constraints, and outcomes related to any issue; b) show sensitivity to the social context, the needs of the group, and align activities accordingly to encourage adoption and discourage resistance; c) attend to the collective reasoning of the community by recognizing that standards for individual and group rationality can be different; and, d) understand the coordination of activities, for example how inquiry and decision making activities are linked. Similarly, Aakhus (2001) examines the normative dimension of facilitation practice to reveal an underlying philosophy of process management that influences how practitioners view the work they do, as well as how they do their work. Findings show how facilitators, in seeing their work as managing natural communication processes reveals their privileging of an information transmission view of communication and a lack of understanding of the constitutive nature of communication.

Individual and collective design. As Clark (1996) notes, "Language use is really a form of joint action . . . one that is carried out by an ensemble of people acting in coordination with each other" (p. 3). This joint action is a form of collective communication design, which encompasses an array of individual and collective contributions. Barbour, Gill, and Barge (2018a) theory of communicative intervention and collective communication design notes how nested within joint activities are individual choices about messages and the flow of interaction, which have implications for collective designs and the communication processes in groups and organizations.

Collective objects of design are reflected in the administrative structures of an organization in the form of institutional messages, interaction formats, policies, procedures, and bylaws that propose rules for joint action toward the achievement of the organization's objectives. Embedded within the routines and rituals of a practice are individual objects including messages and interaction procedures that are selected and performed in particular ways to achieve personal goals (Nicolini, 2012; O'Keefe, 1988; Reckwitz, 2002). Underlying both individual and collective communication design are logics or practical theories which link goals with preferred ways to achieve such goals. These logics represent beliefs about how organizations and institutions function and influence or define new behaviors, which are reflected in the routines and rituals characteristic of a practice (Barbour et al., 2018a).

Reconstructing communication design logics. In analyzing the activities and tools associated with a practice as well as members' talk about their work, the underlying design logic of a practice is revealed. Aakhus and Bzdak (2015) outline a method for reconstruction discussed below and used in chapter four to begin to outline the case. First in understanding any practice is to identify the "exigency," the problem to be addressed through new or different communicative interventions. An exigency functions as an organizing principle in that it creates a "rhetorical situation . . . a natural context of persons, events, objects, relations, and an exigence, which defines the audience and argues for a change in circumstance" (Bitzer, 1992, p. 4). Second, follows the identification of the communicative problem called out as a recurrent issue that requires resolution in light of the exigency. Third, is the analysis of the communicative interventions proposed as probable solutions, which reflect a particular standpoint taken.

Examples of communicative solutions might include rules for discourse (e.g., following an agenda), procedures for interaction (e.g., the order in which participants should speak), roles of participants (e.g., meeting chair), and technologies (e.g., meeting, seminar, telephone call, etc.). Fourth is an analysis of the rationale or justifications given for the interventions proposed, which are reflected in the implicit and explicit arguments for its legitimacy and effectiveness.

Reconstructing communicative practice also requires consideration of the various designable features of communication—the "materials" of language, discourse, and interactivity—consequential for communication design. Aakhus and Jackson (2005) outline "seven things" about language interaction relevant for this investigation including: 1) turn taking which structures interaction; 2) identity and face concerns which influences participation and social relations; 3) commitments to future actions which impacts the achievement of shared objections; 4) the expansion of speech acts which generates future actions; 5) repair in conversation which reveals how individuals manage understanding and sensemaking; 6) changes in design which impacts identities and relationships; and 7) conventional views about communication process, which reveals the normative dimension particular to a culture or practice.

Just as understanding the materials of language and interactivity is relevant for this research, so is the context in which interaction unfolds including the physical arrangement and material artifacts. Practices unfold in arrangements of interconnected material and immaterial entities or "spatial sites" such as buildings, institutions, and events, which enable and constrain each other resulting in distinct "spaces of intelligibility" for members (Schatzki, 2002, p. 117). In reflecting macro discourses

(Dean, Gill, & Barbour, 2016) a site provides a meaningful infrastructure for interaction that serves as an interpretive resource for sensemaking (Aakhus, 2007; Ashcraft, Kuhn, & Cooren, 2009; Barbour, Gill, & Barge, 2018a; Weick, 1995). Members of a practice make sense of these sites and associated material objects through direct engagement with its artifacts as well as through conversations with others (Leonardi, 2009). These material arrangements are contexts that have "powers of determination" for members of a practice in that "the objective spaces of the setting of action help determine how and which actions are performed" (Schatzki, 2005, p. 468).

Furthermore, the material artifacts of a site are rhetorical in that they "are vivid arguments" about how to act (Buchanan, 1985, p. 194). The design of an organization, building, event, is a persuasive conversation between a designer and audience where the goal is to convince others to take part in a particular reality or "adopt new ways and means to achieve objectives in their lives" (Buchanan, 1985, p. 8). A building for example, with its defining features—location, material form, and meaningfulness—makes arguments about how activities should unfold within its space (Fayard & Weeks, 2007; Gieryn, 2000), in that the principles and ideals of practice (i.e., interdisciplinarity) as well as logics concerning how communication works and ought to work (i.e., in the service of interdisciplinarity) are embedded within. These ideas are critical for understanding the nature of organizing at the research site of interest here given that the founders situate the physical structure at the center of interdisciplinary practice grounded in the belief it will enable interdisciplinary research practice. Thus, the design of the physical structure makes an argument about how communication works and ought to work to achieve these ends. As with any designed artifact including physical

arrangements, they nevertheless retain “interpretive flexibility” (Barley, 1986; Bijker, 1987; Bijker, Hughes, & Pinch, 1987; Orlikowski, 1992).

CaD research demonstrates how communicative interventions interact with material artifacts and the physical sites in which they are introduced in unpredictable ways, demonstrating the provisional nature of design (Barley, 1986; Bijker, 1987; Bijker, Hughes, & Pinch, 1987; Orlikowski, 1992). For example, Harrison et al. (2011) investigation of the implementation of an organ donation campaign across 46 organizations, finds that the physical site had no significant effects on changes in knowledge, conversation frequency, or peer influence concerning organ donation. Surprisingly however, they found a negative relationship between aspects of the physical structure and the signing of organ donation cards. In their investigation of participatory design processes, Thompson, Steier, and Ostrenko (2014) attend simultaneously to the process of designing a physical learning space and the related communicative work and interventions to facilitate participatory design activities. The authors note the importance of creating a welcoming environment by providing the appropriate material artifacts in the right type of environment in order for productive conversation, participation, and collaboration to unfold. Dean et al.’s (2016) examination of the intersection of professional roles, physical space, and communication in an academic medical center show how physician and nurse communication is shaped by the configuration of the physical environment, contributing to the reproduction of professional roles and expectations regarding communicative practices. What these studies reveal is that despite the intentions of designers, artifacts including buildings remain provisional and can be taken up as intended, resisted, rejected, or reify patterns of unfavorable behaviors. It is in

the responses to and uses of artifacts and material entities that designs are tested and the gap between what is and what should be reveal tensions and breakdowns in organizing processes (Aakhus, 2007; Harrison & Morrill, 2004; Jackson & Aakhus, 2014).

Tensions and breakdowns. CaD research investigating a variety of contexts and the ways in which communication designs are used in practice reveals hidden sources of tension or breakdowns in interaction processes in part due to the underlying rationales that shape communicative interventions. For example, Jacobs and Aakhus (2002) identify rationale models evident in the actions mediators take to manage competing demands in constructing dialogues among parties in conflict—critical discussion, bargaining, and therapeutic discussion—each enacted through particular types of communicative activity. The practice of dispute mediation from this vantage point privileges the performance of appropriate communicative models and skills over the achievement of a particular outcome. In a study of the dispute resolution process in a university context, Harrison and Morrill (2004) find that aspects of the process failed to realize its stated objectives because of the ways in which the social context and power imbalances interacted with the design features of the resolution process, thus hindering relational reconciliation. Aakhus and Rumsey (2010) find both taken-for-granted patterns of interaction and implicit community norms to be sources of tension in an online social support community. To resolve tensions members engage in collective design work—negotiating the meaning of social support and jointly shaping interactivity to enact supportive communication. Barbour and Gill's (2014) examination of status meetings designed to provide safety oversight for nuclear power plants reveals tensions arising from multiple conflicting situated ideals and competing ideas about how status meetings should work. In their case,

the effectiveness of status meetings was contingent on the fit, function, and fragmentation of communicative techniques. Dysfunction was prevalent when proposed solutions did not fit or adequately address communicative problems, did not function because of participants' failure to enact the technique, or were fragmented in that competing ideas about the technique results in inconsistent uses in practice.

When tensions or contradictions between competing or contradictory logics and goals arise, some groups attempt to redesign interactivity through the negotiation of possible resolutions and the invention of designs for shaping interactivity deemed more suitable (Barbour & Manly, 2016). Communication can be redesigned at multiple levels, for example listening instead of speaking at the individual level, or reconfiguring a dispute resolution process at the collective level (Harrison & Morrill, 2004). The analysis of communication practice from this perspective considers the multiple elements of design including content, the order and structure of interactions, as well as the broader context and individuals involved (Harrison, 2014).

To conclude this section, a design stance offers a distinct way for knowing the world (Cross, 2001) that recognizes the dynamic nature of organizing in which order (and often disorder) comes about through day-to-day interactions. That is, designing for interdisciplinarity is best understood as iterative process, grounded in communication design activities that enable the ongoing enactment of a practice. Consistent with the view that communication generates, not merely expresses, key organizational realities" (Ashcraft, Kuhn, & Cooren, 2009, p. 2), a CaD perspective intentionally draws forth the various ways individuals generate these realities through the invention and redesign of messages, interaction architectures, and communicative moments and flows (Barbour et

al., 2018a). It is fundamentally concerned with the ways in which actors shape their environment and practices through communication design, thus highlighting the constitutivity of communication and revealing how organizing in general and interdisciplinarity in this case is in essence a communication design practice (Aakhus & Laureij, 2012).

Grounded Practical Theory

The underlying principle of GPT is that communication is a practical discipline and the goal of communication studies "is to cultivate the practice of communication" (Craig, 2015, p. 704). GPT addresses *praxis*, determining the kind of communication that is deemed valuable (Craig & Tracy, 2014) revealed in the ways practitioners work out and share an understanding of good communication. The approach attends to how groups frame what counts as a legitimate communication problem, the appropriate communicative techniques for managing the problem, and philosophical rationales developed to justify the uses of the techniques to solve the problem. It provides an inductive method for constructing normative theory in order to provide material for reflection to "generate new possibilities for action" (Barge & Craig, 2009, p. 55).

GPT outlines a method for the reconstruction of practice, which involves the description and critique of: communication problems practitioners experience, the strategies and techniques they devise to deal with these problems, and the underlying principles and ideals that shape attempts to manage interactional dilemmas (Craig & Tracy, 1995, 2014). GPT inspired research has demonstrated how "situated ideals," which are "the beliefs, usually somewhat inchoate and often contested, that participants hold about how they ought to act within a practice" are revealed through the critiques of

other's conduct (Craig & Tracy, 2014, p. 232). For example, Black and Wiederhold (2014) analysis of public dialogue groups finds that situated ideals, ideas concerning proper conduct for civil disagreement, were linked to interaction roles—facilitator versus participant—and this shaped how individuals defined the problem and the strategies employed to address the problem. Koenig, Wingard, Sabee, Olsher, and Vandergriff (2014) examined tensions between doctors and diabetes patients showing various interactional techniques were used to uphold the principle of interactional sensitivity. Similarly, in the context of cross-cultural health-care communication Bloom (2014) demonstrates how individuals develop various communicative strategies in response to language barriers revealing competing situated ideals—wanting to build rapport, but also gather information—across individuals with differences in dialect and language proficiency.

In that a goal of the research undertaken here is to provide practical and useful insight for the participants in this study and for interdisciplinary practitioners more generally, GPT provides an approach to highlight the ways that ideas concerning communicators' ideals influence the ways things are viewed and acted upon. This includes the evaluation of conduct in action (i.e. what it means to perform well, what is good communication) as well as officially espoused ideals and general principles that form rationales for how problems are to be approached and resolved (Craig, 2006; Craig & Tracy, 1995). These principles, ideals, and values of individuals, groups, and organizations are evident in the material aspects of communication such as messages and interaction episodes, techniques to facilitate engagement, as well as architectures for interaction (Aakhus, 2015; Barbour et al., 2018a; Craig, 2006). From this vantage point,

the investigation of the challenges groups experience in managing problems of interaction and meaning are both a theoretical and practical concern in which normative theory ultimately provides the material for reflection and insight into the dilemmas, tensions, and paradoxes of practice (Putnam, 1986; Putnam, Fairhurst, & Banghart, 2016).

Chapter Summary and Conclusion

The perspective advanced by the theoretical framework discussed above is that organizations, language, and interaction episodes embody ideas and values regarding what can and/or should be accomplished through communication (Aakhus, 2007). The objective here therefore is to examine the practice of interdisciplinarity and practical theories about communication by articulating the various ways communicative problems are defined, the ways communicative solutions are identified as viable means to achieve interdisciplinarity, and the ways interdisciplinary communication is idealized in justifying what counts as a problem and solution. Once articulated, it becomes possible to identify the practical theories of communication design at work and how these afford or constrain the achievement of interdisciplinarity. In a context populated by members of multiple disciplines as designers of action, difference can turn into dispute and resistance into stalemate. These standpoints, CaD and GPT offer a productive way to articulate, critique, and ultimately inform practice through the investigation of the communicative tensions and dilemmas that arise, as well as the premises that shape the communicative action of members of a practice (Aakhus, 2007; Craig & Tracy, 2014). Each offers principles and models that inform the development of the research questions posed and shape the methods of enquiry. In doing so, this case demonstrates how there is an important layer to

practice often left unexamined, that is the metacommunication or discourse about it that requires reflection and management. The following section presents the research design and methods used in this dissertation.

Methods

Nicolini (2009, 2012, 2017) proposes using a tool-kit approach, noting how the reconstruction and understanding of a practice requires the use of multiple theoretical lenses that enable 'zooming in' to investigate relevant situated discursive and material aspects of practice, and 'zooming out' by following "connections in action" to understand macro phenomena and the relationship to the local (p. 1392). This toolkit-logic reflects the complex multiply determined nature of organizing and allows for the reconstruction of practices at the research site understood to be a nexus of communication design activities. It enables the surfacing of the various interactional dilemmas that arise in relation to the organization's physical and administrative structures and the routines and rituals of practice to provide understanding of the generation of interdisciplinary commitments or the lack there of (Aakhus & Jackson, 2005).

Consistent with a tool kit approach, this research is a single case study that uses qualitative field methods for data collection including observations, informal conversations, and interviews, as well as document and artifact analysis to investigate the research questions posed. Case studies are best suited to examine real-world situations that exist within particular context that is both dynamic and complex, and is most appropriate for the examination of situations where the researcher has no control over behavior and events (Yin, 2014). The case study method aligns with an interpretive paradigm and enables a deeper understanding of a context through the development of

detailed descriptions and/or explanations of real world phenomena that consider the particular setting and the associated meanings this has for members. The method is useful for both developing practical insight for as well as building theory (Eisenhardt, 1989). In taking a design stance, the case study method attends to the constitutive nature of organizing in examining how the ideas and principles of practice (i.e., interdisciplinarity) are turned into physical, administrative, and social structures and how these are embraced or resisted in various ways generating new conditions that must be worked out through communication.

The position taken here is that interdisciplinarity is productively understood as a communication design practice in which the various ideas about how communication works or ought to work, and the communicative processes and the products of such, constitute organizing in an attempt to realize interdisciplinarity. With this in mind the research is guided by an overarching question that attends to both the descriptive and normative dimensions of the case: *What are the assumptions about how communication works and ought to work to achieve interdisciplinarity at the research site?* The following two research questions guide the data collection and analysis:

RQ1. How do formal rules/procedures (e.g., administrative), routines and rituals (e.g., everyday interaction), and the physical structure (e.g., architectural layout) enable and/or constrain the pursuit of interdisciplinarity?

RQ2. In what ways do members redesign interactivity to overcome challenges or realize new opportunities for interdisciplinarity?

Introduction to the Case Study

This case study centers on the investigation of a newly formed enterprise designed

to facilitate interdisciplinarity around three areas, food, nutrition, and health at a large research university. The opportunity to study this organization arose in a serendipitous manner, as in a chance meeting with the director and a conversation about his organization we found a mutual interest in each other's work. He was interested in having someone research the newly formed organization and my interests aligned with studying loosely organized groups and organizations. I was invited to be a researcher in residence, meaning that I would be given access and a workstation at the institute where I could conduct my research. My first visit to the institute was in March 2016 but I was not ready to begin my dissertation work. Later, I made two preliminary visits to the organization, one with my advisor where the director gave us a tour of the facility and spoke the general aims of the institute. In May 2017, I began to regularly visit the organization as I observed and took field notes, collected various public documents, contemplated my research questions, and wrote my proposal. My behaviors were consistent with other institute members—I worked at my desk, used the kitchen, ate lunch alone or with others, and engaged in informal conversations with members at the research site. What stood out for me in these early visits was how the director spoke of the organizing and communication principles that informed the design of the building, the manner in which practices were predicted to unfold, and the emergent quality of the interdisciplinary outcomes desired. For example how the elimination of offices would contribute to a reduction in hierarchy, and how the open office plan and shared laboratories would lead to new ways of working and collaborating. However, in contrast some residents expressed frustration with working in the research commons and talked about tensions arising from noise, interruptions, or others' behaviors they found inappropriate or

annoying. These early observations informed my research proposal and research questions presented previously.

Research Context

The following gives a brief summary of the research context, with a more complete account of the organization presented in chapter four. The subject of the case is relatively new interdisciplinary institute embedded within a large university. The idea for the institute was formalized in 2008, primarily in name only, the university broke ground for a new building in August, 2013, and officially opened its doors in October 2015.

The institute's stated goal is to bring together faculty, staff, and students from across the university, as well as partners and donors from the broader community in support of a broad health-centered mission centered on addressing the obesity epidemic within the state. It also has a long-term goal to become a model for how to address problems related to food, nutrition and health across the nation. The institute is organized around four "centers of excellence," which involve university members from various departments including food science, nutrition, exercise science and sport studies, agriculture, and health sciences research. The institute's four centers are organized around childhood nutrition education and research, digestive health, health and human performance, and lipids research. Other activities of its members include a number of cross-disciplinary thematic programs—culinary health and wellness, food systems and agriculture, microbiome in human nutrition and health, a state-focused healthy kids initiative, and a student ambassador program.

A key part of the institutes organizing strategy is its physical environment, a three-story, 80,000 gross square-foot building. The primary entrance to the building

opens to a public dining venue and open space eating area with seating for approximately 120 people. This area provides a social environment for building residents, university members, and the public at large. On the same floor there is also a health center that serves the student population, a large seminar room that seats 140 people, and one of the four primary research centers focused on exercise science. On the floor below there are two other centers—one configured as a wet research laboratory with approximately twelve bench seats and the other a learning environment and laboratory focused on child health. On the third floor, where most of the activities that are of interest in this study occur, is the research commons, which includes an open office space with workstations (desks) and a variety of group work spaces, for 100 people including 70 workstations for faculty and staff, and 30 carrels for students. Within this space are various informal and formal gathering spaces including a kitchen and communal eating area, and huddle spaces for informal interaction, and four meeting rooms of various configurations for more private interactions. Connected to the research commons is a shared wet laboratory with 48 bench seats. Just outside of the research commons is a boardroom that seats 25 people and can be converted into a special events dining room and a seminar space with classroom style seating for 70 people. A central staircase flanked by a three-story living wall connects all three floors. The physical environment is discussed in greater detail throughout the case when it pertains to the research questions and is called out by institute members. A detailed examination of the case including the founders' hypotheses and practical theories about how communication works and ought to work in organizing for interdisciplinarity forms the basis of chapter four.

Study Participants

Participants include the founders of the enterprise, in-residence and non-resident members of the institute, and associates of the research site. In-residence members have a workstation in the research commons and/or bench space in one of the laboratories. Institute membership is available to faculty and staff of the university who "who subscribe to the vision, mission and core values of the institute" (Institute website, 2018). Other membership categories include visiting scholar or visiting scientist for non-university individuals approved by a center director, student ambassador for university members approved by the program director, and member-at-large granted to individuals who do not fit with the other membership categories but whose work would make a significant contribution to the institute, as determined by the director. Members are expected to align with and be an active participant in one or more of the centers or thematic programs discussed previously.

As a researcher in residence I was a participant observer and engaged with other members through formal and informal interactions. When I began my field research there were 100 university-wide members listed on the website. Of that number, approximately fifteen were residents in the building. Additional building residents included postdocs, research staff, and students. Approximately 65 faculty, research staff, and students were using the 60 available bench seats in the wet laboratories and had workstations (desks) in the research commons.

Data Collection

In order to address the research questions posed, I engaged in data collection consistent with CaD and GPT as discussed previously. Data collection spanned 11

months with a total of 114 site visits, resulting in 225 hours of time spent at the research site. This resulted in approximately 167 double-spaced pages of field notes. See table 3.1 below for a summary of the qualitative fieldwork. Data collection centered on observing, asking and listening to members as they engaged in regular activities in the site, with attention to their experience of the formal rules and procedures, the routines and rituals of practice, as well as the site as a physical structure. When permitted, I attend a number of semi-structured and structured meetings. As a participant observer, not all visits were formal observations—many times I worked in the space, engaged in social conversation, and ate lunch with members to understand the experience of being a member of the institute.

Table 3.1 Fieldwork Data

Months of field work	11
Number of site visits (approximately)	114
Hours at the site (approximately)	227
Pages of typed field notes (double spaced)	167
Minutes of interview data	1193 (19+ hours)
Pages of interview transcripts (single space)	441
Minutes of focus group data	66 (1+ hour)
Pages of focus group data (single space)	35
Documents collected	114

Semi-structured Interviews

A total of thirty-four individuals were asked to participate in a semi-structured interview—four did not respond to my request, resulting in 30 completed interviews. Participants were identified through initial observations, discussions with the institute leadership, or recommended by other members. Interviews were audio recorded with the exception of one participant who declined to be recorded, and another who asked not to be recorded for portions of the interview. See appendix A for the interview protocol.

The goal was to obtain a cross-section of role types to capture a comprehensive picture of the initial vision for the institute and the nature of organizing and practice to address the research questions posed. Interviews with founders, early funders, and designers (8) were conducted to understand the vision, mission, and goals of the organization and the achievement of such through organization design. Interviews with leadership support members (4) were conducted to understand the day-to-day complexities related to organizing, supporting members and the nature of formal rules and procedures. Interviews with center directors (3) were conducted to understand the relationship between centers and the institute and the ways in which the institute enabled and/or constrained their efforts; Interviews with laboratory research members and residents (4) were conducted to understand the day-to-day realities of working in the laboratories and the research commons and the ways in which their pursuit of interdisciplinarity was enabled and/or constrained. Interviews with program leaders (4) were conducted to understand the relationship between programs and the institute and related complexities, and their experiences working in the research commons. Interviews with non-resident members were also conducted to understand how their membership experience differed from resident members. Finally, one interview was conducted with the manager of the dining venue to understand how this aspect of the institute contributed to the achievement interdisciplinarity. Importantly, each interview with a resident member informed my understanding of the experience of working in the institute, and the ways in which interdisciplinary activities were enabled and/or constrained by the physical structure, administrative structure, or routines and rituals of practice. A table of the interview participants and their roles is offered below.

Table 3.2 Interview Participants

Role	Focus
University President	Initial vision for the enterprise
Executive Dean	Initial vision for the enterprise, executive oversight
Philanthropic Agency Member	Early funding partner and supporter of the vision
Philanthropic Agency Member	Early funding partner and supporter of the vision
Architect	Facility designer
Architect	Facility designer
University Architect	Facility designer
Founding director	Initial vision for the enterprise, day-to-day oversight
Administration and Finance director	Member, Leadership support
Business Specialist	Member, Leadership support
Executive Assistant	Member, Leadership support
Clinical practitioner	Member, Leadership support and clinical practice
Communication specialist	Marketing and communication
Manager	Member, dining services
Center director 1	Member, oversees center
Center director 2	Member, oversees center
Center director 3	Member, oversees center
Center program director	Member, runs a center program
Program leader 1	Member, oversees center
Program leader 2	Member, oversees center
Program leader 3	Member, oversees center
Program leader 4	Member, oversees center
Program associate	Assists with a thematic program
Faculty Principal Investigator 1	Member, wet lab research
Faculty Principal Investigator 2	Member, wet lab research
Research Associate 1	Member, Wet lab research
Research Associate 2	Wet lab research
Non-resident faculty 1	Member, non-resident
Non-resident faculty 2	Member, non-resident
Non-resident faculty 3	Member, non-resident

Observations

General observations focused on residents' typical activities primarily in the research commons. For example, activities included, working at their desk, walking

through the space, interacting with others, conversing in the kitchen area in the research commons, entering and exiting the wet laboratory, using enclosed meeting rooms either alone or with others, or entering and exiting the research commons. Observations of activities in the space were mostly mundane but in the end provided insight into the nature of informal interaction in the space. Overtime, I began to search for critical incidents or asked myself, "what is new here today" to guide my observations but this mostly failed to reveal anything significant.

I also made efforts to engage in activities as a resident, for example attending the holiday social event and eating meals with other residents. Many of my observations were conducted during lunchtime, when I ate and socialized with others. I also conducted observations of the physical space, the arrangement of furniture and meeting rooms, noted aesthetic qualities such as color and light, and attended to audible noise. Field notes were recorded either by pen and paper or through word processing, depending on the situation at hand.

Meeting observations. I attempted to build rapport with members by engaging in small-talk or asking about their work. Of those with whom I developed a personable relationship, I asked if I could attend any meetings they were holding. This was not particularly fruitful but I had the opportunity to attend and observe a total of 12 formal meetings, of various types ranging from a 15-minute semi-structured round table meeting with the leadership support team, to a day-long workshop to develop a new research program. Although this number fell far short of my original research goal, the diversity in meeting types gave me a broad perspective of the ways members of the institute use meetings to interact and organize. Meetings were always documented in field notes

because audio recording was not permitted.

Table 3.3 Meetings Attended

Meeting Type	Participants
Round table meeting	Leadership support team
Annual review and leadership dinner	Senior leadership members
Town hall meeting	All institute residents
New program dinner	Institute members and external partners
New program workshop	Institute members and external partners
Managing space and organizing	Leadership and select members
Regular program meeting	Program director and team members
Meetings with director	Director and myself
Meetings with finance director	Director and myself
Conference call with university considering building an interdisciplinary institute	Director, myself, and representatives from other university
Topic seminar	Individuals from institute, centers, university, and community
Topic seminar	Individuals from institute, centers, university, and community

Focus Group

A single focus group was conducted with a population of in-residence graduate and undergraduate students. This group was deemed important to study in that one of their roles is to act as a liaison between the institute and the broader community. During public events these student residents facilitate activities and provide guided tours of the facility for visitors and potential donors, therefore they have broad knowledge about the institute, its various centers, and related activities. The sixty-six minute focus group with ten members of the student ambassador program resulted in thirty-five, single-spaced pages. The focus group was conducted in the formal boardroom at the institute, requiring permission to gain access. See appendix B for the focus group protocol.

Document and Artifact Analysis

Document analysis entailed the collection of both public and private, current and historical documents concerning governance, organizing, events, and published outcomes. The institute's website provides a key source of information related to membership, organizational structure, vision, and news. The types of documents collected included the original grant for early funding, internal memos, flyers, posted signs, presentations, news articles, and public photographs for example. In addition, extensive observations were made of the physical environment, which were documented in notes, sketches, and photographs. The document types are presented in table 3.4 below. This data served to provide context and greater understanding for the overall case. Those documents that directly related to the research questions were analyzed further.

Table 3.4 Sample of Documents and Artifacts

Document Type	Description
Emails	Approximately 25 that relate to matters concerning the institute
Event announcements	7 flyers announcing institute related events
External blog posting	Director's discussion of the newly formed institute
Industry news articles	8 articles about various aspects of the institute
Institute or center news articles	30+ articles about the institute, members, their activities, or events
Institute and university website	14 documents (e.g., membership, organizing structure, leadership team, message from the director, etc.)
Internal Documents (9)	Grant proposal, space and communication survey, room booking procedures, PowerPoint presentations (2), meeting agendas (town hall, annual review meeting), concept document, building look-book, new position announcement, building tour transcript
Popular press news articles or press release	9 articles about various aspects of the

	institute
Publically available photographs	25 images of the institute interior, exterior, and events
Twitter postings	A total of 129 original tweets or retweets from March 2017 through September 2017
University documents	Strategic planning document
University president emeritus	Book chapter, public speech
Videos	10 videos (e.g., architectural firm, institute promotional video, center videos, etc.)

Data Analysis

The reconstruction of the case presented here proceeded through four phases of data analysis guided by the research questions posed and analytic categories derived from the premises advanced by CaD and GPT. My interest was to capture different levels—individual, group, and organizational level—therefore analysis proceeded in phases. Using qualitative data analysis software Atlas Ti—field notes, interview transcripts, and documents the data were reduced and subsequently analyzed. Reduced data were exported to a spreadsheet for more detailed analysis.

Phase one—Data reduction. Being that I collected copious amounts of data, the first task was to reduce the data. I made the decision to begin analysis by coding all the interview data and a selection of documents and observations based on critical themes that had emerged during interviews. My first pass consisted of reading and briefly commenting on the data I had selected. In this first round of coding I categorized units of text according to the research question they addressed—founders' vision for the organization, formal rules/procedures, routines and rituals, and the physical environment.

Phase two—The founders' vision. I first analyzed the data concerning the original vision for the organization and the various ideas articulated in interviews and documents

(e.g., grant proposal, articles, internal documents) concerning communication and its relationship to the achievement of interdisciplinarity. I was particularly interested in the ways in which the administrative and physical structure presented arguments for a particular view of achieving interdisciplinarity grounded in practical theories about communication. Using the analytic categories outlined by Aakhus and Bzdak (2015), the data was organized according to the exigency, communicative problem, communicative solution, and rationale, discussed in detail in above. A second round of open coding was conducted to understand themes emerging in the data resulting 130 units of text. To create a more coherent understanding of the data a number of themes were collapsed resulting in the 14 codes and definitions below. Some codes were eliminated because they did not represent a pattern in the data in that they were mentioned infrequently.

Table 3.5 Phase Two Qualitative Codes: Founders' Vision of Interdisciplinary Research Practice

Analytic Code	Definition/explanation	Example
Activity/energy	Human action; a state of activity	Silence can be deafening so, you know, having some feeling of people—the biophilia thing where folks are, you know, get the sense of – it's the Starbucks phenomena; "I feel like that floor level floor doesn't have the same level of intensity that I would've liked to have had there. So it doesn't feel—it loses its energy when you go down to it"
Aesthetics	Sensory experience of natural and artificial environments and artifacts	So, here's another issue that we try to do in these buildings is try to maximize your use of all of your senses. You can smell the wall. You know, you can hear the food. You can smell the food. You can feel the warmth of the sun. You see the clouds versus the sun at different times of the day. Your senses are always invigorated so that you're always feeling a sense of rejuvenation that you get by

		having those things changing, not letting them be constant.
Arrangement of space	The positioning of artifacts and placement of activities in the building	. . . this creates a tension—between what you are trying to define, because right now you have to realize aisles and stairs and everything else, the traditional thought is to make them as small and as efficient as possible. So, you hit the staircase you are in it, you are out. You are in a court or, you get from point A to point B.
Bringing people together	Joining individuals into a collective arrangement to share in a common purpose and/or activity	The [institute] draws on the strengths of the entire university as it physically co-locates and strategically aligns the diverse competencies and deep capacity of [the university] to address society's major unmet health problems.
Bringing the outside in	Attracting individuals from outside the organization to share in a common purpose and/or activity	And so being at the periphery of the campus relative to outreach was actually an important thing to have parking right nearby. So like, you know, in a lot of places, in a lot of buildings we do, we have a lot of industry partners and their time is valuable. They want to come – they're fundamentally contributing their, I mean, they have an interest in it but they're also contributing mentally where they're not financially. But they got limited time and they want to be able to get in there and interact and, you know, hightail it out, right.
Changing work practices	Redesigning the way people work	Okay, so your desk doesn't have to be next to the lab. Your desk. It could be on the second-floor office. If the only thing you're doing is looking at the computer. "Well, yeah, but I need to be lab." Okay, we will go through the cycle again until finally somebody realizes that they don't have to be sitting next to the lab to do this.
Circulation	The movement of people throughout the physical space	What can you provide in the path of travel that doesn't mean someone has to go out of their way, but it's a naturally occurring path that there might be a team space?
Culture	A degree of shared	We learned that culture is a really

	reality and behaviors grounded in the institute's core values—academic interdisciplinarity, community responsibility, and collective success—in support of the organizational mission	important design element. That was our light bulb moment, when we realized that we were trying to design a building that creates a certain kind of culture.
Generating Energy	Creating a sense of vibrancy that contributes to physical or mental activity	I don't know if you know the concept of Brownian motion, which is in chemistry where things in a solution or in a gas are moving around and then they bump into each other. And the more they bump into each other, the more energy there is. So, there's more Brownian motion the more energy is put in, more heat.
Hierarchy	The organization of people in which some are ranked above others according to role, status or authority	We're going to eliminate private offices because, we like many organizations in the country, have flatter or horizontal organizational hierarchy now, less vertical, and if the bosses can do it we can do it.
Membership	The state of being connected to the institute	Membership in the [institute] is open to the faculty and staff of [the university] who subscribe to the vision, mission and core values of the institute.
Organization Design	Strategy, structure, and infrastructure created in a manner to enable the institute to realize its objectives	Another important aspect of the new building is the principle of self-assembly, meaning that the institute will learn, evolve, and grow organically—similar to a neural network—in contrast to a more traditional approach driven by existent policies and processes.
Proximity	Two or more individuals being in the same location, creating an opportunity for communication	Generally, if people are more than 50 or 75 feet away from each other, the possibilities of them having conversations drops off precipitously.
Transparency	Vision unobstructed by materials	One thing we learned is that more transparency is better than limited transparency. When there is an abundance of transparency, no single place in the building becomes a fishbowl.

Visibility	Being able to see something or be seen; unimpeded visibility	And that the notion of spawning interaction, and casual collision, and collaboration can be derived from people that interact. Visual access, perceptual access, transparency…There's a seen or be seen aspect to collaboration in our view.

Phase three—The physical structure and routines and rituals of practice.

Whereas phase two focused on the founders ideas for the institute, data analysis in phase three focused on the ways in which the physical environment had been taken up by members of the institute and the ways it interacted with their routines and rituals of practice. I identified 360 units of meaningful text related to the physical structure, primarily from the interview data. To begin to answer my research question, I was concerned with the ways in which the physical structure enabled and constrained the achievement of interdisciplinarity for members. Using the categories identified during phase two and listed and defined in table 3.5 above, the interview data was analyzed and the findings are reported in chapter five. Additionally, I used open coding to identify any tensions cited by interview participants, paying specific attention to dilemmas related to the physical environment. I coded meaningful units of data according to the following: The topic, what is called out in the data; the proposition or claim, what is the stance taken; evidence, the reason or support given for the claim; and unspoken assumptions. Additionally I relied the seven principles of language and interaction (Aakhus & Jackson, 2005) as a heuristic device to enrich my understanding of the dilemmas research participants experienced. A number of themes were collapsed resulting in the 14 categories below. Some codes were eliminated because they did not represent a coherent pattern in the data or were mentioned infrequently.

Table 3.6 Phase Three Qualitative Codes: Members' Reactions to the Physical Environment

Analytic Code	Definition/explanation	Example
Access	The ability, right, or permission to enter	It's also like, super uncomfortable when you're inside, and someone's waiting to get swiped in. Because like, you can see them standing there, and you can see them struggling, and you can see that they have no idea if they're supposed to be – there's a phone over there, so are you supposed to call someone? Are you supposed to wait for someone to come get you?
Aesthetics	Sensory experience of natural and artificial environments and artifacts	The building itself is gorgeous. So I feel really happy to be here just because it's a nice setting. And I think that that can lift spirits in a workplace. It's a beautiful, brand new building. So that's a benefit as well.
Arrangement of Space	The positioning of artifacts and placement of activities in the building	With all the glass walls, which are very pretty, that's all wasted space where normally you'd have–we could have laboratory benches and more storage space.
Availability of Space	Having sufficient space to do work	There's not that much lab space. I know they're talking about like sticking in all of these additional people. I don't know where they're going to put them. I can see room for one more person.
Awareness of Others	Being cognizant of or knowing other members and/or their activities	I think as a group of people in the offices working together, it still kind of needs some work, in my opinion. It was really, really hard to navigate who was who, what department is what, what do the colors of the pod mean, who's in the conference rooms?
Circulation	The movement of people throughout the physical space	And people move around a lot – and not being able to navigate how to walk around, because there are certain areas that you can cut through and get to the other side, but some places you can't. And I see people trying a lot in the wrong places.
Collaboration	Working with another to	I think it's been easier to do some

	produce something	things with them because we have the facility to pull it off, but a lot of these collaborations sort of existed, but I've been here for a while. A lot of these, if I didn't have these collaborations before this ever existed, I never would have survived. So, it's kinda hard to say what did the institute create versus I look at more what did the institute enable.
Disruption	Disturbance that interrupt an event, activity, or process	Even for other conversations over the phone, personally I feel like I'm going to disturb my neighbors if I talk over the phone for a long time so I always try to go to the meeting rooms to do that. I don't know what other people's practices are but like someone called me and say, "Hey, hang on. I'll just call you back." I'll just go into a room. And I find I do this because I want to be considerate to my neighbors but in some ways a little bit inconvenient.
Identity	Distinguishing characteristic of an individual or artifact	But I think the fact that it's this equal playing ground, and we all sit in the same area, and we all dress, and look, and talk the same way. I think it takes away from the fact that there are differences in who we are and in what we do.
Interaction	Two or more individuals engaged in communication	And so, it actually wound up being more social when you put everybody together that was in the same work environment because those were the people they needed to interact with, and it's not always just work, but at the same time, this is a workplace, so I'm not overly bummed that there's not more social interaction.
Noise	Sound that causes a disturbance	I think it's just the lack of having that noise privacy that I don't know how many problems it actually caused. I'm okay with it but it doesn't affect me on a day-to-day. I think that's the only issue I've possibly run into.
Privacy	Shielded from being observed, being overheard, or disturbed	I mean, there's so many private conversations the Director has, where the door needs to be closed because

	by others	they're working on strategy. They're working on changing things. They're working on personnel issues. How does one do that in an open space? There is no open office when you are a manager. You have to deal with some of the more difficult things that should be done behind closed doors.
Proximity	Two or more individuals being in the same location, creating an opportunity for communication	I think there should be a sense of trying to co-locate the faculty's group as close to the faculty member because that's their primary responsibility, and then facilitate other ways that people can get together, or who their edge partners are, and things like that.
Visibility	Being able to see something or be seen; unimpeded visibility	I think the environment makes it – well, it's kind of a two-edged sword, isn't it. Since it's an open office space, people can pretty much see from anywhere on the floor whether or not you're at your desk or not. In that sense, it's nice because they can immediately come down and ask a question that is on their mind. So, it's good on their aspect.

Phase four: Communication design and redesign. Phase four takes a different approach to data analysis in that it focuses on a single meeting and example of communication design, where institute members attempt to work out a dilemma that arises with regard to the physical structure and the routines and rituals of practice. For this I rely on observational data and notes taken during the meeting and use analytic categories derived from GPT. I reconstruct this communicative intervention by examining three interrelated levels that characterize the meeting—the problem, the techniques, and the situated ideals that characterize the meeting to better understand a typical interactional dilemma, the repertoire of strategies and techniques for addressing the dilemma, and the reasoned principles that inform and govern the use of proposed

strategies and techniques. This instance of communication design reveals the provisional nature of interdisciplinary practice in this case evidenced by tensions that emerge around competing ideas about communication and organizing to achieve interdisciplinarity. The findings from this analysis are presented and discussed in chapter six.

Chapter Three Summary

Taking a 'design stance,' and using a practice lens to guide qualitative data collection and analysis allows for the 'zooming out' on arrangements of individual joint action constituted through language, activities, and the use of artifacts as well as 'zooming in' on an important aspect of practice concerning the achievement of interdisciplinary as a form of communication design practice and the working out of differences arising from the nature of the physical and administrative structure, and the routines and rituals of practice (Nicolini, 2009).

The chapters that follow describe and discuss the key findings gleaned from data analysis. Chapter four presents the findings regarding the founders' vision for a new interdisciplinary institute and beliefs about how aspects of the organization design could facilitate a certain quality of communication. Chapter five presents the findings as to how the founders' ideas have been taken up by practitioners and examines aspects of the physical and administrative structures they call out as beneficial and/or problematic. Chapter six presents a close examination of a single event, a meeting where administrators and practitioners attempt to deal with a breakdown in organizing processes. Together these chapters surface important issues regarding the achievement of interdisciplinarity and the provisional nature of its practice, highlight its communicative foundation and the tensions that emerge from competing ideas, and underscores how

organizing for interdisciplinarity requires the surfacing and management of the discourse about communication.

CHAPTER FOUR. THE FOUNDERS' VIEW—SETTING UP THE CASE

"Why has man changed the shapes and substances of his environment?

To change what it affords him" (Gibson, 2015, p. 122).

Introduction

This chapter provides a more complete account of the case through an examination of the organization—its strategy, structure, membership, and programs in order to reconstruct the founders' practical theories about how communication works and ought to work in organizing for interdisciplinarity. As noted in the introduction, the subject of this case is a newly formed interdisciplinary enterprise in which a number of university leaders shared a vision for creating a space to bring together university members interested in addressing challenges related to food, nutrition, and health. The solution was to design and build an organization that would provide shared space and technologies to bring people together in a collaborative way. The institute, materialized in the administrative and physical structures is an artifact that reflects practical theories about communication works or ought to work. As Craig and Tracy (1995) note, practical theories are often "inchoate," not always clearly understood or expressed, so the goal here is to begin to articulate the theories through the analysis of interview data (Aakhus, 2001; Aakhus (Aakhus & Harrison, 2016)& Harrison, 2016), internal documents, and public artifacts such as news articles, videos, and websites (Aakhus, Dadlani, Gigliotti, Goldthwaite, & Sahay, 2016).

The approach taken here is to investigate the institute as an intervention that makes an argument (Buchanan, 1985; E. V. B. Tompkins, Tompkins, & Cheney, 1989), based on the founders' practical theory of communication and reflected in

"communication logics," or models of how communication works to achieve goals (Barbour, Gill, & Barge, 2018a). These logics inform the founders' prescriptions about how to shape a given situation into a preferred through the design of the physical and administrative structure to shape the routines and rituals of practice and generate new interdisciplinary commitments.

As will be explained in further detail below, the founders' and designers of the institute embrace a practical theory of emergence and emergent outcomes achieved in part through serendipitous interactions—that is experiencing a shared context and a chance meeting with a colleague from another discipline and the sharing a thought or idea would lead to interdisciplinary collaboration. The building of a space designed in a particular manner would therefore structure, organize, and condition discourse in ways that would contribute to the development of an interdisciplinary culture, facilitate the awareness of others, enable serendipitous interaction, and ultimately the generation of interdisciplinary commitments.

Following from the work of Aakhus and colleagues (Aakhus & Bzdak, 2015; Aakhus et al., 2016; Aakhus & Harrison, 2016) the first section of this chapter begins to articulate the practical theory by examining the exigency, the communicative problem to be addressed in light of the exigency, the communicative solution for resolving the problem, and the underlying rationale revealed through the justifications given for the effectiveness and legitimacy of the solutions to understand the design logic of a practice (Aakhus & Bzdak, 2015; Aakhus & Harrison, 2016). The second section expands the case through the examination of the administrative structure, and the strategy for populating the institute with members, centers and programs. The final section examines

the various techniques designed in to the physical environment to structure members' interactions, support the development of an interdisciplinary culture, and facilitate emergent outcomes. The findings presented here are gleaned from a number of sources including interviews with university leaders, the founding director, and architects; documents such as the grant proposal seeking funding for the building, as well as public documents such as news articles, videos, and the institute's website. The analysis and discussion that follows gives a detailed explanation of the case and provides further context for chapter five, which examines the institute members' experience of the physical structure and how these design ideas are taken up in practice.

Exigency, Problem, Solution, and Rationale

The interdisciplinary enterprise discussed here is informed in part by the founders' communication design logics—models that "embody beliefs about how communication, organizations, and institutions work" which are revealed through the examination of the exigency, problem, solution, and rationale as mentioned above (Barbour et al., 2018a, p. 99). These logics are consequential in that they enable and or constrain interdisciplinary practice depending on how they are taken up either as intended, or resisted and/or transformed through everyday activities and interaction of the institute's members.

Exigency. Exigency here is understood to be a situation at the societal level that motivates attention and the design of an intervention to address the issue. An exigency functions as an organizing principle in that it creates a "rhetorical situation . . . a natural context of persons, events, objects, relations, and an exigence, which defines the audience and argues for a change in circumstance" (Bitzer, 1992, p. 4). In this case, the exigency

was identified and defined by the leadership broadly as a need to tackle grand problems—"the human challenges that we face here and around the world" (University president, interview transcript, 2017). This was motivated in part by the growing expectation that universities must produce practical research that addresses "real-world problems" (Barry, Born, & Weszkalnys, 2008; Moran, 2002). The university leadership engaged in informal conversations with other high-level leaders to identify ways to capitalize on certain disciplinary strengths within the university to address significant problems in the community and nationally. Recognizing that the state was the epicenter for childhood obesity, university leaders proposed "a signature initiative" focused on nutrition, which would guide the development of programs that included research, education, and community outreach to address a growing epidemic of obesity, diabetes, and heart disease. As noted by the director,

> . . . a complex problem that is driving the institute has to do with children being overweight, becoming obese, putting them on a track towards diabetes, heart disease, cancer. . . obesity is not a biological entity that is amenable to single point intervention. So, then the institute needed to adopt an approach that was more than just a simple biology, and that's where we started to fold in not just nutrition, not just physical activity. We needed a community engagement, we needed a built-in environment, it was a composite intervention that leads to managing weight gain in children. And you can't do that unless you have a systems approach (Interview transcript, 2018).

Nutrition was the logical choice according to the leadership, because of the existence of a notable academic department with many-decades-long tradition of outstanding research in the field. The goal as outlined by the founders was to develop and provide solutions to critical health and health care issues to improve the health status of the public across the state. To this end, an institute was established in 2008 that would bring faculty, staff, and students from agriculture, nutrition, food science, health sciences,

and public policy together to address the exigency, the need for cross-cutting research that would address complex issues concerning health and nutrition in the state.

Communicative problem. The notion that addressing complex problems requires an interdisciplinary approach is broadly accepted. The problem of obesity in particular stems from a complex web of interrelated factors including social dynamics, nutrition, food availability, education, and other factors. These multiple factors make tackling the obesity issue impossible without knowledge and expertise that cuts across disciplines, in particular nutrition, which is a broad field of research and practice that spans multiple academic disciplines. Nevertheless, the founders believed that the traditional organizational structure of the university, which separates disciplines by departments, essentially segments knowledge and expertise into silos making interdisciplinarity difficult if not impossible. The founders recognized the university's strengths around nutrition but believed these were not brought together in a coherent manner. The problem, as noted by one of the architects, was that interdisciplinary collaboration is restricted and in some cases non-existent in buildings that house single disciplines. The problem as seen by the founders was that research-faculty were encumbered by structures and systems that prevent creative, regionally targeted science and its translation into practice. The communicative problem therefore is how to bring people with different disciplinary strengths who are working on related problems across the university and in the community together in a coherent way to engage around the issues outlined above.

Communicative solution. To this end, the solution was to introduce a new organizing structure, an institute that would serve as a hub to integrate disciplinary activities across the university. University leaders proposed the creation of a space that

would bring together those interested in addressing challenges related to food, nutrition, and health. The belief was that a physical structure would be the most effective way to connect faculty, staff, and students from various departments, in that it would enable the orchestration of cross discipline interaction through the sharing of physical space and technologies. In the early development stage of the proposal, the focus was on co-localization and multi-disciplinary activities but as the design process unfolded and construction of the building began, interdisciplinarity became the goal. As the director notes, "knowing the complexity of the health outcome we were trying to achieve, that very much guided how we structured the institute" (Interview transcript, 2018). The solution was an institute model informed by a number of premises—first, the institute should be organized thematically through centers and programs that would make up its operational core; second an open floor research commons with no offices, identical workstations, and social spaces would reduce hierarchy and contribute to greater informal interaction and the sharing of ideas; third, shared laboratory space would encourage members from different research groups to interact more frequently; fourth, a health clinic would address health needs of the student population and bridge the boundary between the institute and the community. Finally, multi-use social spaces such as a healthy dining venue and seminar spaces would facilitate bringing people from the outside in by providing a space for both informal and formal gatherings around food, nutrition and health. Together these would conceivable result in greater interdisciplinary collaboration and outreach to the community. The solution was to create an environment that would enable the achievement of a certain quality of communication grounded in the

idea of emergence in alignment with the organization's values discussed later in this chapter.

Rationale. The underlying rationale evident in the ideas put forth by the founders is that interdisciplinarity is constrained because university members who are contributing to the same subject are working in silos separated by departments and buildings. Therefore the most productive way to blur disciplinary boundaries is to physically bring them together to space to share space and resources. The underlying assumption is that thus far there was a lack of productive interchange of ideas or an integrating mechanism that enables individuals to contribute varied viewpoints on how to approach health problems. As one of the architects noted,

> [T]heir chance to walk over and have conversations with folks in . . . other groups, [is] practically nonexistent. So, there is no collaboration that is going to occur . . . There is no interchange of ideas. It's very, very independent research (Interview transcript, 2017).

Therefore the underlying premise that guided the design was that by creating a shared environment, interdisciplinary research and programs would be both driven ground up by practitioners, yet organized and integrated on a wider scale to effectively address specific problems in improving nutrition. That is, the chance running into a colleague working in a different discipline, and sharing some idea would lead to collaboration. A building designed in a particular manner was therefore viewed as the most productive way to develop and support a new interdisciplinary culture where cross-disciplinary collaboration would flourish. The building would in essence would eliminate disciplinary silos and structure interaction in particular ways to facilitate emergent solutions.

The design process. To facilitate the further development of the institute, moving it from an idea formalized in 2008 to a physical interdisciplinary institute, a director was hired to oversee the process. He was given three directives—create a new cross-university research organization, oversee the design and construction of a new building, and populate the organization with people and programs. The design of the programs and of the building occurred in tandem. One of the most challenging aspects of the process was designing the building when it was uncertain which people and what programs would eventually populate the organization. Therefore, a number of principles guided the building design process—flexibility, multi-use/multi-benefit, and open concept deemed necessary from the beginning for fostering interdisciplinary activities.

Input from stakeholders—students, staff, faculty, and research administrators—regarding imagined programs and facilities was distilled down into a concept document that was approved by the university without hesitation. While there was an early period of broad-based engagement, eventually the leadership team made the final decision as to the building design and facilities moving forward. The building of the physical structure was described as a top-down leadership activity, while the building of the organization was bottom-up to reflect the nature of shared governance in the academic environment. As one of the founders noted, the intended outcome was somewhat unclear, but through collaboration with university leaders, faculty, and stakeholders, the new director, and a team of architects, what was once an institute in name only would become a physical site that opened its doors in October 2015. The primary components of the organization design are explained below including the strategy, administrative structure, membership, and culture, all deemed critical for the achievement of the organization's objectives.

Organization Design

As discussed previously, embedded within this organization design are prescriptions grounded in a practical understanding about how communication could address the exigency outlined above. The belief was that while each discipline had part of a solution, the existing departmental silo structure created barriers that made interdisciplinary interaction difficult or impossible. Reducing these barriers by physically co-locating and aligning activities among individuals with diverse competencies the design of a new organization would result in transformation, changing 'what is' in to what 'ought' to be (Aakhus, 2007; Jackson & Aakhus, 2014). Traditionally, organization design is understood as the alignment of strategies, structures, and processes that enable an entity to achieve its goals. However, from the view of communication design organization design is better understood as "mandated relations of people and practices" (McPhee & Poole, 2002) and the generation of commitments to future (Aakhus & Jackson, 2005). Together, these practices, mandated relations, and commitments reflect collective action and collective communication design (Barbour et al., 2018b).

Strategy. Strategy in a traditional managerial view is the approach an organization takes to realize a preferred future state, informed by its mission, carried out by its members, and supported through an administrative structure. In a trade article discussing the institute the director notes, "You need a different strategy if you are pushing people into this kind of space" (Director quoted by, J. Allen, 2016). The institute is a mission driven organization with a broad aspirational vision, which allows for a diversity of activities to align with its objectives. The organization articulates a somewhat ambiguous strategy for achieving its mission described as growth, evolution, and emergent outcomes

achieved in part through a process of self-assembly, with the physical environment serving as an integrating device.

The concept self-assembly reflects the notion of spontaneous ordering from disorder, an autonomous process where individual components naturally organize into patterns or structures (Whitesides & Grzybowski, 2002). The self-assembly process is reflected in the ways the organization was populated through voluntary member participation and how programs and centers that aligned with the organization's mission naturally emerged out of members' interests. Another aspect of the self-assembly principle according to the leadership is the belief that the organization would learn, evolve, and grow organically to achieve creative output and ultimately success. As articulated in the accounts given by the leadership, self-assembly is highly dependent upon cultural determinants, which will be discussed later in the chapter.

The second concept, "emergence," an idea coming from complexity theory and systems thinking, refers to the nature of outcomes resulting from the self-assembly process as described above. Emergent outcomes, explained as a principle grounded in biology and expressed in the phrase "the sum is greater than the parts," is both a quality of, and a method for, achieving interdisciplinarity advanced by the director. As a method it reflects the founders' belief that through interaction and collective activities, unanticipated synergies and programs would arise (i.e., the output would be greater than the sum of its individual components), not possible in a traditional university research culture. As the director notes, "In an interdisciplinary organization, you have to be able to take on projects that nobody can do by themselves . . . that they can only be solved through more systems-based thinking" (Interview transcript, 2018). Emergence enabled

through the design of the physical environment would therefore facilitate interactions that reflect a particular quality of communication consistent with the organization's values—academic interdisciplinarity, collective success, and community responsibility. The focus on emergence as a quality of an outcome suggests a preference for interdisciplinary outcomes that develop with little central coordination.

Structure. Structure is commonly understood to follow from strategy (Chandler, 1962) however a design view offers a more nuanced position noting the interdependency of both, in that structure also constrains, conditions, and guides strategy (Mintzberg,, 1990). The institute's goal was to create a structure that was notably different from that of traditional department arrangements at the university where research and teaching centers around a single or closely related disciplines. The institute therefore would provide a physical nexus and integrating mechanism to bring together a diverse group of stakeholders including faculty, researchers, students, community leaders, and health educators under the goal to advance and accelerate research, educate scholar-leaders and community health advocates, to support the community at large.

The founders developed an administrative structure to balance the tension between formal procedures and processes necessary for interfacing with a traditional university structure, against the desire to build an internal flexible and dynamic network that deemed necessary for creativity, growth, and emergence. The solution was to form a multi-layer, multi-stakeholder governance structure consisting of a leadership advisory board, an external advisory board, a core as well as extended leadership team, a building council, and a cross-university finance committee. The leadership advisory board, chaired by the executive dean of the institute's academic home department, includes senior level

advisors such as chancellors and deans from across the university to facilitate cross-university guidance and provide a channel for the institute director to interface with constituents from across the university. To assess the institute's performance from a community, state, and national perspective, a ten member external advisory board was formed to provide advice and counsel to the leadership advisory board and the core leadership team.

The internal leadership model, primarily concerned with the activities in the physical environment, is comprised of two teams—a core team made up of the institute's primary leaders and center directors, and an extended team that includes program directors. These internal administrative structures are responsible for providing oversight to ensure the activities of the institute are aligned with the organization's mission. A four-person joint finance committee comprised of key financial officers from different schools across the university provides oversight of the organization's business model and provides advice and counsel as well. As the director noted, "Interdisciplinarity is messy business and it requires a different kind of leadership model if it is to really flourish—herein the built environment can really help make it work" (Office of Communications, 2018, May 31).

The institute is organized around four centers, which are its operational core. The centers include childhood nutrition education and research, digestive health, health and human performance, and a lipids research center that existed before the institute but subsequently joined. Additionally, the institute supports a variety of thematic programs focused on culinary health and wellness, food systems and agriculture, student ambassadors, a healthy kids initiative, one-nutrition, and microbiome in human nutrition

and health. These diverse activities align in varying ways with the institute's broad mission. As noted previously, early in the design process the makeup of the centers and programs that would populate the institute was unknown but came into existence through a process of self-assembly, in that those who became members would ultimately define the centers and programs.

> "What we did was we, in the design of the building, and in all the focus groups, an energy started to emerge around, "Hey, these are really important activities" and the people who were a part of focus groups are the ones who ultimately self-assembled, and led to the formation of the centers" (Director, Interview transcript, 2018).

The belief was that the self-assembly process would allow for a greater diversity of membership and the surfacing of innovative programs and initiatives. Today, the institute supports activities ranging from basic research, clinical research, healthy dining, community outreach, and student services. In contrast to the planned and hierarchical nature of the external leadership structure, the internal administrative structure was designed to be an adaptive network that would allow for learning and growth to occur organically occurs through interconnections in the organization. This idea is consistent with emergence as a method in that through interaction, spontaneous or otherwise knowledge would be exchanged, learning would occur, and desirable but not wholly predictable outcomes would emerge.

Membership. The strategy for membership development is grounded principles of interdisciplinarity—that bringing a diverse group together will result in synergies and programs thought not to be possible in a traditional university structure. Early on the founders recognized that asking people to work in a different kind of environment was a "bold experiment," and that the institute would only succeed with faculty support. The

process of identifying potential members was described as “interviewing to be in the building.” Instead of assigning people to work in the institute, the membership was “self-assembled” through elective participation. Leaders engaged in both formal and informal conversations with various university members during the early design stages to assess the willingness of members to be part of the “experiment.” Not everyone who was approached was interested or willing to work in an environment that was fundamentally different from the academic department structure at this university. For example, conversations with people who work in traditional laboratory spaces revealed a degree of hesitation and resistance. The configuration of space, such as not having ones’ office inside the laboratory would require changes to the routines of laboratory practices and some were not interested in making this change. In the end, by making participation voluntary, and hiring only new research faculty who were deemed “a good cultural fit” with the vision and mission of the institute, the leadership believes full buy-in from the current membership was achieved. Today, the institute has approximately 115 members drawn from nine schools and twenty-eight different departments, but nevertheless still seeks a greater diversity of membership across the university to reach critical mass so that larger research programs develop (Office of Communications, 2018).

Culture. As noted by the director, “culture is as important as concrete in the design of an interdisciplinary research facility,” (J. Allen, 2016)a point that was reiterated a number of times in various conversations. The goal of the institute was not to dictate culture, but rather foster the development of a particular culture that would enable a transformation in practices and ultimately outcomes. The organization’s culture as articulated in its values is viewed as an enabling resource more powerful than the

organization's mission. The espoused values center on academic interdisciplinarity, collective success, and community responsibility. As the director notes, "the key strategic question wasn't about the design of the building as much as it was about the culture it was designed to foster—a culture of health, and of team-based, mission oriented research" (Office of Communications, 2018). The director was also concerned with creating a sustainable culture, one that persists beyond the vision of a single individual. As he notes,

> "From a long-term leadership perspective, you don't want an institute to be the personification of the current director. One way to get around that is to create a culture that is larger than life, larger than the director, so it carries itself forward" (Allen, 2016).

Culture is a potent word for the founders who liken it to the concrete of the building. The founders thus call out its materiality and the way it is consequential (i.e., matters) for members and its potential to endure across time (Leonardi, 2012). The challenge for the organization therefore was how to nurture the development of a sustainable culture that was distinct from how they perceived the broader university culture. Two approaches were taken that would begin to define the culture the organization sought—one was through programming and the other through building design.

First, the decision to bring disparate functions together in a single organization was a first step toward signaling a cultural shift away from a discipline-focused culture to an interdisciplinary culture. As noted in an interview with one of the architects,

> We talked about the crazy array of different things that don't sound like they should be compatible, but when you do that, I think you deliver this message about a culture of collaboration, that there are no obstacles or constraints that would prevent us from putting the right people together at the right time to do the best work (Architect, interview transcript, 2017).

While programming would help to define a new culture, there was also a strong belief that building design could influence culture as well. Although colocation was understood as a necessary condition for interdisciplinarity, the founders recognized it would not automatically lead to collaboration, that would require a shift in culture as noted by one of the architects, "It just means that you're existing in the same facility, maybe on different floors. [It] doesn't mean you have anything that would bring you together, right? So, there's a whole other step towards collaboration, and it's got to be cultural." (Architect, interview transcript, 2017).

Beginning in the early development phase the founders and designers were consciously thinking about how building design could contribute to the formation of an interdisciplinary culture. Their first idea reflects the symbolic quality of aesthetics (Elsbach & Pratt, 2007), that a new building with a distinct design in itself would be a first step toward signaling to members and stakeholders that the organization sought to define itself differently from other organizations across the university. In this sense the building design would serve as an interpretive resource for sensemaking, so the driving question became how to articulate a new culture through design while structuring interactions in a particular way to achieve the emergence of interdisciplinary activities. As the director notes,

> One of the early taglines that were used to describe the institute was breaking down physical barriers, and enabling intellectual collisions. And to take those words and say, "What does that really mean?" So, breaking down barriers led to open offices, and shared labs, and fostering intellectual collisions took the concept of open office concept a little further, and led to the design of huddle centers, and community gathering spots such as the eating area that is available only for the residents. (Director, interview transcript, 2018).

These beliefs were shaped in part by the director's personal experiences working in research environments in private industry. A decision was made to have everyone from the director down, work at open workstations in the research commons instead of having offices. In addition to increasing the probability that people would interact, everyone having identical workstations would also reflect a flattening of hierarchy across the organization, which would in theory align with the organizing principle of self-assembly. Additionally, the "open-concept interactive space" (Allen, 2016) conceivably would not only enhance communication, but would also communicate that the organization was cultivating a culture of openness and transparency. The understanding was that in designing a space that was fundamentally different from the traditional university research environment—a space a without walls or separate offices—it would inherently define a different culture. In this sense, culture is viewed as a strategic design element consistent with the view proffered bySchein (2010)and others, who argue that it can have a greater determining force than strategy.

As articulated by the founders, culture expressed in the organization's values—academic interdisciplinarity, collective success, and community responsibility—frame the institute's activities and guide its decision making processes and is envisioned to be an enabling resource cultivated through the design of the building, a diverse membership, and distinct programs, which would enable emergent outcomes. As an interpretive resource, the culture would in theory signal to members the types of attitudes and behaviors deemed appropriate for the achievement of interdisciplinarity. These values imply a certain type and quality of communication expected of members—professional, collegial, and cooperative, in the service of collective activities. This quality of

communication is not explicit, rather the organization relies on a particular configuration of space to create a context for interaction and enable emergence to occur, reflecting a traditional understanding of culture, which views values as informing and influencing the ends people seek (Swidler, 1986).

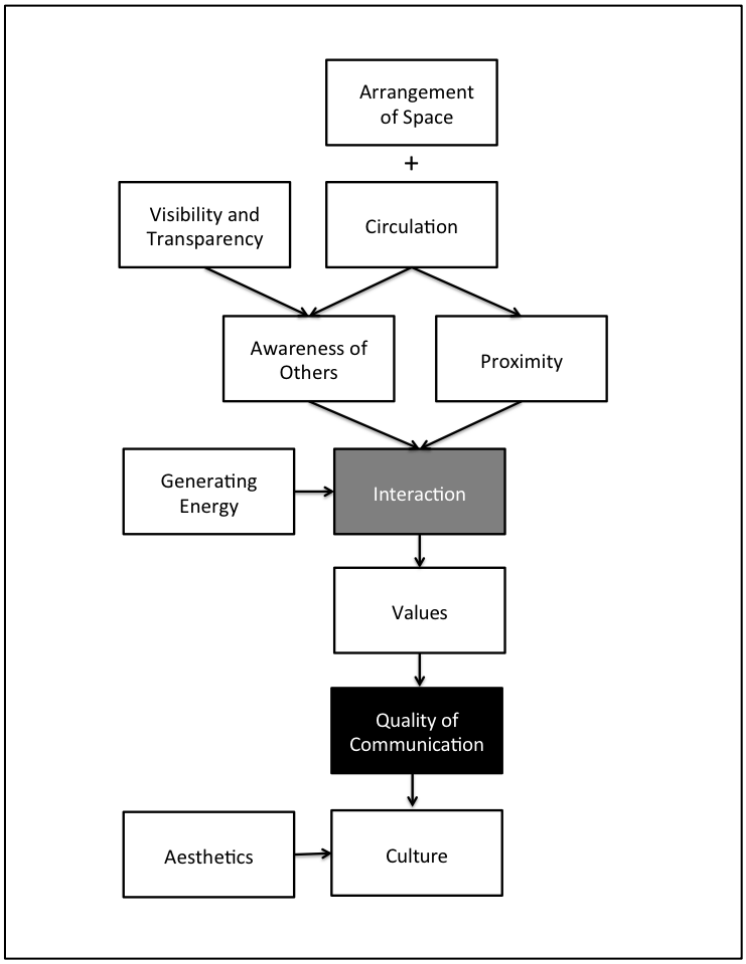
In summary, the founders were relying on these aspects of organization design—strategy, structure, membership, and culture—to support a process of self-assembly and encourage emergent outcomes. This was to be enabled through the building of a physical structure with instrumental, symbolic, and aesthetic qualities (Rafaeli & Vilnai-Yavetz, 2004) that would serve as an integrating mechanism. The following section focuses on the specific design techniques called out in the data, which are grounded in practical notions about the nature of communication and ideas about how to structure interaction and enable the generation interdisciplinary commitments (Aakhus, 2007; Aakhus & Jackson, 2005; Jackson & Aakhus, 2014).

The Physical Structure as a Design for Communication

The following section focuses on the various ideas articulated by the founders and architects regarding the ways in which the physical structure could facilitate the development of an interdisciplinary culture and thus emergent outcomes. The techniques center on enabling proximity of members, and increasing the awareness of others' activities in order to generate certain quality of communication consistent the organization's values. Proximity and therefore interaction would be enabled in part through the arrangement of space and influencing patterns of circulation, while managing visibility and transparency across the space would enable a greater awareness of, and interest in others and their activities motivating members to interact. Aesthetic design

elements served both symbolic and functional purposes—communicating a certain identity as well as providing a positive sensory experience for building inhabitants. Finally, attention was given to designing the building in such a way as to generate energy—stimulating activity and interactivity. These techniques offered by the founders and architects are solutions to perceived communication problems grounded in beliefs about how communication works and ought to work. Figure 4.1 below offers a visual representation of the founders' design rationale as constructed from the data, the various techniques, and how they are theorized to operate. The seven design techniques proximity, the arrangement of space, circulation, awareness of others, generating energy and aesthetics are discussed further below.

Figure 4.1 Founders' Design Rationale



Proximity. Ideas concerning proximity are the heart of the founders' practical theory of communication and how it ought to work for interdisciplinary practice. As one of the founders noted,

> . . . the people who work together, who bump into each other casually, the people who sit and have lunch together, the people who work late at night together . . . their interdisciplinary collaboration is empowered by their proximity and by their shared experience (Founder, interview transcript, 2017).

The architects in particular were explicit in their ideas about how proximity contributes to communication referencing research that supports this idea. "Generally, if people are more than 50 or 75 feet away from each other, the possibilities of them having conversations drops off precipitously" (Architect, interview transcript, 2017). From their perspective horizontal proximity is more effective than vertical proximity in facilitating interaction, noting how people are more likely to interact in buildings with two floors, but not six floors. Therefore, managing the height of the building and number of floors was a concern—"So, the minute you start going through multiple levels, now you are also risking a lot of communication cut off between floors" (Architect, interview transcript, 2017). Their solution for facilitating vertical interaction was to create a 'psychic center' of the building, a dramatic focal point that would move people into the center of the building, encouraging them use the stairs to move between floors. This psychic center includes a broad open staircase flanked by a 1,300 square foot vertical wall of living plants that visually connects all three floors. The architects referred to this as a "communicating stair," the theory being that the "generous, drawing" staircase would both encourage people to take the stairs and possibly pause for an impromptu conversation, where the result might be a future collaboration.

The arrangement of space. The arrangement of space was also important for managing proximity. As noted earlier, the goal was to create spaces within the building that were both flexible and multipurpose and arrange them in such a way that would encourage interaction. This was accomplished by "managing adjacencies," intentionally positioning diverse activities next to each other—for example formal meeting spaces next to workstations, or informal gathering spaces next to laboratories. This in theory would facilitate a greater awareness of others' activities, which would enhance the possibility of conversations occurring. Although the architects preference was for there to be no boundaries, they recognized their necessity so attention was given to providing them where needed for acoustical separation or privacy, or to contain chemicals and biological materials by separating wet laboratories from workstations. The solution was to consolidate high-privacy need areas (e.g., student health center) and mechanical equipment in the center of the building to allow the rest to be as open as possible. This would allow for visual connections across the space, which would in theory contribute to a greater awareness of others activities.

Circulation. Circulation refers to the movement of people in to and around the architectural space. Circulation, mostly experienced unconsciously, is facilitated through walkways, hallways, stairs and foyers, which as Cairns (2012) argues, functions by covertly "inclining, predisposing, prompting, inducing, and tempting bodies kinesthetically" (p. 461). An initial concern was that because the building would be situated at the periphery of the campus there would need to be techniques to draw people into the building. This was primarily accomplished through the positioning of walkways and providing sufficient parking to lower the transaction costs for interaction. Once

inside the building, circulation becomes even more important to encourage opportunities for interaction by stimulating flow and providing adjacent gathering spaces referred to as "streams and eddies." Streams represent the path of travel, while eddies are open areas place alongside the path of travel so people can step to the side for conversation. For example, in the research commons the path from the laboratories to the workstations, or from the laboratory to the exit, provides seating areas along the way to encourage people to pause for a conversation. The small meeting rooms enclosed by glass line the perimeter of the interior wall along the path of travel—the idea being that as people walk from their workstation to the kitchen area, copier room, or laboratory they might see a meeting going on in one of the rooms and potentially join. The area outside the research commons serves as both a pathway to the stairs, elevator, water, and restrooms, but also provides seating in various spots for conversation to occur. Outside the large meeting rooms on the second floor has what the architects call "pre-function space" open areas where people can gather pre- or post-formal meeting, the goal being to create opportunities for people to pause for informal conversations.

Visibility and transparency. Managing visibility and transparency across the site was another technique used to encourage interaction. The underlying premise is that when individuals can see what is going on in the space, this generates interest in others' work and a potential interest in collaborating. In providing as many visual connections as possible amongst the various modalities that exist within the building proximity to others was enhanced. Internally glass is used extensively to create an environment of openness and transparency. As the architects note, "Visual access, perceptual access, transparency . . . There's a seen or be seen aspect to collaboration in our view" (Architects, interview

transcript, 2017). Within the research commons, the open floor plan and the lack of enclosed private offices enables broad visual connections across the various modalities. The positioning of wet laboratories next to social spaces, and workstations near formal and informal meeting spaces enables people to view the activities of others, potentially generating interest in working together. Even areas that require containment such as the wet laboratories, glass walls are used to preserve visibility and transparency. In the private meeting spaces full transparency and visibility is maintained afforded by the glass walls and doors that enclose the space, the premise being that full glass and complete transparency actually minimizes the "fish-bowl effect," the feeling of being watched by others. As one of the architects notes, "You know, if I'm sitting there and I can see a formal meeting going on, perhaps I want to participate in that formal meeting. If I couldn't see it, I may not know it's even happening" (Architect, Interview transcript, 2017).

The external glass walls also create a connection between the outside and the inside environments, making the activities going on in the building visible to outsiders. The architects referred to this as research on display—the low scale of the building and the high degree of transparency enabled by its glass walls signals "a culture of visibility and interaction" (Architect, interview transcript, 2017). This high degree of transparency also serves to communicate an identity that is distinct from the surrounding "introverted" looking buildings as described by the architects,

> "They [the surrounding buildings] look inwards. Researchers go in, and if you have ever been in those buildings, you look. And, there is no lobby, you walk in, you are 10 feet into a building and you are presented with the bathrooms with the elevator, nothing else (Architect, interview transcript, 2017).

Generating energy. As articulated by the leadership, the space "exudes a sense of energy and connectivity . . . an overall sense of harmony as architectural design, science, and nature blend in spatial creativity" (Director, video, 2017). One of the design considerations was how to facilitate as well as balance activities in the space to create a feeling of energy, bring the facility to life, and by extension generate interactivity. This was achieved in part through a technique called placemaking, a concept drawn from urban planning and public space design that theorizes how the experience of space has an influence on the individual and community physical, social, emotional, and ecological health (Project for Public Spaces, 2018). The "power of 10" an underlying principle of placemaking, argues that having ten areas for potential activity makes a place "more than the sum of its parts" and increases the chance that a space will be active and vibrant (Project for Public Spaces, 2009). As one of the architects noted,

> And so, even inside a building, if you think about food venues, interactive screens, public art, where two people who don't know each other might pause and look at something, and comment, and even strike up a conversation between two total strangers (Architect, Interview transcript, 2018).

The challenge for the founders and designers was to make sure the social environment was not underutilized so the goal became to manage the cycle of bringing people together. This was facilitated in part through the healthy dining courtyard, which offers food from breakfast to dinner and provides tables and seating for approximately 120 people. As the architect noted, mealtime conversations contribute to the auditory nature of the space and bringing the space alive, likening it to the "Starbucks phenomena" in which people find it beneficial working around others in public spaces. According to the architects, while there needs to be critical mass to bring a space to life,

there also needs to be a balance in that spaces that are too noisy or too quiet affect the life of the space.

Aesthetics. Aesthetics concerns the sensory experience of both the natural and artificial. Individuals make sense of their surroundings and the organization at-large through passive and/or deliberate attention to cues in the physical and social environment (Rafaeli & Vilnai-Yavetz, 2004). Aesthetic techniques were used in the design of the physical structure to create a distinct identity that would represent the institute to the outside world in a particular way and shape sensemaking for its members and the public. The architects describe the building as embodying "the concepts of movement, activity, and wellness," which align with the organization's mission to be a model for tackling health problems in the state and eventually the nation (Ballinger, 2016, October 21). In that the building would be situated among a number of other traditional academic buildings housing related disciplines, the goal was to design a facility that was intentionally different to reflect a distinct cultural vision as articulated by the founders. As previously discussed, the organization wanted to change conventional research practices and relied on the building to represent this culture of transformation. The objective was not to dictate culture but rather to signal a 'cultural shift' communicated through aesthetic qualities. The thought was that the distinct and defining features of the building would signal to occupants and visitors that the activities going on in the institute would be clearly different from the activities going on other areas of the university.

However, the architects were faced with the challenge of balancing a potentially dichotomous identity—the image of an institute as a monastic place, the epitome of academic investigation filled with the best and brightest, and that of being open,

transparent and welcoming for all. The solution was to reflect the ideals of democracy by siting the building on a hill and placing the entrance or "noble floor" one level above grade, similar to the way the Parthenon or other Greek temples are sited allowing visitors to experience a "rising up" of the building. However, to balance this hermetic identity of the institute on the hill, with a welcoming manner they wished to communicate the building was designed as a simple rectangular transparent glass structure that would appear to outsiders as extraordinarily open. This "thin environment" as described by the architects was intended to present the building as accessible and engaging to draw people in from the outside.

The aesthetic created through transparency—glass and open space—not only is intended to communicate openness, but also serves to connect the building occupants to the natural world, the belief being that this would have the effect of invigorating the senses to create a positive physical and mental response when in the space. The building is a highly porous transparent structure that presents a light and open environment, enabling occupants within the space to experience 360-degree views of the changing outdoor environment. As one of the architects noted,

> So, here's another issue that we try to do in these buildings is try to maximize your use of all of your senses. You can smell the wall. You know, you can hear the food. You can smell the food. You can feel the warmth of the sun. You see the clouds versus the sun at different times of the day. Your senses are always invigorated so that you're always feeling a sense of rejuvenation that you get by having those things changing, not letting them be constant (Architect, interview transcript, 2017).

The underlying principle is that feeling "boxed in," as is the experience in many buildings, inhibits mental relaxation. Therefore the experience of long views of the outdoor environment, similar to the feeling one has being at the beach or on a

mountaintop, would produce a calming effect. This, the architects posited, would in turn lower the intensity of the research environment enabling individuals to think more freely when in the space. These ideas are based on the concept of biophilia, the human need to be around other living things and the natural environment were incorporated in the interior as well. As discussed previously, one of the most striking features is a 1,300 square foot vertical wall that flanks the internal central staircase made up of 6,000 plants from 72 different species. The living wall was designed to provide an experience of nature that would stimulate visual and olfactory senses, and draw people toward the center of the building. In this sense the architects used aesthetics to encourage circulation as well. The institute has been publicly recognized for its aesthetic qualities. In 2016, the architectural firm of record won the top honor for built work from the state's chapter of the American Institute of Architects, and in 2018 *USA Today* recognized the building as one of the top 25 buildings to see in the state.

Summary of the Design Rationale

The design techniques embedded in the physical infrastructure reflect the founders' design rationale and practical theory of communication. Together, they are intended to provide a solution to a perceived problem of communication grounded in the belief that aspects of the previous organization structure and physical environment constrained the achievement of interdisciplinarity, and that in creating a new organization that structures the environment in certain ways will moderate these constraints. The arrangement of space, and circulation are techniques used to structure the environment so that individuals are proximate, which in theory will contribute to increases in interaction and ultimately the generation of interdisciplinary commitments. Underpinning visibility

and transparency is the idea that increasing an individual's awareness of others and their activities will contribute to a desire or willingness to communicate. Generating energy functions by changing the quality of the environment in two ways—first, by providing artifacts or experiences in the environment to stimulate serendipitous interaction, and second by influencing the level of activity in the space, which contributes to people wanting to be present in the building. Finally, aesthetics relates to aspects of sensemaking and interpretive processes. The idea is that the sensory experience of the environment will influence an individual's understanding of the organizational culture for members, or stimulate a desire for outsiders to come to the organization and participate in various ways.

These practical theories about communication and the design techniques used to structure interaction are examined in the next chapter to understand how they have been taken up, resisted, embraced, or redesigned my the members of the organization. Consistent with research on the physical environment of organizations, the ways in which users experience instrumental, symbolic, and aesthetic aspects of the workplace are never wholly predictable (Elsbach & Pratt, 2007). Underlying these design techniques are assumptions concerning the nature of language and interaction, which will be taken up again in chapter seven.

CHAPTER FIVE. THE PHYSICAL STRUCTURE TAKEN-UP IN PRACTICE

"We have no offices in this building, which is remarkable. People just bump into each other in very positive ways, which engenders intellectual collisions"

(Director, quoted by Simmons, 2015).

This chapter reports on the experiences of members and residents and the ways in which the founders' ideas about interaction and communication, built into the physical environment have been embraced or praised, resisted or blamed. As noted previously the physical structure was designed to function as an "interaction architecture" with various features devised to structure interactivity and shape discourse (Harrison, Morgan, King, & Williams, 2011) in ways consistent with the principles of interdisciplinarity. This chapter presents a summary and discussion of findings distilled from interview and focus group data, supplemented with observational data to better understand of the lived experience of the institute residents. The chapter attends to the various stances members and building residents take in response to their experiences of the physical space.

The findings discussed here are organized around the categories reported on in the previous chapter, presented in the design rationale and summarized in table 5.1 below. These include: proximity, arrangement of space, circulation, visibility and transparency, generating energy, and aesthetics. To protect participants' identity I avoid any indication of gender and therefore frequently use he/she, his/her, or they or their. I also do not use gendered pseudonyms as is common in qualitative reports, rather I have assigned each participant a number and use this to identify different individuals in my citations.

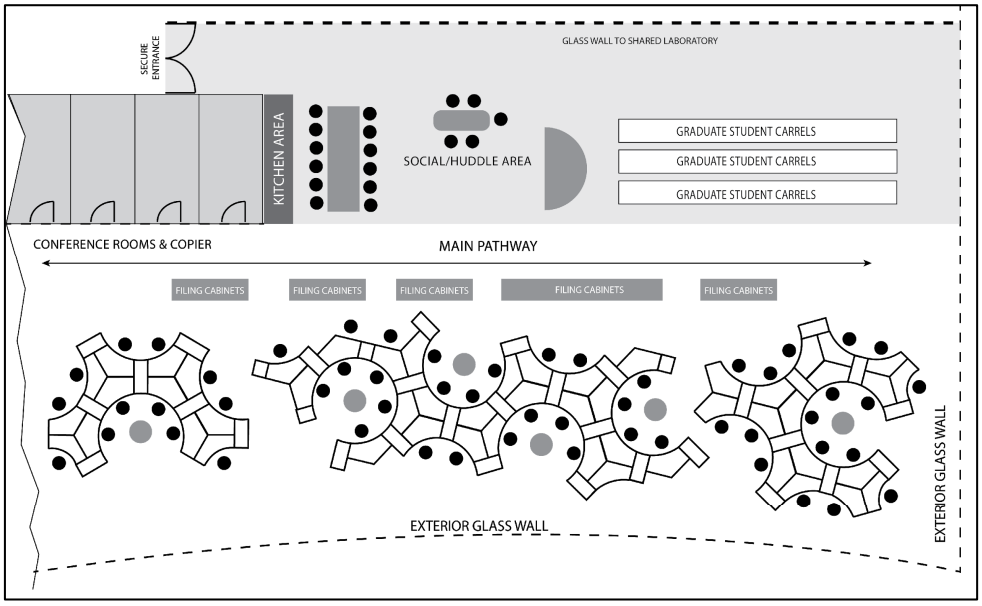
Consistent with previous studies of the workplace environment, this case lends support for findings that show organizational members have both positive and negative experiences of the physical work environment and that achieving a benefit in one area typically requires a tradeoff in another (Elsbach & Pratt, 2007). This evident in the data presented below as demonstrated through the mix of positive and negative stances residents take with regard to the physical infrastructure.

Setting the context. The discussion in this chapter centers primarily on the research commons on the third floor of the building, which is a 9,746 net square foot secured area where most resident members carry out their daily work activities. Designed as an open floor plan, the research commons reflects current trends in office design in professional practice—open space, modern design, and colorful decor. Only residents of the institute have access to this area via a swipe card, and are required to wear their university identification attached to a branded lanyard to signal to others they are permitted to be in this space. Visitors and non-resident members must arrange access to the space through a resident member.

Within the research commons are 70 nearly identical workstations for faculty, and 30 identical carrels in a separate location for students similar to those typically found in libraries. See figure 5.1 below for a representation of a cross-section of research commons floor plan (not to scale). As noted in chapter four, the open floor plan and lack of private offices was intentional based on the premise that increased visibility and being proximate to others would facilitate increased awareness of others activities and stimulate informal interaction that might lead to interdisciplinary activities. All residents of the

institute, including the director work at the same type of workstation, the rationale being that this uniformity would signal the diminishment of hierarchy.

Figure 5.1 Cross-section of the Research Commons Floor Plan (not to scale)



Within the research commons are four small meeting rooms enclosed by a glass wall and door, which seat between six to twelve people depending on how the room is configured. In the center of the research commons is a shared kitchen and large communal table with seating for twelve, flanked by soft seating and huddle spaces for informal interaction. Residents use these more informal areas for eating meals, interacting with visitors, or occasional informal meetings. Adjoining the research commons is a shared wet laboratory space with 48 bench seats to accommodate faculty, research staff, and students. This is a secure area, which restricts access primarily to laboratory members and associated staff. Most laboratory residents also have a workstation alongside non-laboratory members in the research commons.

The following section reports on resident's experiences of the physical environment, organized according to the various techniques discussed in chapter four.

Proximity. Proximity, the degree to which individuals are physically close has implications for some residents' experiences as well as the nature of their interactions

with others. As noted in the previous chapter, the founders and designers theorized that communication and emergent interdisciplinary outcomes would be enabled by proximity and the shared experience it affords. Many of the residents perceive proximity as a positive, noting how it creates the opportunity to interact face-to-face with people they might have never met if not for being in the same facility. A number of residents claim that proximity facilitates social, advisory, and collaborative interactions, for example learning about others' personal lives and professional interests, seeking and giving advice, accomplishing tasks such as managing existing programs, joint conference planning, and generating ideas for future research, workshops or seminars. Some attribute proximity to making communication easier overall and appreciate the exposure to other residents working in different disciplines. Consistent with previous studies demonstrating a link between proximity and communication (T. J. Allen, 1977; T. J. Allen & Fustfeld, 1975; Festinger, 1951; Knoben & Oerlemans, 2006; Kraut, Egido, & Galegher, 1988; Wilson, Boyer O'Leary, Metiu, & Jett, 2008) a resident spoke about how relocating to a new area in the research commons resulted in diminished communication with those previously seated nearby. Another resident stated, "the further we move away from where I am, it seems that I don't interact with them as much" (Participant 19, interview transcript, 2017). The immediacy of face-to-face interaction enabled by shared proximity also allows residents to more quickly address matters. For example, conversations characterized as, 'Hey, do you have five minutes? Let's talk about this,' lead to swiftly resolving matters that previously would take multiple emails over a number of days with frequent back and forth waiting for responses (Participant 5, interview transcript, 2017). Some residents view proximity and the increased opportunities for face-to-face

conversations as reducing miscommunication and misunderstandings, as one resident shared,

> . . . when people are around, it's easy to just—rather than writing an email or picking up a phone—just getting up and walking across the room. I mean it's what, not even 100 yards from end-to-end. It's probably more like 50 or 60 yards. So, that's easy and having a face-to-face conversation it's much less likely that miscommunication will happen or misunderstanding happens (Participant 8, 2018).

Students in particular perceive a benefit in being close to their supervisors, noting how it reduces their uncertainty concerning how to act or what to do when in the space. It also increases the frequency of informal conversations with current and future professors, which students see as valuable. These types of informal interactions have lead to student-professor collaborative research projects in some cases. Finally, consistent with the research on interaction in photocopier rooms and around water coolers (Fayard & Weeks, 2007), a student resident reports frequently meeting and getting to know more about other members around the shared printing station in the semi-enclosed mail room.

While many find the closeness afforded by being in the same space and in close proximity to others beneficial, others highlight a number of challenges. Though the factors often do not present insurmountable barriers, they create occasions for disruption, contribute to feelings of frustration, and require the development of workarounds to remain productive. First, some report that sitting next to an individual from another work group or discipline creates distractions as each group over hears conversations that have no relevance for one's work. One resident commented, "the guy who sits next to me probably has my credit card number memorized because I hand it out over the phone for various purchases" (Participant 11, interview transcript, 2017). Similarly, a resident describes an early experience in which a small group stood in close proximity having a

loud discussion. The resident did not respond directly to the situation but thought, “Guys, go take a room. I’m trying to get work done here too. This is a shared space” (Participant 5, interview transcript, 2017).

As many report, a consequence of being in close proximity to others is that one cannot have more than a quick conversation or phone call at their desk and conference calls in particular must be done in meeting rooms because of the disruption in creates for others. Having to move a conversation or phone call to a meeting room is seen as disruptive for some. Second, while most understand the reasoning for being in close proximity to others from different disciplines, the consequence is greater separation from one’s home department located in other buildings. Some report feeling intellectually isolated and report a reduction in ‘productive’ scholarly discussions. To compensate for the isolation they make-up reasons to visit colleagues in other buildings. As one resident stated,

> “So it’s hard to have these off the cuff conversations with them because I feel like I need to invent a reason to go over there and intrude upon their time. Whereas if we were next door neighbors, we would have a lot more conversations that would be productive and enjoyable” (Participant 11, interview transcript, 2017).

Others report a reduced awareness of what goes on in their home departments and reduced participation in decision making. Interactions with supervisors, collaborators, and research team members who are located in other buildings can be infrequent in some cases, with the duration between interactions as long as two weeks for one resident, although this has likely been resolved by now. Even when residents are co-located within the research commons, some feel artificially separated from colleagues who are dispersed across the room, asserting that interactions would be more productive if work groups were clustered together in the space. However the perceived downside to the clustering

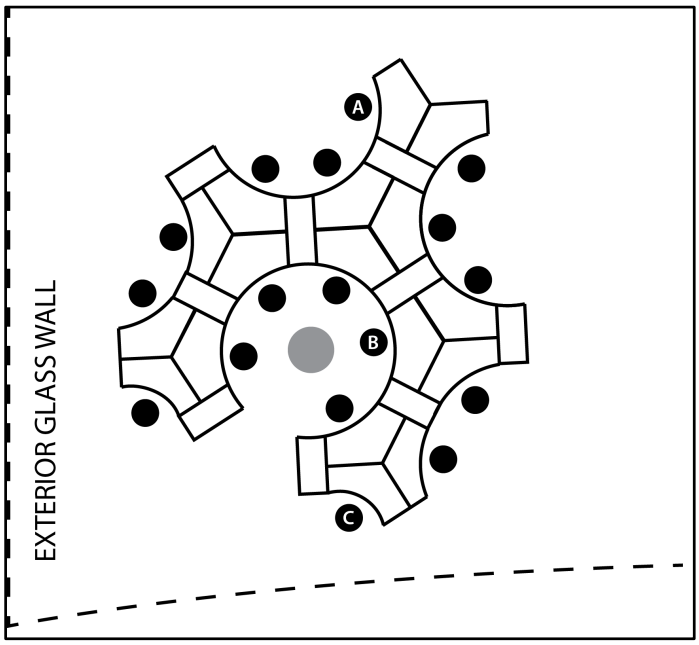
arrangement is that these co-located groups interact less frequently with those outside their work group. Clearly there are individual differences and preferences with regard to one's experience but overwhelmingly residents report that frequent interruptions, noise disturbances, and unproductive interactions are a source of frustration, a consequence of the open office environment and the close proximity it affords, findings supported by others (e.g., Davis, Leach, & Clegg, 2011; Khazanchi, Sprinkle, Masterson, & Tong, 2018).

Arrangement of space. The arrangement of space has implications as well, in that where one is seated in the research commons influences residents' experiences. As discussed in the previous chapter, the arrangement of material artifacts and activities in the space would conceivably contribute to an increased awareness of others and their activities. One resident spoke of having a degree of skepticism about the open office space originally, but actually finds it to be a positive experience, attributing this to where one is located in the space. One student resident described how their experience of working in the space changed dramatically when all members of the work group were relocated to a "pod" near their supervisor, a configuration where workstations are arranged in a semi-circle. The student characterized the move as "a game changer," which contributed greater interaction among workgroup members and increased comfort working in the space. The student noted, "Yeah, it's so weird how the location of where the pod was affected us, but it did" (Student participant, focus group transcript, 2017).

As indicated in figure 5.2 below, the way the workstations are arranged, their proximity to pathways, and the degree to which the pathways are frequented, results in differing degrees of privacy and the potential disruption. The black circles in the figure

above represent where residents are seated facing inwards toward the desk and computer with their backs to the open space behind. In the example, workstation A is situated closest to a main pathway and therefore the resident experiences more foot traffic and therefore less privacy than workstations B and C. In contrast, workstation B is situated within a semi-enclosed area or pod, which has the least amount of foot traffic and affords the greatest degree of privacy. Workstation C, is somewhere in between in that it is open to the exterior glass wall where foot traffic is minimal, typically limited to individuals visiting other residents seated in the area. Within this small area and among seemingly similar workstations residents can have markedly different experiences with regard to privacy and disruption to their work a finding supported by other studies (Kupritz, 1998).

Figure 5.2 Workstation Arrangements (not to scale)



For some laboratory residents the arrangement of space requires a change in routines. In a traditional wet laboratory a researcher would have a desk or workstation in the laboratory, but for residents at the institute workstations are located outside of the

laboratory in the research commons to encourage more interaction across disciplines. Although uncommon, one laboratory resident, has a workstation in the research commons to be close to other members of the research team, but conducts most laboratory work in another building. These changes in routines present a challenge for some who note a loss in productivity or needing to develop workarounds. For example one resident notes,

> But in my opinion, this doesn't work quite as well because it's pain in the butt to take off your gloves, take off your lab coat because you can't be walking around with all that in this space [research commons], then you gotta come out, and then two minutes later, your timer goes off, so you gotta go back in there. So I think that if I were working in that space, that would be a deterrent to my productivity because I would try to think of, "What are all the things that I could just finish in the lab on these days, so that on other days, I don't have to be in the lab at all?" And that's not a very good way to work. It's nice if you're able to do both—to work at your desk on your computer, as well as work at the bench (Participant 11, interview transcript, 2017).

The findings above point to clear differences in members' experiences of proximity and the arrangement of space, a positive experience for those who perceive benefits from increased interaction and awareness of others, and a negative experience for those who experience disruption, changes to routines and a loss of productivity.

Circulation. Circulation enabled through walkways, hallways, stairs and foyers refers to the movement of people in to and around the architectural space. As discussed in the previous chapter the internal central staircase was designed to manage circulation in the building and manage horizontal and vertical proximity. The "generous, drawing" staircase as described by the architects was designed to both draw people to the center of the building encouraging them to take the stairs and possibly pause for an impromptu conversation. The three-story living wall outside of the research commons was designed as a focal point encouraging people to pause on the steps to admire the variety of plants and provide subject matter for informal conversation. Although I found it amusing when

the architect referred to the staircase as a "communicating stair," I observed a resident pausing to have a conversation on the stairway. After attending a public seminar in the building I proceeded down the stairs and observed three of the attendees standing in the middle of the staircase engaged in conversation. I did not stop to ask them what they were talking about so I cannot confirm a potential collaboration but one of the attendees was in fact a researcher in the building and the others were visitors. I myself have paused on the stairway numerous times to converse with others frequently either socially or to discuss work related matters.

Within the research commons main pathways weave throughout the space with movement influenced by entrances, the placement of seating areas, and a row of filing cabinets that demarcate a main pathway from workstations. As noted in the previous chapter, the objective was to deliberately manage the adjacencies, positioning diverse activities next to each other—for example formal meeting spaces next to workstations or informal gathering spaces next to laboratories. The theory according to the architects was that this positioning would facilitate a greater awareness of others' activities and enhance the possibility of conversations occurring. I asked a resident whose workstation is near an external pathway about their awareness of others' activities, who responded, "I don't pay attention. I know they go to lunch, and I know they go make copies " (Participant 20, interview transcript, 2018).

The negative implication to positioning diverse activities near each other however can be unwanted disruption and distraction. As noted previously, where one sits in the space influences the amount of traffic one may experience, hence disruption from others walking or conversing nearby. All of the workstations in the open office are arranged so

that residents' are seated with their backs to the pathway behind them. The consequence of this arrangement is that all computer screens are visible to those walking behind, making it difficult to protect private information on computer screens from others who pass. Residents spoke about the practice of closing their laptops or darkening computer screens when people pass by to protect private information. For some residents not knowing who is behind you when you are seated at your desk can be unsettling, or make one feel like they are in a fishbowl. Additionally, the way the desks are arranged so that everyone sits facing inward with their back to the outside creates awkward conditions for starting conversations as well.

Finally, being seated near busy pathways like around the printing station, shared kitchen and eating area, and exits results in residents experiencing higher degrees of noise and distraction. Because the demarcation between workstation and public area is indistinct, it is necessary to walk through areas that some might consider personal workspace. One resident described walking through the research commons as breathing down the necks of others. Some find navigating the pathways between workstations to visit other residents challenging in that it requires a weaving between others' workstations to reach a desired location. There are certain areas where you can easily travel to the other side of the room and other places where you cannot. In the focus group a student participant described a time when she invited a faculty member guest standing next to her workstation to come around the divider and sit down, but the individual found it confusing to find the entrance despite standing directly next to the area. The student walked around and escorted the faculty member into the space. While some aspects of

circulation appear to have a benefit and provide conditions for interaction, in other cases it contributes to a lack of privacy and increased disturbance.

Visibility and transparency. As discussed in the previous chapter managing visibility was a technique used to encourage interaction based on the belief transparency across the various activities going on in the building would generate greater awareness of and interest in others' activities and contribute to greater interaction. The glass exterior walls provide complete transparency to the outside and as one enters the building you can see residents in the research commons seated at their workstations or walking from one place to another. The views afforded by the glass walls are aesthetically pleasing and some residents have commented on how they appreciate the natural light. The window blinds automatically raise and lower in response to sunlight in the external environment to manage the degree of light in the space. Although not a common complaint, when the automatic blinds are delayed or fail to work it can make it difficult to see computer screens that face the windows. During a focus group I conducted in the boardroom, the automatic blinds were not operating so individuals shifted their chairs around the room as the sun tracked across the sky.

Some residents note the benefits of the enhanced visibility afforded by the open office stating that one can stand at their desk and see across the room to see who is in the space and then walk over to have a quick conversation or ask a question. Some have highlighted increased interaction with and awareness of supervisees, which contributes to higher levels of productivity. "So, we interact a lot more, so the speed of response is much better, so nobody gets ignored, and like I said earlier, there's more accountability" (Participant 19, interview transcript, 2018). Students who work in the research commons

find being visible to their professors beneficial in that it reduces the experience of feeling anonymous some students report feeling with other professors.

Conversely, not being visible has its downsides as well, as one resident described perceptions of not being in the space, “if they don’t see you there, then there’s this presumption that somehow you’re not there, or you’re not available, or you’re not working” (Participant 11, interview transcript, 2017). Another resident described the visibility and transparency afforded by the open office space as “a double-edged sword” on one hand it enables you to see who is in the space and gain immediate access and on the other hand it contributes to increased disruption by others who see you are present and presume you are available (Participant 3, interview transcript, 2017).

Residents who work in the glass enclosed laboratory spaces are visible to both other residents and in some cases visitors to the building. Outsiders looking in to the laboratory create a distraction for some, while others report feeling like they are in a fishbowl and bemoan the lack of privacy. Some residents attempt to reclaim privacy by hanging conference posters on the exterior glass wall, a practice not appreciated by the administration as indicated by one of the participants. Additionally, not being able to control the amount of outside light coming in through the glass exterior walls in the laboratories can present a challenge for some who find that it makes it difficult to observe materials in test tubes.

The meeting rooms in the research commons were designed to provide a solution for those needing a private space to meet with others or talk on the phone, but there are challenges with using these spaces as well. Each room has a glass wall that is open to the research commons making all activities visible to those outside of the room. In

conducting one of my interviews a participant asked to be seated with their back to the glass wall because seeing others walking by outside would be too distracting. Sharing information on the monitors with others is in a meeting can be problematic for some because of the screen is visible to those outside the room. In that the rooms are situated along a frequented pathway, those passing by often look in, including myself. I often looked in as I passed on the way to my workstation to see who was in the meeting room and was curious about the content displayed on the screen. Others report that having to move in to a meeting room in the midst of conversation that suddenly needs privacy is disruptive and triggers the unwanted attention and curiosity of others, suggesting that having a private office would eliminate this attention. While in most instances residents are able to find an available room for an impromptu private conversation, there are times when no room is available, which leads to occasional frustration. The most prominent consequence of visibility and transparency, as well as proximity is a lack of privacy called out by a majority of those interviewed. Some found it to be a mere inconvenience, while others saw it as a factor that decreased their desire and willingness to spend time in the research commons. Residents noted a number of activities that require privacy including working on non-confidential disclosure agreements with clients and research team members, discussing research participant information over the phone, relaying personal information such as credit card numbers and social security numbers, private conversations with colleagues, reviewing student health information, having confidential conversations with students, and other factors that arise in the course of one's work that require discretion. Although the nature of visibility and transparency in the space does

not present insurmountable challenges, it greatly reduces privacy, contributes to perceptions of being surveilled, and increases feelings of frustration.

Aesthetics. Aesthetics, the sensory experience of either the natural world or human made artifacts, did not appear to play a significant role in residents or member experiences of the physical space. Since I did not explicitly ask about aesthetics in the interviews what follows are reflections on the subject in the few instances where residents and members overtly called it out as having some relevance for their experience. Not surprisingly, because an aesthetic experience is highly subjective there were both positive and negative remarks about sensory aspects of the physical structure.

A number of those interviewed noted how aesthetics plays a positive role in bringing in the outside in and attracting others to the building, to programs, as well as the university at large. One noted how the building had become an attraction on campus, in particular for donors,

> And because it is a beautiful new building, people [want] come here to showcase it. When other donors from other places come here and they see nice buildings, they're more excited then be involved or to give, even if it's not to us (Participant 2, interview transcript, 2017).

Another noted how open houses or showing photos and videos of the facility to outsiders generates enthusiasm for both coming to the building and participating in programs. One member who is primarily a bench scientist described the demotivating experience of previously working in a dilapidated lab that caused embarrassment and impacted the willingness to bring outside collaborators in to the space. The resident speculated that the aesthetic aspects of the laboratory spaces could have a positive impact on collaboration stating, "So, the Institute I think would foster [collaborations], because we'd sort of be proud to have people come. It's just a beautiful building. It really is

(Participant 14, interview transcript, 2018). Members also note their pleasure with having an aesthetically pleasing meeting space and have deliberately moved some of their meetings previously held in less attractive spaces in to the building. Others see the aesthetic aspects of the space as a personal benefit, "The building itself is gorgeous. So I feel really happy to be here just because it's a nice setting. And I think that that can lift spirits in a workplace. It's a beautiful, brand new building. So that's a benefit as well" (Participant 17, interview transcript, 2018).

However, in some cases where residents perceived that aesthetics were prioritized over function, sentiments were less positive. For example some residents expressed frustration with the laboratory space "so, the labs are beautiful . . . but they were designed by a design person, not in consultation, or serious consultation, with actual users" (Participant 14, interview transcript, 2018). Another remarked how visitors to the lab space say, "'Oh, how beautiful and gorgeous!' But I just say to myself, 'What an inconvenience this place is'" (Participant 10, interview transcript, 2018). Similar comments were made about the research commons in relation to the lack of storage "It's just too aesthetic . . . They went for aesthetics and not functionality" (Participant 25, interview transcript, 2017). In speaking about the overall building another resident stated, "A little less minimalism. Because it feels like some things are a little bit too simplistic. Like even just trying to find the bathroom, since they hid it away" (Student Participant, focus group transcript, 2017). This tension between the aesthetic, symbolic, and instrumental (Elsbach & Pratt, 2007) or functional (Strati, 1992) aspects of the workplace has been noted in the literature.

Generating energy. One idea advanced by the architects was to design the building in such a way as to both facilitate and balance activities in the space to create a feeling of energy, bring the facility to life, and by extension generate interactivity. As one resident noted, the building as a whole generates energy in that it, " . . . does foster conversation, and collaboration, and meeting people" (Participant 2, interview transcript, 2017). The building provides a venue for various events that bring the public and others from across the university together bringing the space alive and providing an active central hub for the campus. One resident reported hearing from others how people from other campuses "go out of their way to come to the building" (Student participant, focus group transcript, 2017). The various spaces in the building generate differing levels of and types of interaction. For example the restaurant area on the second floor can be described as a space that generates more energy in terms of interaction, than the research commons on the third floor. During my time embedded in the site I watched the public areas on the second floor transform from a somewhat active area to one in which all tables and chairs are occupied with residents, students, and members of the public during the busy lunch time hours. Near the end of my time spent in the space, diners would sometimes resort to sitting at a table with strangers just to have a space to eat their meals. Residents of the building view the restaurant as a valuable space that offers an informal meeting space for interaction with other residents and outside visitors. One resident described the environment as a space that contributes to Brownian motion—a concept originating in botany that describes the energetic movement of particles suspended in liquid. Another resident attributed a boost in productivity to having the restaurant in the building more so than the experience of working in the research commons on the third

floor. Some have noted how the restaurant has transformed the campus as a whole in that it draws students who take classes, use the student health center, or participate in programs in the building as well as others from across the campus and from other campuses at the university. Students described how they appreciate the opportunity to have informal conversations or share meals with their professors they see in the space.

A number of residents also see the research commons on the third floor as facilitating informal interaction stating, "So, I guess it's easier to interact with others when I'm up here, and I'm getting up from my desk and go to get some water or something, walk by, smile, say hi versus being stuck at an office somewhere" (Participant 15, interview transcript, 2018). Others note how interactions are more fluid than would be in an environment where people have private offices, stating

> "People are pretty willing to just walk over to your desk when they know you're there and pop in. I think people sometimes are hesitant to walk into an office or to knock on the door and that type of thing. But here, people just walk up. So, I think the interactions are much more fluid than they would be in an office with doors and that type of thing" (Participant 3, interview transcript, 2017).

According to residents, being in the open office space enables them to learn information about subjects outside their discipline, accomplish business goals more easily, ask questions of people they would not normally have access to, more quickly receive responses and resolve problems that would in a traditional academic office environment typically be addressed through multiple emails, phone calls, or text messages if. As a member notes,

> I think the main thing that really just comes to my mind is the availability to make connections here. If I have a problem or question, I'm popping over to other people's offices, and maybe I've never worked with them before, but they may be an expert in that field, and I might just have a question that could help in whatever I'm doing. I think that that's the most valuable thing that I've come across (Participant 17, interview transcript, 2017).

Students also find it easier to ask questions, seek help or interact with faculty or graduate students whom they would not normally speak to. As one student noted, "Certain barriers are just broken. Like, you wouldn't knock on someone's door in a regular office building just to talk to them, but if you're both going for the coffee machine, you end up talking, and you just see them as another person" (Student participant, focus group transcript, 2017).

Some however believe the open office space in the research commons generates negative energy, in that it creates more issues than interactions. As one member indicated there will always be interaction, "but are those productive interactions, or are they disruptive interactions?" (Participant 11, interview transcript, 2017). Others find the space encourages frequent interruptions that hinder their productivity. One resident stated "I wish we had a red light, green light on top of our stations, which said, 'Stay away.' Just because I'm sitting there with my back to you, doesn't mean I wanna talk" (Participant 7, interview transcript, 2017). When I asked another resident if the physical space ever interferes with the ability to accomplish work the resident spoke of interruptions as the most obvious one:

> It happens all the time. When I'm in the midst of really on a roll, it never fails that someone will be hovering ready, wanting to talk and then what happens—and science supports this—is I step away and then it takes me ten or 15 minutes just to get back into what I was doing and I will sometimes not absorb what I pulled myself away to focus on as well because I'm thinking, "I gotta get back to this other thing that I was really on roll on. So, that's frustrating and it takes a bit of social grace to either say or fortitude to say, "Give me five minutes. I know you want to talk now because you're standing right there, but I can't. I'm on a roll. This is important and I'm doing well on this. Can I get back to you?" So, that's the hardest part about the way things are set up here (Participant 8, interview transcript, 2017).

In contrast however, others indicate having a different experience noting a complete lack of interaction among some residents as illustrated in this comment, “The dude’s been sitting next to me for two months, and we didn’t say two words to each other,” because, one, you don’t want to be interrupted because you’ve got stuff to do, and two, you literally have nothing in common” (Student participant, focus group transcript, 2017).

For other residents the research commons on the third floor is not the place for social interaction. As one resident stated, “I don’t eat lunch up here just because I don’t wanna sit and talk with people. I just wanna get out, have my lunch, and come back. Plus, I don’t wanna have lunch in the same place where I work at” (Participant 7, interview transcript, 2018). Others concur stating they are here to work, not to socialize. Another stated, “Downstairs is where you socialize. This is the work floor, and where you socialize may be over at the lunch area, but downstairs is where . . . if you want to socialize” (Participant 23, interview transcript). Clearly there are differing assumptions about what the nature of interactions in the space ought to be, as will be addressed in chapter seven.

This leads to the final findings regarding the ways in which the physical structure enables or constrains the pursuit of interdisciplinarity. I argue that having an awareness of others is a precursor for generating energy and productive interactions. The following considers the degree to which residents are aware of other members, who they are and what they do. This was not asked directly in the interviews, but rather the topic emerged multiple times, with significant variation across members as to the degree to which they were are aware of others. As discussed earlier, transparency and visibility was

manipulated to increase the awareness of others with the intention that it would contribute to serendipitous interaction collaborative activities. One resident confirmed this idea noting how working in the building makes her activities more visible to others and generates interest in the programs she runs. Another resident describes getting to know other residents working in other disciplines as a positive and easy experience that has contributed to collaborative activities. One resident who supervises doctoral students has experienced an increased awareness of supervisee activities since moving into the building, noting that they cannot "hide" in the space and therefore the group as a whole is more productive. Another resident describes getting to know others, partnering with some residents, and being able to mentor new incoming people who are interested. Finally, social events such as the holiday get-togethers were described as providing opportunities for social interaction that increases awareness of others in that through interaction people learn more about others and what others are doing.

Conversely, there are differences in the degree to which some residents are aware of others. As one resident notes,

> Well, I would love to have a little more interaction. While we're physically in a building where we're all co-located, I don't sense that there's a lot of interaction other than occasionally at the lunch table or I'm starting to see conferences or I don't know what they're called—seminars or something—that are interesting to me that I go to. I honestly couldn't tell you if those folks are part of [the institute] or not. They're held in the [institute] building, but I don't know if they're [institute] people. But it would be nice to have some sort of thing that builds a sense of community as [the institute] (Participant 8, interview transcript, 2018).

Another remarked how it was strange that after being in the institute for one year the resident only knows a few people, primarily limited to those individuals frequently seen in the laboratory space. The resident found this unusual because it contrasted with previous personal experiences working in a much larger organization where it was typical

to know everyone. The resident attributed this experience to cultural differences, believing that people from this geographical area are more private.

> I don't think people talk. I don't know that it's necessarily an [institute] thing. I honestly feel like it's a New Jersey thing. I lived in the south for a lot of my life. People smile, and say hi, and have conversations, it's okay. Up here, you don't even make eye contact with people, and so that I think permeates the entire area (participant 15, interview transcript, 2017).

When I asked one resident about the percentage of people he/she knows in the research commons the answer given highlights the limited awareness of others some experience:

> It's hard. It's funny. The people I know, I'm probably like 65 or 70 percent. People I interact with, maybe like 90 percent, but I don't know who the hell they are. So, I say hi to everybody and whatever, but I couldn't tell you what they do or what their name is in many cases. So, I would say people that I actually know their names and what they do, probably like 40 or 50 percent at best because we don't do much with the Ocean group. I don't know any of them. I talk to them, but I don't know who they are (Participant 19, interview transcript, 2017).

Student residents in particular desired greater awareness of others, as one remarked, "But I feel like one downside is that I don't get to—I don't know what the distribution is of people from different departments in this building . . . And I love the fact that we do interact with different majors, but I feel like that could definitely be something that would be greater" (Student participant, focus group transcript, 2017). Another student added, "It's weird not knowing who's here, like who is who, because we're always here. And it's like, we're working with a bunch of strangers (Student participant, focus group transcript, 2017). During an interview with a resident I expressed surprise that there were so many people in his/her research group that I was not aware of. He/she responded, "And there are a lot of research folks on this floor. And I think the fact that you don't realize it, is one of the problems of the way that the space is structured. It's

a little bit scattered (Participant 11, interview transcript, 2017). In speaking about the laboratory space in particular and the awareness of others a resident noted how they do not know the names of other people working in the laboratory space, and that some members of lab groups do not seem to interact with members of other lab groups. In discussing awareness of what other residents do and the programs they oversee an interviewee notes, "I know there's some sort of program. I have no idea what it is; who does it. I know [name] is in charge of it. I have no idea what these people do. I have no idea who they are. I don't think I could even recognize anybody that is here. We're completely disconnected" (Participant 11, interview transcript, 2017). Similarly, a resident wished for some kind of regularly scheduled interaction stating,

> There's a lot of people here that we see all the time that we don't know. I think it could be enhanced if we had maybe a bimonthly just [institute] meeting of some sort, a half-hour, everyone comes or whatever. I feel like the best discussions sometimes take place "over the water cooler" and we don't get that because even though it's open, we're in a little area and sometimes we only know the people right next to us (Participant 18, interview transcript, 2017).

Clearly there are differences among residents regarding the degree to which they are aware of others, who they are and what they do. The matter of awareness of others is addressed in greater detail in chapter seven.

Other Matters of Space

Residents cited other matters concerning the physical environment as working well or contributing to their annoyance or disruption, for example the availability of space for working, storing materials, or holding meetings. Some residents report having plenty of available space to do their work and describe their environment as flexible and uncluttered, while others report a lack of space and have difficulty storing materials needed for their work. Those who have limited space develop workarounds such as

storing supplies in other buildings or in spaces occupied by other residents, or negotiating with others for access to more space. In some cases the lack of space results in a need to go back and forth between buildings or disrupting other residents to access supplies. There is a perception among some residents that the lack of available space will ultimately constrain the growth and productivity for some research groups. Although, administrators recognize the space limitations and have sought ways to remedy the constraint, perceptions of differences in the amount of space allocated to some and not others creates a point of contention. In addition, the availability of meeting space can be problematic at times. As groups grow in number some need to move to larger meeting spaces in other buildings for their regular meetings. Also, for scheduled meetings there is no system for reserving the space ahead of time, so residents use workarounds such as posting notes on the door indicating when they will need the room. One resident who was waiting in a large meeting room for other attendees to join, was asked to move to a smaller room so another group could use the room. The need to explain that they were waiting for other people to join was viewed as an annoyance as indicated by the resident. Having to move to a meeting room for phone conversations can be inconvenient as well. Some noted needing information that is on their computers at their workstations so they need to write down or print out information before moving. Others find it disruptive to take a call at their workstation only to have to call back once they have moved to a meeting room.

Finally, the idea embedded into the design of the building was that would be a multi-use flexible space. For example, when symposia are held in the building the space outside the large meeting room adjacent to the restaurant on the second floor is used as

dining a venue for attendees; and walkways outside of the research commons on the third floor are used for poster sessions. Although this was not a common objection, some residents describe this flexible use of space as less than ideal because these events sometimes disrupt the use of the space for others in the building. As noted throughout the above section there are clear differences across members' experiences of the physical environment. Table 5.1 offers a summary of the positive and negative stances residents take concerning the physical environment.

Table 5.1 The Physical Environment—Summary of Positive and Negative Stances

Category	Positive Stance	Negative Stance
Proximity: Two or more individuals being in the same location, creating an opportunity for communication	● Opportunity for face-to-face with new people ● Social, advisory, and collaborative interactions ● Communication is easier ● Exposure to others from different disciplines ● More quickly resolve matters ● Reduction in miscommunication and misunderstandings ● Reduction in uncertainty as to how to act in the space ● Getting to know people	● Increase in noise distraction and disruption ● Intellectual isolation ● Decreased awareness of what goes on in home department ● Infrequent interaction with home department ● Increases in unproductive interactions
Arrangement of Space: The positioning of artifacts and placement of activities in the building	● Comfort working in the space ● Being collocated with work group members	● Requires a change in work routines ● Increase in noise distraction and disruption
Circulation: The movement of people in to and around the architectural space	● Connection and cohesion between buildings ● Facilitates interaction	● Increase in disruption and distraction ● Feelings of being surveilled ● Lack of privacy
Visibility and transparency: Being able to see something or be seen;	● Contributes to awareness of others, which contributes to productivity	● Increase in disruption and distraction ● Lack of privacy

unimpeded visibility	● Quicker resolution of problems ● Reduces feelings of anonymity	● Feelings of being surveilled
Generating energy: Stimulating activity and interactivity	● Draws people to the building ● Increases in informal interaction boosts productivity ● Easier to ask questions and receive responses quickly ● Learn new information ● More easily accomplish tasks ● Resolve problems more quickly ● Receive help	● Increase in disruption and distraction ● Unproductive interactions ● Lack of interaction ● Silence
Aesthetics: A sensory experience of either the natural world or human made artifacts	● Attract others to the building or programs ● Increases the willingness of members to bring collaborators in ● Creates a pleasant working environment	● Perceptions that aesthetics take priority over functionality

Chapter Five Summary

To conclude this section I will return to my research question. How does the physical structure (e.g., architectural layout enable and/or constrain the pursuit of interdisciplinarity? As this chapter shows there are both positive and negative aspects of the physical structure. It enables residents in the following ways: 1) being in close proximity allows for social, advisory, and collaborative interactions such as learning about others' personal lives and professional interests, seeking and giving advice, accomplishing joint tasks such as managing existing programs or developing new ones, joint conference planning, and generating ideas for research collaborations. The increased face-to-face interaction can result in fewer misunderstandings and miscommunication

and enables residents to resolve problems quickly and makes interaction easier; 2) the aesthetics aspects of the building create a pleasant working environment and generates interest in wanting to come to the building and participate in programs; 3) transparency allows residents to see who is in the space to have quick conversations, contributes to greater accountability among work groups; 4) circulation between buildings is effective for creating a functional and symbolic connection among buildings; 5) the public dining provides a venue for bringing people from across the campus and the university at large together. The dynamic environment is viewed as a positive place for informal interaction and helps create a central hub for the campus.

However, as indicated at the beginning of the chapter, the physical environment can have both positive and negative consequences and achieving a benefit in one area typically requires a tradeoff in another (Elsbach & Pratt, 2007). The ideas put forth by the founders and designers articulated in the previous chapter are not always taken up in practice as intended. The consequence for some residents is a negative response to the realities of the workplace—transparency and visibility contribute to the loss of privacy, proximity contributes to frequent disruptions. The conclusion to be drawn here however is not that they fail to accomplish their goals, rather residents experience frustration and expend energy creating workarounds and dealing with disruptions to work processes. Most notable in the findings presented here is a limited awareness of other members—who they are and what they do.

In chapter seven these design techniques are discussed again and I use the principles of language and interaction as a heuristic device to enrich our understanding of the nature of these tensions. Additionally, tensions arising from members' different

experiences of the physical environment trigger a need for resolution. However, as is evident in the following chapter the residents and administrators struggle with how to address such problems and competing ideas, about communication in particular, generate tensions. The findings in the next chapter examine these tensions more closely to understand how problems are addressed and potentially resolved through communication design work.

CHAPTER SIX. THE OPENING OF A DISAGREEMENT SPACE

> I'm still learning the culture. I always default to being straightforward and candid and open. I don't know if that's the default for the culture here – I'm still learning that – and I don't know if the culture is one that conflict or disagreement is hashed out one-to-one or if it's escalated to say [the director] to solve problems or if problems are solved at the individual level. I don't know (Participant 8, interview transcript, 2017).

The previous chapters offered an overview of the administrative and physical structure, the members' experience of the physical environment, and they ways their activities are enabled and/or constrained. This chapter examines how residents and administrators deal with tensions that arise concerning the sharing space and managing common resources, revealing the limits of the design theory advanced by the founders. Consistent with Nicolini (2009) call for researchers to zoom in on "the local accomplishment of practice," this chapter brings attention to a single instance of communication design—a meeting called to collectively address problems related to organizing for interdisciplinarity. As an exemplar of communication design, the meeting reflects the *techné* of communicative practice revealed in the choices groups make concerning how they should communicate and the implementation of these choices to achieve individual and shared goals (Barbour et al., 2018a) as well as *praxis*, the collective working out of a shared understanding of the kind of communication that is deemed valuable (Craig & Tracy, 2014). It sheds light on the ways in which the intersection of the physical structure, routines and rituals, and administrative structure generate points of contention that are worked out through communicative activity. As Forester (1992) notes, ordinary conversation and action can "be extraordinarily rich. What passes for 'ordinary work' in professional-bureaucratic settings is a thickly layered

texture of political struggles concerning power and authority, cultural negotiations over identities and social constructions of the "problems" at hand" (p. 47).

In taking the analytical approach outlined by GPT this chapter reconstructs an aspect of practice by articulating the communicative problem, the techniques proposed, and the situated ideals to better understand the kind of communication that is deemed valuable (Craig & Tracy, 2014). What becomes evident in the analysis presented below are the various ideals implicitly and explicitly stated, reflected in competing logics of communication or means-to-ends reasoning concerning how to address and resolve problems and disagreements. These include a community rule logic promoted by the administration and a dedicated decision maker logic endorsed by a number of members, which reflect differing beliefs concerning the way communication works or ought to work in organizing to achieve interdisciplinarity (Aakhus, 2007; Barbour et al., 2018a).

Dilemmas Arising in the Laboratory

Whereas chapter five examined a number of challenges arising for residents primarily in the research commons, this chapter expands the case and provides greater context for the analysis that follows by attending to matters concerning the shared laboratory. This further illustrates how the features of the physical environment, which carry presumptions about interaction, generate a need for the collective working out of the conditions for communication.

The laboratory space. The institute has two separate wet laboratory spaces, which reflect current trends in lab design characterized by open space, modular furniture and shared equipment to encourage interaction and collaboration (Hock, 2015, June 4). Wet laboratories generally accommodate research that involves working with various

chemicals, substances or biological material. The first floor laboratory resembles a conventional arrangement in that a single research group occupies the full laboratory space and functions as one of the institute's four research centers. In contrast, the laboratory space on the third floor adjacent to the research commons is a shared space occupied by multiple research groups. It is a flexible and modular laboratory with forty-eight bench seats designed to accommodate six to eight research groups. An essential aspect of its design is that the space can be easily reconfigured to meet changing programmatic needs. The amount of space allocated to a particular researcher or research group is designed to expand and/or contract based on fluctuating needs of research programs. For example, if a researcher acquires a new contract or grant, the expectation is that more space would be allocated to meet the needs of an expanding program. Conversely, research programs that become less productive for whatever reason are expected to forfeit space. However, a key constraint in the shared laboratory is a limited availability of storage space, a challenge recognized by the administration, which has attempted to remedy the situation by providing additional storage.

The shared laboratory provides both a space for researchers to conduct their work as well as providing an intentionally designed environment to influence the ways members relate to each other and the work they do. For example, the need to share equipment, resources, and space creates conditions where laboratory residents must interact and resolve differences in the conduct of their work. The objective underlying this design rationale was that the sharing of space and resources would enable residents to have greater awareness of others' work, potentially leading to interdisciplinary activities. The following section examines how the routines and rituals of practice intersect with the

material aspects of the laboratory, which results in tensions members seek to resolve through communication.

The following section presents two scenarios drawn from interview data that highlight a challenge related to working in a shared laboratory space. A resident describes an early experience as a new member. In attempting to find space to store supplies in the share laboratory, the member perceives the task to be challenging because of the lack of available space and an unclear process as to how to acquire space. The member describes making multiple face-to-face requests of other lab residents to use some of the space to store supplies only to be denied each time. The resident states, "At beginning, I was new and it was like I was a nobody in the lab. So it was really difficult" (Participant 16, interview transcript, 2017). The problem was eventually resolved when the resident's supervisor intervened in the matter and secured a bit of space. The resident explained how it was unclear what things were shared and what were not in the laboratory. For example, learning that each research team must have separate containers for biological waste, after being reprimanded by another laboratory resident. In an interview the resident commented, "From my opinion, it's an open space, the lab, but it's not a sharing space" (Participant 16, interview transcript, 2017). Nevertheless, over time the resident became more familiar with the norms around sharing, finding out from other lab members which equipment is shared and asking for permission to use equipment when needed. As the new resident became better acquainted with the other members the experience of working in the laboratory became less challenging, stating, "Now it's really easy. I just talk with them and they explain [to] me" (Participant 16, interview transcript, 2017).

Similarly, another member describes an early experience of working in the space:

> "So, the director brought me in the lab and said, 'Okay, this half bench is all yours,' but then to get something up and running we need more than half a bench, like we need some space to store our glassware and things like that. And I tried to ask around here where can we get the space to do that and they say, 'Oh, talk to the other PI'" (Participant 24, interview transcript, 2017).

As supplies and equipment continued to arrive the new resident stockpiled the materials on the assigned half-bench until being reprimanded by other lab members. Unsure what to do, the resident went to the administration with the dilemma and was told to address the issue directly with the other lab members. Eventually, another laboratory resident recognized the dilemma and offered to make some room to accommodate some of the supplies. Still not having sufficient space, the new resident moved the remaining supplies to another building. In describing this experience the resident stated,

> "So, I don't know—well, my impression is, after all this is a shared lab but there has to be someone who is in charge of the whole lab and this person should be someone that I should talk to if I have problems, not that I try to go to negotiate with the neighbor next to me" (Participant 24, interview transcript, 2017).

The purpose of presenting these brief scenarios is to highlight a practical dilemma that members encounter in the course of their work and the ways in which the routines and rituals of practice intersect with the physical environment. For example, the practice of sharing in the space is ambiguous and therefore needs to be worked out moment-by-moment, and the practice of negotiating with other lab members for space is not a normal practice for some lab residents. Such matters result in the opening of a "disagreement space" (van Eemeren et al., 1993, p.95) and a breakdown in organizing processes that members seek to resolve through communication. These two scenarios provide background for understanding one aspect of laboratory practice and the approaches taken for resolving differences foreshadow competing ideas about communication. For

example, the director expressed surprise over continually being called on to mediate matters concerning the sharing of space and resources. As one resident explained, "The PIs [principal investigators] need to get together and work as a community in the open space and ebb and flow, and decide amongst themselves how they can accommodate each other" (Participant 4, interview transcript, 2017). This brief example illustrates how the administration and laboratory residents have competing ideas as to how communication works in the management of issues related to the physical environment. Ultimately, being that members were not willing or able to adequately work out these dilemmas, the administration intervened by calling a formal meeting with some of the residents to collectively address problems concerning the management of the physical space. Meetings, as a form of communication design, afford collectives a way to intervene into practical activities (Aakhus & Jackson, 2005). Just as the building is an intervention into interdisciplinary activities more generally, the meeting is an intervention into a subset of organizing activity that structures and organizes interaction in specific ways. For example, it focuses attention on particular tasks, highlights certain issues, attempts to place boundaries around topics, and affords certain rights and obligations for participants (Schwartzman, 1989, p. 61). As Craig and Tracy (1995) note, examining the communicative problem practitioners face and the techniques used to address problems, the normative dimension of a practice is revealed (Craig & Tracy, 1995).

A Disagreement Space over Managing Space

The following section examines a single meeting in which a subset of the institute's membership assembles to address problems arising from aspects of the physical structure and the ways it complicates organizing for members of the institute. As

the account below illustrates, the discussion expands beyond just matters of the physical structure, as members also grapple with the rights, obligations, and entitlements of organizational membership. It is evident in their discussion that despite the well articulated theories concerning how organizing would unfold at the institute, various aspects of have yet to be formalized or remain ambiguous for members requiring members to work out these impasses through communication design work.

Setting the context. In response to tensions arising from the physical environment, the institute director convened a meeting with ten resident members including administrators, center directors, program directors, and laboratory principal investigators. Residents who were present represent those who conceivably have greater degrees of decision making power than those not invited, such as research associates, and graduate and undergraduate students. The meeting was held in the large boardroom located outside of the research commons on the third floor. For me, it was a spur of the moment invitation from the director to join the meeting, but clearly it was a scheduled event for the other attendees who had already assembled by the time I arrived. I was invited under the condition that I sit at the back of the room, observe but not participate. I entered the room with the director who took the seat at the head of the table, where he frequently sat in other meetings I had attended as I proceeded to the back of the room.

The director began the meeting by introducing me to the group, explaining that I was asked to join the meeting in that my research focused on the institute and the director's work. He assured the other attendees that if anyone was uncomfortable having me in the room that I would be asked to leave. I interjected and explained to the group how my dissertation research concerns issues of organizing and space, echoing the

director's assertions that I would leave if asked. The attendees looked somewhat uncomfortable but no one outwardly objected so the meeting commenced.

Setting the frame. The director began by asking a rhetorical question, 'Why are we here and where are we going?' He announced to the group that he would "start with a couple of framing remarks." The first issue presented focused on finances and a number of financial restrictions the institute was facing. Again the director asked a rhetorical question, 'where's the money to do everything we want to do?' The director assured the group that all centers and programs were currently funded and provided a brief financial overview that touched on incoming and outgoing funds, and restrictions on how funds could be used. In calling out finances to start a meeting about the management of space, the director called attention to the way resource constraints placed boundaries around the approaches for resolving problems that would be recognized as appropriate. That is if any of the proposed solutions required money the director would need to go to others for additional resources, which would likely be denied because of current constraints.

Managing membership. The director shifted the meeting topic to the addition of a new resident who would be joining the institute in a few months along with two research team associates. The new residents would likely need a half bench in the lab and three workstations in the research commons. The director indicated that there was some uncertainty regarding the new members needs and whether or not the institute had made a long-term or short-term commitment of support because the offer had been negotiated through the senior leadership. Understanding that the availability of space was likely a concern for the meeting attendees, the director added that a temporary group occupying space at the institute would likely be vacating next year.

This presentation of financial and space constraints prompted a member to state how this matter opens the door to a dilemma—the idea of what people do here, how it relates to the goal of the organization, and how long they stay here. The director agreed and said if there were a lot more space this would be less of an issue, but reassured new faculty that they will stay until they get tenure. Another member asked if there had been any thought given as to how decisions will be made, and how to handle people who are 'not pulling their weight,' for example those who no longer have funding. The director stated that there are no good answers and added that the way he sees it 'use it or lose it.' In response, a member added that there is an issue with those who come to the institute. There are those who fit with the organization and the mission so there is a benefit to having them in the space—for example the new resident soon to join; but for groups like the temporary residents whose research is unrelated to the institute's mission, they should be asked to leave. The member attributed the institute's failure to ask them to leave to being 'nice people' who cannot say no. The member went on to bemoan the ambiguous and confusing way space is assigned throughout the university—by person, by square foot, by usable space. He noted how the institute has an opportunity to do things differently, to allocate space more efficiently. The director concurred, adding that there is a degree of complexity with the management of space in that it is fraught with issues of hierarchy and matters of tenure.

A proposal for resolving differences. At this point, the director advanced an approach for resolving differences regarding managing space and resources by stressing his commitment to collectively addressing issues, adding how he prefers not to be forced to rule on the matter or act as 'Solomon.' The director offered his 55 years of experience

working around labs and dealing with lab issues as evidence for his belief in the group's ability to make decisions, adding that the group has the necessary maturity to collectively resolve issues. Reiterating a desire for collaborative decision making, the director argued for discussion, open discussion, and even heated discussion. He explained that if the group could not come to a collaborative decision he would resort to a dedicated decision-making model, an approach that involves seeking input from everyone individually, reflecting on the recommendations and ultimately making the final decision. If unable to make a reasonable decision for whatever reason, the matter would be taken up with senior leaders as a last resort.

Ideas for managing space. The director continued by framing the issue at hand not as a matter of enough available space but rather how residents should be arranged in the space. He stated that it is time to make a decision asking a rhetorical question, 'do we believe it's better to create clusters or scrambling a mix of people.' He argued that scrambling residents in the research commons reflects the ideals of interdisciplinarity. In response, a member argued that there are other considerations—not just a matter of positioning in the space, not just who is around you, but also their activities and what they are doing. The director agreed, but failed to take up the matter and instead redirected the discussion back to the original choice by posing the same rhetorical question, 'but do we want to be split apart or clustered?' He provided evidence for the benefit of scrambling, noting how having the administrative staff spread across the research commons enables a greater awareness of 'the pulse in the space.'

At this point another member interjected, not by addressing the director's question or taking up the other member's contribution to the discussion, but instead noting how

the decision making approach the director was advancing was as a radical proposition. The member went on to contrast the institute's collective approach to managing space with the university's practice of not making waves by just waiting until someone retired. He went on to describe the institute's approach as a 'radical socialistic consensus process.' The director responded by stating that they are focusing on why people are here, and that the programs should drive decisions about who is at the institute. The member responded by noting however that there is a lack of clear criteria for the process and while the collective approach is a worthwhile experiment, future changes in leadership could result in the abandonment of the process altogether.

A number of matters in the scenario above are important to note. First, the topic, how to arrange members in the space, is framed by the director as a binary choice—clustering or scattering—essentially cutting off the possibility for other ideas to emerge. For example, perhaps some groups might prefer clustering, while others might not, nevertheless the way the matter is framed eliminates the consideration of other approaches. Additionally, in appealing to the ideals of interdisciplinarity and the founders' practical theories about how this could be accomplished through the arrangement of space, the director provides evidence to support his preferred approach, while the contributions of some members were disregarded. Also, notable is the argument made by the director that programs would drive decisions about residents and membership at the institute. This contrasts with the approach taken early in the design process where members drove decisions about the programs that would eventually become part of the institute as noted in chapter four. It appears that overtime programs gain greater visibility and become reified in the organization resulting in less

consideration given to individual members and their needs. Finally, the assertion made about collective decision making in matters of managing of space is considered 'radical' highlights the challenge this organization faces with regard to innovating organizing processes against the backdrop of conventional institutional practices.

Surfacing tensions. At this point in the meeting a member interjected by expressing frustration and a feeling of powerlessness stating, 'I am confused, it's unclear as to what has been decided. There should be a decision. If you have a cluster you were lucky. I want a formal setup, a formal decision.' The member added how being at the bottom of the hierarchy affords little power or say in these matters. The director responded to the confusion by clarifying that no decision has been made and how decisions should be made carefully, restating his desire for the group to collectively work through the issues, to understand member needs, and to develop a process for realizing those needs. He then added that no changes in the arrangement of space would be made until the temporary group vacates, otherwise non-members would be influencing the group's decisions. Another member interjected stating that there is a need for more information concerning members' needs, problems and annoyances, the nature communication and interaction, and what is working or not working. In response, a member agreed with the points stating how talking is good, but argued that eventually talking should materialize into something. The director interjected stating that this is an exercise in process and at the very least everyone is at the table talking. He proposes that the group needs to have a number of proposals on the table, review the proposals, and then determine if they are ready to make a decision.

Eliminating hierarchy. The topic of the conversation shifted again when the director calls out the clustering question noting how it raises questions about the arrangement of workstations and how this should reflect the ideals of the institute and the goal to eliminate hierarchy. He noted how organizing programmatically helps to flatten hierarchy, but in separating student workstations this ideal is contradicted and does not reflect the spirit of the organization. From his perspective students bring value to the programs and therefore it is preferable to have all workstations identical, arguing that the arrangement of the student space contributes to an unconscious bias. A member responds by asking if the space can be rearranged, but the director responds by citing the earlier discussion of financial constraints. Another member interjects and refers to the institute's logo on the wall, a cluster of six differently sized and colored overlapping spheres that resembles a grouping of molecules in motion. Pointing to the logo, he reminds the group of what they are attempting to accomplish, to operate without hierarchy. The director does not respond to the comment but redirects the conversation stating that he is comfortable that there is a process to figure out the space issue, but he says is still not comfortable with the lab question.

Being in the space. The director then redirects the topic of the conversation to focus on the laboratories calling out questions regarding who should stay, and how to make the case when it is appropriate for members to stay. He states that for the moment the institute can accommodate the new member previously discussed, but that there would be no additional lab members for now. However, the matter of the laboratory is not taken up by the group, instead a member asks how can we best accommodate a mix of a physical and virtual community, suggesting hoteling or flexible workstations that are

assigned for the day (Participant 23, meeting notes, 2017). Another member highlights how many of the members are rarely in the building, asking ‘what do we do with AWOL people and space? Do we set up some kind of shared workstations?’ (Participant 11, meeting notes, 2017). In response a member adds, ‘if you are not here at least three days a week, then you don’t need the desk, maybe you have a shared workstation’ (Participant 19, meeting notes, 2017). The conversation then turns to how university policies and space allocation impacts how frequently members are in the space. A member argues that residents are sometimes forced to choose between spending time at the institute and losing their office in their home department and asserts there is a need for a clearly articulated process about space allocation. Another member blames the issue on the university financial and budgetary model where units are responsible for managing their own revenues and expenditures. The member adds that this deters people from being part of the institute because if people are spending too much time in the building there is a concern that they their home department office will be taken away.

A member returns the discussion to the matter of clustering, arguing that clustering works and mixing teams does not, stating, ‘we are not here for social interaction, we are here to work with people’ (Participant 19, meeting notes, 2017). The member continues by stating how the institute has to make it attractive to be here and make people feel welcome, adding that maybe it is a certain type of person that works well here—noting how currently people are snarky and there is a lack of collegiality, concluding with it has worked in the past but it is just not working right now.

Making sense of the matter. The director takes up the comment about collegiality and makes sense of the matter by offering a metaphor. He likens the current situation to

the heating of gas molecules that increases the pace in which molecules vibrate and bump into each other. He suggests that the organization is going through changes and the result is the surfacing issues. Again the director reiterated a preference for the members of the institute deal with the issues collectively instead of going to the senior leadership and echoed the importance of making people feel welcome at the institute. He noted again that no one would move until the group has more information and then identifies two matters as being the top concerns—program clustering and the use of the student cubicles. A member then responded by arguing that the needs of existing members should have priority over new members. The director responds by saying it depends on whether the new member is going to be a permanent or temporary residence. The member reasserts that the existing members should have priority for rearrangement, but the director once again calls out the preeminence of programs over members, stating that the programs are the priority.

Arranging space. The conversation is redirected again, returning to the matter of arranging space when a member asks where residents with no other group members should be situated geographically in the space. Another member interjects how being in close proximity and having a sightline to the laboratory is essential. The director agrees that functionality is important, but the topic switches once again to the arrangement of the huddle spaces, with a member describing them as all over the place and not being used effectively. In response an administrator reports that they are not being used much at all. Another adds that the ability to stand up and see people who you are working with to have a quick conversation is important. The director expresses agreement, noting how he also likes to be able to stand up to see people. However, he redirects the topic again

stating that there is a need for creating more meeting space. In response a member calls out how the meeting room designed as a lounge space, 'looks cool,' but that it does not work. The topic returns again to the huddle spaces with a member stating how the way they are arranged now requires people to get up. The member proposes that there is a need for space that facilitates 10-second conversations, arguing that it would be better to have research groups in the laboratory so they could easily have 10-second conversations.

As the meeting begins to wind down, the director summarizes the discussion noting issues of proximity, functionality, programs not in labs, and then introduces a topic not previously mentioned, the need for space for a newly implemented program. A member adds that the challenge is how to partition groups while still taking advantage of the strengths of the space. Another member agrees noting how there are limitations of the open space so the positive aspects of the open space need to be strengthened.

The meeting concludes with the director declaring that the group needs to be disciplined about getting opinions and then summarizing the issues at hand—shared space, the laboratory, camaraderie, the ability to stand up and see others, noise level, shared conference rooms, ability to do serious thinking, and finding out why people are working from home. He called for surveying the members, to gather more information for further discussion among the group and added that he welcomes members to speak with him at anytime, concluding with the assertion that the group will reconvene to discuss these matters further. After the meeting the director asked my opinion about the meeting. I replied briefly stating that it seemed to be a productive meeting, that it provided members with the opportunity to give opinions and ask questions. Again the director brought up the metaphor of gas molecules saying that it was inevitable that

concerns over space would develop. He explained that when a gas is heated it creates an increase in volume that results in an increase in pressure—the molecules become excited and start bumping into each other.

Making Sense of the Matter

Returning to the interview data provides greater understanding regarding underlying tensions and the stances members take toward resolving differences in the scenario above. From the administration's perspective the organization's core values—academic interdisciplinarity, community responsibility, and collective success—are what frame the organization's activities and guide its decision making process. The administration describes the institute as an open and "very flat organization" and has explicitly communicated the desire to not have rules and regulations arbitrate tensions. Administrators do not see their role as dictating the allocation of space and believe that members should work out issues amongst themselves. This stance reflects the ideals of emergence and emergent outcomes that should be orchestrated through members working together as a community to decide how to accommodate each other. From the administration's perspective if people do not subscribe to the core values, they will not work well together and will not be happy at the institute. Working in an open office environment and shared laboratory space requires confrontational skills, which the administration sees some members lacking.

In contrast, members have commented on the their experiences with the administration's approach to decision making. In reflecting on the meeting presented above, a member described to me how some residents expressed frustration after this meeting, dismayed to be discussing these topics again. Some asserted that they had

already given their input on the matter and therefore were expecting a final decision and that the meeting was an imposition on members' limited time. One member expressed that meetings should be efficient, focused, and conclude with a decision. Another member expressed a similar point in an interview, stating:

> I appreciate the fact that [the director] likes people's input, and I think that's good. The problem is, I think, at some point, you wind up with a little bit of input diarrhea where everybody feels the need to voice their part, and they may actually be a minor player over here, and while you don't wanna dismiss what they have to say, when they delay things because they want it their way, at some point I think, as an institute director, you have to be like, "All right, look, this is the way it's gonna have to work." (Participant 19, interview transcript, 2017)

The member concluded by stressing that decisions should be in the best interest of the majority, or with the priority of the center.

Reconstructing Communicative Practice

As GPT emphasizes, communication problems typically arise because of multiple and sometimes conflicting, goals about communication that constrain a collectives' attempt to resolve differences (Craig & Tracy, 1995). As members propose competing strategies for action, rationales are given in support solutions and discussions concerning the 'right way to act' are implied or explicitly debated. The dilemma is layered in that members not only struggle over how to manage issues regarding the physical environment, but also how to communicate about the issues. The following section reconstructs the communicative practice in this case by articulating the problem level, technical level, and the philosophical level revealed in the justifications for solutions.

The problem level. The reconstruction of a practice begins at the level of the problem, the communicative dilemmas people encounter in the course of their work, for example here, the collective management of a "disagreement space," which encompasses

an "indefinitely large and complex set of beliefs, wants, and intentions," which influences the stances participants take with regard to the dilemma at hand (van Eemeren et al., 1993, p. 95). The interview data and the meeting discussed above highlights a surface level problem, dilemmas arising from the affordances of the physical infrastructure. However, numerous other matters emerge in the discussion, some explicit (e.g., how should members be arranged in the space), and some implied (e.g., having power and say in matters). In addition, issues concerning membership—who can be a member and for how long, and what are the appropriate member behaviors. There is also a lack of clear criteria regarding some matters, uncertainty whether or not decisions made will be honored by new leadership, and larger institutional norms regarding the management space, all which make collective decision making challenging. With regard to problems of communication in particular, while approaches are offered such as discussion and even heated discussion, these are resisted or ignored by some members. And when matters are brought to the forefront, they are often disregarded.

The technical level. At the technical level two things are occurring simultaneously—the working out of methods for managing space, and the working out of communicative approaches for managing differences. At the individual level, when a member experiences a problem in the lab space according to the leadership, the problem should be worked out either through a one-on-one interaction or at the collective level, but it is unclear how this has been communicated to members and how comfortable they are with engaging with conflict. The director argues for the collective working out of the issues and commitment to a process of collective action but this is contradicted in that not all contributions are taken-up for discussion. The meeting concludes not with a resolution

or even conscious attention to competing ideas about communication, rather the solution posed is to collect additional information to better understand the problems members experience before action will be taken. The meeting therefore provides a forum for the airing of grievances and the working out of ideas regarding how interdisciplinarity ought to be accomplished but it does not result in substantive action.

The philosophical level. The philosophical level of practice represents the "normative ideals and overarching principles that provide a rationale for the resolution of problems" (Craig & Tracy, 1995, p. 253). These "inchoate and often contested" ideals are revealed through claims members make as to how they "ought to act within a practice," but ideals may not align with the organization's espoused ideals as evident in the scenarios discussed here (Craig & Tracy, 2014, p. 232). As discussed in chapter four, emergence as an approach to organizing reflects a philosophical stance in which hierarchy is viewed to be antithetical to the principles of interdisciplinarity. Emergence and self-assembly are preferable as 'natural' processes which operate without the need for central coordination. It is therefore an ideal to be achieved as well as a preferred quality of interactivity around interdisciplinary activities. The position taken by the administration is that in creating the conditions for ordinary conversation to unfold enabled through design techniques—proximity and the arrangement of space, visibility and transparency, and generating energy—commitments will inherently be generated and sustained. This perspective however ignores the nature of speech as action and how commitments to future action are accomplished through language and interaction, which will be taken up in greater detail in the next chapter (Aakhus & Jackson, 2005).

Competing Design Logics

The scenarios presented above highlight the ways in which the physical and administrative structures generate conditions that contribute to dilemmas and the surfacing of tensions. This requires members to not only confront how to best organize activities within the constraints of the physical structure, but also determine effective techniques and communicative strategies to resolve differences. As they discuss their various dilemmas, points of disagreement and uncertainty are revealed—ambiguity concerning the rights and obligations of members, the availability of space and the best way to use it, constraints around on the ability to make decisions and take action, and concerns over the durability of decisions. Complicating the resolution of these matters however, is the underlying existence of two competing communication design logics or models for how to intervene and resolve difference—the community rule model and the dedicated decision making model.

Design logics are practical theories at the level of the organization that represent the linking of goals with preferred means to achieve such goals and reflect members' viewpoints concerning how organizations and institutions should function (Barbour et al., 2018a; Caughlin et al., 2008). Embedded within these design logics are beliefs about how communication works or ought to work, which shape the individual and collective communicative interventions advanced (Aakhus, 2007; Aakhus, Dadlani, Gigliotti, Goldthwaite, & Sahay, 2016; Aakhus & Harrison, 2016). Conflicting logics are negotiated through interaction, supported or resisted through behaviors, or ignored all together (Barbour & Manly, 2016). They have constitutive force in that they shape the design and formation of administrative structures and influence the various routines and

rituals of practice. The table presented below summarizes the competing stances evident in the claims administrators and members make regarding the issues they confront:

Table 6.1 Competing Communication Design Logics

Community Rule Model	**Dedicated Decision Maker Model**
Resolving space issues should be accomplished collectively ● Members should get together, talk and negotiate the allocation of space and determine how resources should be shared ● The organization is open and flat therefore decision making should reflect this design. ● Members should work together as a community and determine amongst themselves how to accommodate each other. ● Community responsibility and collective success are what should guide the organization's decision making process. ● Some members may not be a good fit with the community rule model	*There should be a formal set-up, a formal procedure, and ultimately a formal decision* ● Resolving difficult issues is the leadership's responsibility ● Some input is desirable but ultimately a decision should be made by the administration. ● Dedicated decision making allows for quicker resolution of problems. ● Input from "minor players" delays the resolution of matters. ● Residents should not have to negotiate with others, there should be an intermediary who resolves issues. ● Some members lack power and authority—real or perceived—for influencing decisions in a community rule model.

The community rule model. The community rule model advances the idea that the primary goal of the organization is interdisciplinarity and the preferred means to achieve this goal is through the diminishment of hierarchy—which is symbolically reflected in the open office space and uniform workstations—and the working out of differences through interaction. This is the model advanced by administrators of the organization, who advise members to workout their problems through direct communication with other members. In this way, they avoid the role of decision maker viewing it as antithetical to the principles of interdisciplinarity. Maturity is put forth as a pre-condition of the community model, and the administration views members as having this quality.

Discussion is called out as the primary method through which collective problem solving is accomplished and the nature of such discussion should be open and even heated. In this way productive conflict is advanced as a legitimate approach for resolving differences. Finally, asking those with greater authority to make decisions is used as a last resort if an impasse is reached.

The dedicated decision model. The dedicated decision model advances the idea that members do not view resolving problems related to space and resources as their responsibility and therefore the preferred means is for administrators to intervene in problems. Some members view negotiating with other members as being inconsistent with their practice, which has likely been shaped by previous experiences in other organizations. Other members recognize the role power plays in collaborative decision making and believe they do not have adequate voice or authority to effectively argue for their needs. Some frame the community rule model as a radical socialist process, which is seen as antithetical to the broader institutional approach to resolving tensions arising from the management of resources. While the community model may be attractive to some in theory, there is an underlying concern that the process will be abandoned with future leaders. While discussion is viewed in a positive light, some members view the community model as inefficient that impedes upon their limited time.

Misalignment Between the Technical and Philosophical

The design of the physical structure (e.g., no offices, uniform workstations) as a method for reducing hierarchy and orchestrating emergence offers a technical solution for a social problem that nevertheless persists. This is evident in the ways that perceptions of hierarchy endure and influence members' perceptions and actions. For example, in the

interview data a laboratory resident indicates feeling like ‘a nobody’ in the shared space. In the meeting discussed above a resident expresses frustration with being at the bottom of the hierarchy, while in an interview another member states that some members are minor players whose input should be given less consideration than others.

Also, the setting and scene of the meeting discussed above reinforces notions of hierarchy despite the claims that it is antithetical to the ideals of the institute (Schwartzman, 1989). For example, it is conceivable that institute members would not be permitted to invite a guest to a meeting. The director reveals a degree of authority not granted to all members in inviting and outsider to attend the meeting. The fact that no one openly objected suggests that members acquiesce to this authority. Other factors subtly communicate to members the persistence of hierarchy as well, for example the meeting being held in the formal boardroom where access is controlled by the administration, the director being the last to enter the room and sitting at the head of the table, and the exclusion of institute residents such as administrative personnel, research assistants, or students. Finally, although there was not a formal meeting agenda, the director managed the flow of discussion—opening the meeting with framing remarks, taking up some contributions and not others, and introducing issues that were not identified by members. The meeting in essence serves an interpretive resource for members who make sense of the notion of hierarchy at the institute, which conflicts with the collaborative decision making model advanced by the administration. Various ideals are revealed in the meeting—what it means to be a member including being collegial, comfortable with conflict, pulling one’s weight, doing work that aligns with the mission, not being snarky, making people feel welcome, and being mature. These in essence align with the

organization's stated values of community responsibility and collective success and present expectations concerning the quality of communication, that is the willingness to engage in discussion, open discussion, and heated discussion. However as shown in the data some residents view this as negotiation, and not an aspect of their practice as they see their work.

In the examples above, members individually and collectively not only attempt to work-out the 'right way' to organize for interdisciplinarity, but also the 'right way' to resolve differences through communication (Barbour et al., 2018b). A consequence of the design of the physical and administrative structures is a need for members to collectively engage around issues of space and resources and in doing so members are confronted with many of the known challenges associated with managing common resources—unclear group boundaries, ambiguous rules, uneven participation, and weak or non existent mechanisms for dispute resolution (Ostrom, 1990). As the group discusses the various issues, underlying logics influence the degree to which communicative interventions are taken up or resisted, which has implications for the effectiveness and persistence of solutions (Barbour et al., 2018b).

As typical in the case of complex organizations, the problems are overlapping and interconnected but nevertheless present "opportunities to change prevailing practices" (Putnam, 1986, p. 153), which is perhaps more challenging in an interdisciplinary organization where by its nature multiple different practices and logics exist. This is revealed in competing norms and values—the values of interdisciplinarity as prescribed by the founders, versus the norms tied to the various disciplinary practices represented in the organization. Complicating matters is a relatively low degree of interdependency

across the membership evident in the limited awareness some members have of others as discussed in chapter five. This lack of awareness of others and the dearth of opportunities for members to better understand and work out conflicting values makes it challenging for residents and administrators. Finally, the lack of effective interventions designed to deal with conflict arising in daily tasks runs the risk of contributing to higher degrees of relational conflict (Jehn, 1997).

Chapter Six Summary and Conclusion

At the heart of the issue above are competing ideas or assumptions about how communication should work to resolve issues. Communication is always situated in a larger culture with corresponding assumptions about communicative practice and in that members come from various practices their membership in their particular communities influence their individual assumptions concerning appropriate communication and the way that messages are interpreted and acted upon (Aakhus & DiDomenico, 2016). As Seo and Creed (2002) note, change is dependent on the negotiation of communicative tensions. The meeting discussed previously, represents an initial step toward the working out of tensions and development of communication norms around interdisciplinarity or "the ground rules of the game" (Goffman, 1983, p. 5). What is lacking however are systematic efforts in the form of communicative interventions that enable members to work out their various differences and tensions arising from realities of day-to-day activities to create a shared practice of interdisciplinarity.

The dilemmas presented here illustrate the limits of a thin design theory of communication as articulated in the founders' design rationale. As the design "talks back" the administrators and residents need to engage in a "reflective conversation with

the materials of the situation" (Schön, 1983) and this requires regular opportunities to do so. The tensions evident throughout the case suggests that the theory of how to orchestrate communication to generate interdisciplinarity needs rethinking, including the various notions of what it means to be interdisciplinary, which remains somewhat ambiguous. In that a practice is a broad and coherent set of activities that are meaningful for members of a particular group, which shares ways of thinking, talking, and acting (Craig, 2006; Nicolini, 2009, 2012; Reckwitz, 2002), there is a need to generate new interdisciplinary practices for this organization. The coherence of a practice comes about through a generally agreed upon ways of doing things, rules regarding what counts, what should, could or must be, and various desired end states manifested through communication (Schatzki, 2005).

The design of the physical and administrative structure creates conditions, which triggers a need for change in practice, but what is lacking is an communicative infrastructure for resolving differences that arise. Whereas a great deal of the literature on interdisciplinarity centers on language differences across disciplines and competing thought worlds (Dougherty, 1992) this chapter calls attention to dialectical tensions surrounding organizing for interdisciplinarity and argues that a precursor to getting to interdisciplinary is first to design interventions for managing disagreements over everyday practical activities.

CHAPTER SEVEN. INTERDISCIPLINARITY AS COMMUNICATION DESIGN PRACTICE

This dissertation began with the claim that interdisciplinarity can be understood as a communication design practice and proposed an overarching question to guide the case regarding the assumptions about how communication works and ought to work to achieve interdisciplinarity at the research site. Throughout the previous chapters this study interrogated these assumptions and investigated the members' experience of these aspects of the organization. This revealed a number of tensions that are understood more clearly through the lens of CaD, GPT, and practice theory.

This chapter reflects on the findings in chapters four, five, and six to summarize how the administrative and physical structure as well as routines and rituals enables and/or constrains interdisciplinarity in this case by drawing connections to communication and organization theory more generally and principles of language and interaction in particular. Additionally, the chapter provides an overview of the nature of interdisciplinary activities at the institute to illustrate the diverse and unpredictable ways such initiatives develop.

How Does the Physical Structure Enable and/or Constrain the Pursuit of Interdisciplinarity?

Chapter four represents both physical and rhetorical aspects of the organization design reflected in the various ideas articulated by the founders and architects concerning the ways in which the physical structure would facilitate emergent outcomes and the development of an interdisciplinary culture. The techniques center on enabling proximity of members, and increasing the awareness of others' activities in order to generate certain

quality of communication consistent the organization's values. Underlying the design of the physical environment and the perpetual visibility and transparency of actions, and proximity the space affords is a normative model of ideal action. It presents an argument for how residents ought to approach interaction in order to achieve emergent interdisciplinary outcomes. The institute as a design for interdisciplinary interaction provides a material and social infrastructure that disciplines the ways people relate to each other, their environment, and the artifacts around them (Star & Ruhleder, 1996), but evident in this case is that individuals respond to this structuring in various ways. Residents who attribute positive outcomes to the physical environment cite meeting people from other disciplines, learning about others, seeking and giving advice, asking questions and receiving answers in an expedient manner. However, this case also finds interruption, disruption and a lack of privacy as potentially constraining for residents. This finding is unsurprising given existing research demonstrating how the work environment can contribute to stress, negatively impact the ability to think, reduce performances and influence work satisfaction (Baron, 1994 ; Evans & Johnson, 2000; Sundstrom, Burt, & Kamp, 1980; Sundstrom, Town, Rice, & Osborn, 1994), as well as decreased satisfaction with team members that persists over time (Brennan,Chugh, & Kline, 2002). Additionally, industry research on open office space finds reductions in creativity, productivity, engagement, and wellbeing to be linked to a lack of privacy in the workplace (Steelecase, 2014). Perhaps more significant are recent findings established through digital data collected from wearable devices and electronic communication in two large organizations that moved employees to open office floor plans, which finds a significant decrease in face-to-face interaction by as much as 70

percent (Bernstein & Turban, 2018). Findings such as these have implications for this case as well in that the founders' practical theory of communication relies on conditions that eliminate privacy for members. As noted in chapter five, members' experience of the physical environment and perpetual visibility and transparency is a source of contention.

Regarding the founders' notion of proximity as a contributing factor for increased communication focuses primarily on physical properties such as the distance between individuals, an idea supported through investigations of various contexts including communities (Festinger, 1951); research and development (Allen, 1977; Allen & Fustfeld, 1975); scientific collaboration (Kraut, Egido, & Galegher, 1988, 1990); and interorganizational collaboration (Knoben & Oerlemans, 2006). Although the case here provides some evidence for the positive effects of physical proximity for some residents, such as quicker resolution of problems and answering asking questions, for others the experience is less positive contributing to increased disruption. Additionally, despite members being in close proximity to others, ironically a number of members report not knowing others who work in the space. These inconsistent experiences highlight a need to consider other factors related to proximity, for example social and relational aspects, which were given less consideration in the design of the physical environment. Previous research investigating innovation, communication, and knowledge sharing processes has identified other relevant dimensions of proximity, including cognitive, organizational, social, institutional, and geographic—each impacting organizing processes in particular ways (Boschma, 2005). Notable in this case is the limited awareness of others that residents note despite close physical proximity, suggesting that other dimensions of proximity are at play. For example, in that interdisciplinary collaborations have yet to

form for some members, organizational proximity—the degree to which individuals are interdependent—is likely weak. Given that there is a limited awareness of others social proximity—the degree to which individuals experience close trusting relations based on friendship or past experience is likely anemic as well. Additionally, in that members come from various disciplines with distinct practices and ways of understanding how to engage in interdisciplinary work, cognitive proximity—the degree to which individuals share a base of knowledge—and institutional proximity—the degree to which there are shared routines and established practices is likely inadequate as well.

Previous research has demonstrated that individuals may be physically close but nonetheless still perceive others as being quite distant likely due to social and relational factors. This is consistent with Wilson, Boyer O'Leary, Metiu, and Jett (2008) argument that communication matters more for perceptions of proximity and feeling close. It is the frequency in which others interact, the degree to which communication is personally meaningful and relevant, and the degree of "interdependent and reciprocal" exchanges that matter more than physical proximity (p. 985). This would suggest that physical proximity in this case is insufficient to facilitate the awareness others. What are needed therefore are communicative interventions that can facilitate an increase in saliency of others and an understanding of the realities of their work experience. This can reduce feelings of uncertainty one might have of others, and contribute to the development of common ground and a degree of shared identity (Wilson, Boyer O'Leary, Metiu, & Jett, 2008).

Additionally, while proximity is related to an increased possibility that informal interaction will occur, physical environments must also afford privacy (Fayard & Weeks,

2007) and "the ability to control and limit physical, interactional, psychological, and informational access to the self or one's group" (Burgoon et al., 1989, p. 132). Spaces that limit one's privacy constrain the nature of informal interaction restricting the depth and personal nature of conversation for fear that one would be overheard by another (Fayard & Weeks, 2007). Finally, having the opportunity to communicate does not automatically translate into an obligation or willingness to communicate. In fact, similarity across individuals may contribute more so than proximity alone in facilitating informal interaction (Sykes, Larntz, & Fox, 1976).

The privileging of proximity and its ability to generate serendipitous interaction in this case reflects to some degree technologically deterministic thinking and an orthodox view of organizing that understands interaction as occurring within a "container" (i.e., the organization as a physical structure) (Axley, 1984 ; Putnam, Phillips, & Chapman, 1996 ; P. K. Tompkins & Wanca-Thibault, 2001). The design advanced by the founders privileges a simple causal theory based on a belief that physical arrangements result in preferred behaviors, failing to consider human agency, the fundamentals of language and interaction, and the role of shared logics or practical theories about communication. It gives little consideration to the nature of organizations as dialectic sites of "resistance and accommodation" (Pickering, 1995) constituted through communication processes. While aspects of the physical environment are deterministic in the sense it can resist the exercise of human agency, humans inevitably exercise agency in creative ways, including through communication as they accommodate the resistance. For example, choosing not to interact because of a lack of privacy or minimizing visibility by altering the transparency of glass walls.

Human action is always multiply determined, influenced by each individual's unique understanding of the world as well as individual practical theories regarding how communication works or ought to work. From the view of communication design, individuals exercise agency and respond and relate to others, their environment, and related artifacts primarily through the manipulation of the materials of language and interactivity in order to generate commitments or manage meaning and understanding by redesigning communication in response to difficulties they experience (Aakhus & Jackson, 2005). Notable in the design theory articulated by the founders and designers of the institute is a lack of attention to relational aspects of communication and the *materials* of communication design identified in the field of language and social interaction as outlined by Aakhus and Jackson (2005). These principles of language offer insight into the human experience of the physical environment and the implications this has for communication in this case. A number of these principles are relevant for the discussion here include turn-taking and identity and face concerns with regard to the physical environment in particular. Additionally, speech as action and the generation of commitments to future action, and matters of culture and culturally shared assumptions about communication are addressed later in relation to the routines and rituals of practice.

Turn-taking. Turn-taking is a fundamental aspect of language and interaction, a technique humans use to organized communication in a cooperative manner. In ordinary conversation individuals use various linguistic (e.g., utterance) and non-linguistic cues (e.g., eye gaze) to make contributions to conversation, react to others, and facilitate transitions to other speakers (Drew & Heritage, 2006). There are two points to make about the physical environment and the ways it conditions turn-taking. First, whereas the

arrangement of space was intended to contribute to higher degrees of interaction, the way all of the workstations are positioned in the space creates an unnatural condition for turn-taking to unfold. For example, an important aspect of turn-taking is addressivity, "the quality of turning to someone" (Bakhtin, 1986, p. 99) or what Goffman (1981) calls "footing," how individuals orient to each other in conversation to either receive or produce an utterance. The way all residents sit with their back to an approaching person sets up a peculiar condition for addressivity. Instead of orienting to another through eye gaze and utterance as would be typical in a face-to-face interaction, those who want to begin a conversation must begin the exchange in awkward manner, such as knocking on something nearby or saying 'excuse me' to trigger the attention of a potential conversational partner. One might imagine that this atypical condition contributes in some way to a decrease in satisfaction in communicative interactions and perhaps the desire to work in the space. Second, while the arrangement of workstations sets up irregular conditions for turn-taking, an underlying assumption of the open office design is that others are always available. Some members call out issues concerning turn-taking, evident for example when a resident states, "I wish we had a red light, green light on top of our stations, which said, 'Stay away.' Just because I'm sitting there with my back to you, doesn't mean I wanna talk" (Participant 7, interview transcript, 2017). The founders' goal to generate emergence through the arrangement of space that affords little privacy sets up an expectation for residents to be perpetually open to the initiation of conversation and the acceptance of turns. To initiate a conversation is to make a request, and to refuse a turn is to be impolite which has implications for identity and face concerns (Johnson, Roloff, & Riffee, 2004). For example, a resident who is pressed for time but is in close

proximity to another may choose to ignore the invitation to interact, but over time, a repeated pattern of avoiding communication creates a cultural norm that can become pervasive.

Identity and face concerns. Face concerns are grounded in a fundamental human motivation to be accepted by others but also control one's own thoughts and actions (i.e., autonomy) and both speaker and listener are compelled to manage these competing tensions to maintain positive face but also preserve their autonomy (P. Brown & Levinson, 1987). Those who refuse a request to engage in conversation in order to maintain autonomy risk a threat to their positive face, as well as a pose a threat to another's face who is being rejected (Johnson et al., 2004). More so, power dynamics complicate matters in that those with less power and autonomy are obliged to accept the initiation of a conversation coming from someone with authority. Those who refuse the initiation of a conversation may be perceived as failing to communicate appropriately or effectively based on community or cultural assumptions about how communication works or ought to work (Aakhus & Rumsey, 2010; Ting-Toomey, 2009) . Clearly residents recognize the tension that exists between being open to conversation and preserving autonomy as indicated by their resistance to the design of the physical environment.

Additionally, identity is more than a property of an individual rather it is a situated and co-constructed comprised of personal, relational, enacted, and communal dimensions enacted through communication (Hecht, 1993; Jung & Hecht, 2004). This enactment is shaped in part by the various organizing routines within a practice including aspects of one's role and expected behaviors, and status and expectations of others'

behaviors (Mokros, 2003; Stoetzel, 1963 . For example, the identity of a laboratory resident is enacted through the work they do, and whom they interact with in the course of their work. Goffman (1959) notably discussed identity and face concerns explaining how individuals seek to strategically control the impressions other form of themselves in all interaction episodes. These strategic behaviors differ depending on the "stage," one is on. For example when on the "front stage"—a more public, ceremonial, and highly normative space—there is a greater expectation of behaviors that reflect cultural norms and expectations. However, the "backstage" affording greater privacy and autonomy—there can be a reduced commitment to social norms and even anti-normative behavior.

The design of the open office requires residents to always be on the front-stage and conform to some degree to normative expectations, which are still developing for the newly formed organization, in order to control others' impressions. Therefore facework and the communicative strategies individuals use to project, sustain, or repair face concerns must routinely be accomplished in a highly public space, which can be challenging for dealing with conflict or negotiating for one's needs. In instances that require negotiation or where conflict is possible, face concerns are highly salient as individuals balance concerns over autonomy and inclusion. Individuals may be concerned with maintaining autonomy, showing respect for the autonomy of others, preserving inclusion, and/or recognizing another's need for inclusion, all of which are made more difficult without the privilege of privacy (Ting-Toomey, 1988).

Additionally, the physical environment is implicated here as well in that it reflects aspects of one's identity, and acts as a warrant for status and expectations concerning the behaviors of others. For example, the identical workstations require some residents to

engage in additional identity work and strategic self-presentation to communicate status and authority to others. As one resident notes, being young and female can make it challenging to have clout or impact, which would be less of a problem in a traditional department where working out of an office would reflect a clear line of authority. As the following quote illustrates, aspects of the physical environment change the nature of identity work and face concerns.

> I think it's important when students walk in, for instance—I have no way of saying without sounding like some egotistical maniac and that's really not what I'm trying to be. But when students walk in, and they see you, and they see your postdoc, and your graduate student all sitting together, I think you completely lose this aspect of, 'You're the boss.' In some instances, it does matter that you are the boss and that what you say matters. If they have a query or a problem that they're supposed to come to you and not go to the graduate student who's been there for six months (Participant 11, interview transcript, 2017).

As Aakhus and DiDomenico (2016) note, "people adapt discursive practices to fit the particular constraints and affordances of technical spaces in order to manage their identities" (p. 380). The discussion above highlights a number of ways that the physical environment constrains the ability to work in general, which ultimately leads to tensions that may spill over into collaborative work.

How do the Routines and Rituals of Practice Enable and/or Constrain the Pursuit of Interdisciplinarity?

What is the nature of the routines and rituals of practice, that is the everyday interaction of members and how does this enable and/or constrain the achievement of interdisciplinarity? The variety of practices members engage in are quite diverse ranging from laboratory bench work, developing programs, teaching and writing grants for example—all typical behaviors for researchers, educators, clinicians, and laboratory personnel members who have an innate understanding of their individual practices. The

founders design theory assumes that in creating the right context through the arrangement of space and the sharing of resources that new practices and collective activities will organically emerge. However, the findings reveal a limited awareness of others and their activities, and limited informal interaction, which has implications for the nature of commitments to future action.

Speech as action and the generation of commitments to future action. Speech is a form of action in that we accomplish things and construct our realities through language—generating commitments and obligations through promises, agreements, or invitations (Austin, 1962; Searle, 1969) . An underlying assumption of the principles of emergence and emergent outcomes is that commitments to future action should be generated organically, not directed from above. The physical environment supported by the administrative structure was designed to prescribe a type and quality of interaction that calls for mutual persuasion and influence and the self-governance of the expandability of actions. That is collectively individuals will decide the reasonableness of ideas or ambitions and mutually manage differences that emerge. In this way there is a presumption that collective interests will take priority. However, as noted in chapter six, the meeting as an example of an attempt at repair for breakdowns in organizing and communication processes reveals problematic aspects of the emergence philosophy. It highlights a dilemma of communication practice, for example the challenge of facilitating a meeting as a content contributor, while simultaneously dealing with the multiple matters members call out as problematic regarding the kind and quality of interactivity to achieve interdisciplinary practice. What emerges is a tension between a desire to be directed and have decisions made, and the prescriptions to solve dilemmas collectively

through discussion, open discussion, and even heated discussion. This striving to generate commitments through the reorganization of communication practice while simultaneously managing how residents position themselves in relation to others through the use of language reflects competing underlying logics (Aakhus, 2007; O'Keefe, 1988; O'Keefe & Shepherd, 1987), which has implications for the commitment to future action. Additionally, these commitments are also impeded in part by the nature and quality of communication and interaction or the lack there of, that exists among members.

Awareness of others. A number of residents note the limited awareness they have of other residents, who they are and what they do—some residents describe the nature of the relationships as completely disconnected. Not only are residents unsure of what other members do, there is also a limited understanding of the work that goes on in the four centers. For example a member of one of the centers states, "What is the center for—no, I'm not trying to make fun of it or anything like that but—that's not clear to me at all (Participant 11, interview transcript, 2017). Another resident argues that some of the tensions among institute residents could be resolved if members had a greater awareness of members' various roles and what the institute was trying to accomplish, stating:

> So, I think from top down, if we had a culture that enabled or facilitated everybody understanding what each arm or branch of [the institute] actually does, that may better facilitate communication amongst people instead of, "I don't understand what this person does. How come I can't get in there and just use this stuff? How come I can't go over here?" (Participant 15, interview transcript, 2017).

What becomes evident in the case is that despite the stated goal that the physical environment would be sufficient for generating awareness of others, it is less than ideal in realizing this objective. As Aakhus and Jackson (2005) note, "A design may include

many features that solve interactional problems experienced by users, but the solution may not resonate (or even violates) the sense of appropriate communication" (p. 430). Evident in the case is that it is not sufficient that individuals are merely in close proximity and that activities are visible to each other, what matters is that residents actually take account of each other. Thayer (1986) calls this idea, "take-into-account-abilities," stating that "People will attend to those events external to themselves which they assume might have some relevance to their personal goals and objectives, immediate or long range" (p. 51). This is a recognized challenge for loosely coupled organizations such as the case presented here, which is characterized by a multiplicity of disciplines and practices situated within a traditionally loosely-coupled institution (Weick, 1976).

Serendipity therefore can fail to be a productive mechanism for bringing people together in particular when individual goals and interests have greater command over attention. As Feld (1981) makes clear it is activity that brings people together and creates durable relations in an organization. Therefore it is generating interdependence, the degree to which "group members must interact and depend on each other in order for the group to accomplish its work" (Guzzo & Shea, 1992) (p. 296) is what matters. What appear to be lacking in this case are structured opportunities across the organization for residents to develop interdependence. For example, some centers have regular opportunities for interaction including a seminar series, weekly meetings, monthly lab presentations, and yearly symposia. These forums provide opportunities to invite speakers from across the university or from around the world with the hopes of forming future collaborations, however some members of the institute have a limited awareness of these opportunities. Additionally, the institute as an interdisciplinary entity provides

limited opportunities—an annual town hall and a holiday party—to bring all members together. As discussed previously in the literature review, focused initiatives designed to encourage and support interdisciplinarity promote collaboration through various communicative interventions such as educational activities, seminars, workshops, symposium, discussions, monthly and quarterly meetings and annual retreats. Also, disciplinary rituals such as symposia, workshops, and conferences provide mechanisms to bring individuals from different disciplines together (Siedlok, Hibbert, & Sillince, 2015). These varieties of communicative interventions generate interdependencies by creating occasions that bring individuals together through focused interactions, which contribute to durable relations for collaboration and the generation of commitments.

Generating energy and interactivity. As noted in chapter four, one of the objectives of the design was to facilitate informal interaction and generate energy deemed necessary for the generation of interdisciplinary commitments. However, the environment could not accurately be described as energetic as explained by the architects. Many of my observations were focused on the communal area in the research commons, comprised of a kitchen, a large high-top table that seats twelve, and an open lounge area that provides hard seating and tables as well as soft seating for informal meetings and interactions. I made a number of notes of residents' behaviors that consistently showed a lack of spontaneous interaction. Additionally, on the days I worked in the research commons I often ate lunch at the communal table either alone or with other residents who happened to be there. Residents who ate lunch within the research commons typically sat in the same location each day. On most occasions, the same three to seven residents would eat at one end of the communal table, while other individuals sat with members of

their work groups at the tables nearby or at the opposite end of the communal table. The interactions within the group I often ate lunch with was sociable, mostly focused on personal not work related matters. However, it was typical for the various subgroups eating in the same space at the same time to not interact with others outside their group. For example, it was not uncommon for one or two individuals eating at one end of the communal table to not interact with others eating at the other end of the same table. Additionally, it was typical that when residents walked into the kitchen area to retrieve something from the refrigerator or use the sink or microwave there would be no acknowledgement of, or interaction with those sitting at the communal table a few feet away. Conversely, those at the table would not acknowledge or interact with those who just entered the space. It was also common that when two people were in the kitchen area at the same time neither would acknowledge the other except if the other person was a member of their primary work group. What was most noticeable for me in my observations concerning the opportunity for spontaneous informal interaction afforded by the space among residents was the frequency with which no interaction occurred. Frequently called out in my notes was the relative lack of sound overall in the space. I often noted in my observations that the only sound I would hear was that of the whirring of the air handlers or the opening or closing of doors as people entered or exited. Predictably the noise would increase somewhat during lunch hours with more people moving around in the space or socializing while eating. But the level of noise resulting from increases in interaction never reached the point where I would describe the physical space as generating energy.

In fact on my final day in the research commons I noted how it was remarkably quiet but I attributed the lack of activity to it being the day before a holiday. I commented to one of the residents how the space was unusually quiet, who offered an opinion as to why in response to my comment. The resident explained the decrease in noise as a response to an email sent to all residents by the administration. The email provided a quarterly report of the institute's activities and included a summary of the results from the internal survey soliciting feedback from a sample of residents about their experiences of the physical environment initiated by the administration after the meeting discussed in chapter six. The findings shared with the residents indicated that the research commons is not conducive for activities requiring privacy and concentration, that the shared laboratory and open workstations have the lowest satisfaction ratings, and that while members respect each other, problems are not discussed openly and when conflict arises it is not addressed appropriately. The conclusion offered in the email by the administration was for residents to "up their game in terms of 'social etiquette' as it relates to noise and personal space" (Email, March 21, 2018). According to the resident I spoke with on this day, this message from the administration had a dampening effect on interaction in the space. This is not surprising in that residents recognize the ways in which activities in the research commons are disruptive to others. As one of the members explained to me in an interview, there is a lot of silence in the space and this shows respect, so you can work in the open space.

How Does the Administrative Structure Enable and/or Constrain the Pursuit of Interdisciplinarity?

Chapter four articulated the strategy and structure as envisioned by the founders. Three aspects of are highlighted here to better understand the ways that interdisciplinarity is enabled and or constrained by the administrative structure. The design rationale makes a number of assumptions. First, emergence and emergent outcomes is preferred over administrative interventions; second hierarchy is antithetical to organizing for interdisciplinarity; and third culture should function as an enabling device that would support and generate a certain quality of communication, that is collegiality, showing interest in others activities, and the mutual working out of difference, which align with organization's values—academic interdisciplinarity, community responsibility, and collective success. Evident in this case however are tensions arising as the design talks back (Schön, 1983) revealing differing underlying assumptions concerning expectations for communication and competing communication design logics—the tension between the founders' ideals regarding the nature of interdisciplinary communication (i.e., emergent) and the needs of individual practitioners and the desire for a degree of administrative intervention. These aspects of the design rationale, emergence, hierarchy, and culture are discussed below in that they appear to create conditions, which constrain organizational members in distinct ways.

Emergence. As discussed in chapter four, emergence and emergent outcomes arise from a process of self-assembly and the autonomous ordering from disorder. Essentially the founders theorized that in populating the organization with self-selected members who develop programs and centers aligned with their interests, interdisciplinary

outcomes would naturally arise. However a byproduct of emergence as a strategy is a climate of uncertainty and ambiguity as evidenced by members' comments offered in the interviews. Emergence, implicit in symbolic resources (e.g., values, logos, stories, myths), is viewed by some members to be strategically ambiguous. Strategic ambiguity allows for various interpretations across the membership and enables some degree of cohesion and coordination while providing a degree of individual autonomy necessary for flexibility, creativity and adaptability (Eisenberg, 1984). However ambiguity can also lead to uncertainty, which has implications for interpersonal relations (Berger & Calabrese, 1975) and satisfaction in organizations (Salem & Williams, 1984). Ambiguity is compounded in loosely coupled organizations like the institute, what Cohen, March, and Olsen (1972) refer to as 'organized anarchies' that resemble a "loose collection of ideas," which often lack a coherent structure and have unclear goals and processes and only become comprehensible to members through action and retrospection (p. 1). The authors note how the degree to which members of organized anarchies attend to any particular matter changes frequently. Therefore a high degree of ambiguity coupled with a lack of opportunities for collective action and retrospection likely result in individual goals being more salient than collective goals among members. This is relevant for the case presented here in that there are limited opportunities to collectively engage around challenges arising from organizing processes or contemplate collective goals and ideas for the achievement of interdisciplinarity.

Hierarchy. Hierarchies are formal bureaucratic structures constituted in part through routine top-down communication, where individual goals are contingent on authority and conflict is resolved through administrative decision making. In contrast,

collectives (i.e., network forms) operate through relational communication and interdependency, norms of reciprocity, and matters of face concern (Powell, 1990). In this case, a primary goal articulated by the founders was a desire to eliminate hierarchy attempted and communicated to members in part through the design of the physical environment. However as noted in chapter six, traces of hierarchy persist and are often recreated symbolically. Additionally, the limited interaction and awareness of others across the membership suggests that the formation of a collective, which is contingent upon communication processes and repeated interactions, is less likely to develop. It is reasonable to argue that in organizations characterized by weak interpersonal networks and a low degree of interdependency, hierarchy becomes more salient for members when confronted with problematic aspects of organizing. In the case presented here, limited awareness members and a low degree of informal interaction likely contribute to a persistent reliance on hierarchy. As Powell (1990) notes, networks are dependent on trust and more likely to emerge in homogeneous groups among individuals with some degree of a shared background. He argues,

> "When the diversity of participants increases, trust recedes, and so does the willingness to enter into long term collaborations. Calculative attitudes replace cooperative ones, and formal agreements—either contractual or bureaucratic—supplant informal understandings" (p. 326).

Interdisciplinarity by its nature is contingent on diversity and like most creative activities, can be nebulous characterized by ill-defined tasks and novel situations that requires the integration of autonomous individuals. It therefore requires some degree of structure and facilitated interaction to manage groups and tasks and balance autonomy (Mumford, Scott, Gaddis, & Strange, 2002). This is consistent with Lengwiler's (2006) finding that a combination of administrative structure, social interdependence, and theoretical and

methodological integration, are necessary for the development of an interdisciplinary culture and collaboration.

Culture. As Bruhn (1995) notes, "The basic problem is that interdisciplinary research is often ad hoc; it has no culture to sustain it" (p. 333). In the case presented here, culture expressed in the organization's values—academic interdisciplinarity, collective success, and community responsibility—and cultivated through the design of the building, a diverse membership, and distinct programs is a potent concept for the founders who believed it would enable emergent outcomes. The values advanced by administrators hint at the type and quality of communication expected of members—professional, collegial, and cooperative, in the service of collective action towards the achievement of interdisciplinarity. From this perspective, culture functions as an interpretive resource, signaling to members the types of attitudes and behaviors deemed most fitting for the achievement of interdisciplinarity at the institute. This in theory would reduce the reliance on hierarchy and the need for administrators to intervene in matters and instead values would stimulate appropriate goals and behaviors among members. This view however reflects an unsophisticated understanding of culture as a natural outcome of exposure to values and symbols. It positions culture as something an organization has as a "container" of symbolic resources (Axley, 1984; Putnam et al., 1996; Tompkins & Wanca-Thibault, 2001), rather than culture as action and what organizational members do. However, a communicative understanding of culture recognizes the ways in which an organization is a nexuses of numerous cultures enacted and sustained through communication (Eisenberg, Murphy, & Andrews, 1998; Martin, 1992, p. 17). Culture is constituted through actions and interactions, becoming

recognizable and persisting in the patterned behaviors of members or routines and rituals of practice. The communication-culture nexus is a recursive relationship in that communication is the primary mechanism for the development, maintenance, and transmission of culture and once reified in practices, artifacts, beliefs and assumptions (Schein, 2010) it influences how members make sense of their environment and expectations for behavior. That is, the practice (i.e., interdisciplinarity) constituted through action and interaction becomes "the source of meaning and normativity" (Schatzki, 2001, p. 12). As Swidler (1986) argues culture is not a well-ordered progression of value driven activities, rather it is an assemblage of actions grounded in particular ways of understanding the world informed by a particular practice. She notes, "One can hardly pursue success in a world where the accepted skills, style and informal know-how are unfamiliar. One does better to look for a line of action for which one already has the cultural equipment" (p. 275).

This view of culture holds relevance for the case presented her in that members of a newly formed interdisciplinary institute have yet to work out an understanding of shared practices and inevitably look to the "cultural equipment" consistent with their individual disciplinary practices. As shown in chapter six, ideas about how to organize for interdisciplinarity are still up for debate and the practice has yet to become coherent. Therefore to generate a new interdisciplinary culture requires the collective working out of strategies for action, which reflect the type of interdisciplinary activities and practices the organization and its members want. Therefore, what is needed are communicative interventions that provide opportunities for interaction and collective action that

facilitates social interdependence and nurtures the development of an interdisciplinary culture.

In What Ways Do Members Redesign Interactivity?

The second research question asked: In what ways do members redesign interactivity to overcome challenges or realize new opportunities for interdisciplinarity? From the observational and interview data it is difficult to provide a definitive picture. However what the data do show as discussed in chapter six, is that members of the institute are still working through how to organize to shift from parallel programs to interdisciplinarity. Additionally, institute members are not only trying to work-out the 'right way' to organize for interdisciplinarity, but also the 'right way' to communicate about and resolve their differences (Barbour et al., 2018b). The design of the physical and administrative structure generates a need for members to attend to and engage around issues of space and resources, not interdisciplinarity. As members confront the various issues, competing logics—community rule versus dedicated decision making model—likely slow progress toward interdisciplinary activities. Nonetheless, a number of interdisciplinary activities are underway that have developed in various ways as discussed below.

What is the Nature of Interdisciplinarity at the Institute?

A fundamental question yet to be answered thus far is, what is the nature of interdisciplinarity at the institute? This section attempts to shed light on this question. Consistent with Mallon and Bunton's (2005) finding that many interdisciplinary institutes and centers support the university mission in other ways such as providing undergraduate and graduate education, engaging in community outreach, and offering services for

students and university members, many of the collaborations at the institute are not research-based. The broad health-centered mission of the institute allows for a diversity of undertakings ranging from collaborations focused on developing interdisciplinary workshops and symposia, to interdisciplinarity in teaching and research. Interdisciplinarity therefore is understood here as any form of joint activity among individuals from different realms of disciplinary practice.

During my time at the research site a number of notable interdisciplinary collaborations developed, some could be described as emergent, others evolved through carefully orchestrated methods, and some were unrelated to institute membership. In May 2018 the director reported that the current value of the institute's grant and contract portfolio was $22.2 million. An internal survey of a subset of institute residents seeking feedback on the nature of their interdisciplinary collaborations found 50 percent of those who responded attributed a new collaboration to interactions with others at the institute, 31 percent did not, and nearly 19 percent said they were not sure. The types of interdisciplinary collaborations at the institute can be categorized in four ways: a) emergent, defined here as a collaboration that developed among members who became aware of others' activities through their relationship with the institute; b) enabled, defined here as a collaboration that was empowered in some way by having an affiliation with the institute; c) orchestrated, defined here as a collaboration that was a pre-existing idea subsequently formalized through member efforts; and d) unrelated, defined here as a collaboration that existed prior to the institute or that developed without benefit of the institute. Although these categories are not necessarily neatly delineated, they nonetheless

bring some degree of clarity around the nature of interdisciplinary collaborations in this case.

Emergent. As previously stated, emergence is the preferred way for interdisciplinarity to develop. A number of noteworthy emergent interdisciplinary collaborations have developed because of the existence of a restaurant in the institute, which has contributed to research on the human microbiome, plant biology and plant pathology, and polyphenols. Other non-research initiatives include those related to sustainable farming, state agriculture, landscape architecture, and cross institution collaborations around developing healthy food menus for universities across the country. A significant interdisciplinary collaboration that has developed encompasses basic science, dietary interventions, and clinical research and includes the chef of the institute's restaurant, a behavioral nutritionist, clinical and research dieticians, and a microbiologist from the department of biochemistry and microbiology. The formation of this collaboration is due in large part to the institute as providing both a place to prepare and test food for dietary interventions and space to run clinical trials. Other collaborations that can be described as emergent include members who met because they sat in close proximity and ended up collaborating on the development of an interdisciplinary event around world food day. Another member describes developing an interdisciplinary symposium around the microbiome and human growth that resulted in a grant-funded pilot program that brought together pre-existing collaborators and new collaborators met through the institute. Other residents note how meeting other residents and developing relationships has contributed to more interdisciplinary teaching. These examples lend

support for the idea that shared space and shared resources contribute to the emergence of interdisciplinary collaborations.

Enabled. A number of collaborations were described as being facilitated by membership in the institute, for example one resident noted how relationships existed prior to the institute, but new collaborations were enabled because of the facilities provided by the institute. One resident describes how the ability to obtain grants is enabled by membership in the institute, in that the administrations attention to applications and the management of budgets allows for greater efficiency and successful grant applications. Another resident who works with members both inside and outside the institute developed an interdisciplinary collaboration prior to the institute but notes how now being collocated with some of the collaborators on the grant makes the work easier. Collaborations with industry partners have also been enabled through the institute because the access it brings to a diversity of disciplines.

Orchestrated. In contrast to the previous example, a carefully orchestrated interdisciplinary collaboration formalized during my time at the research site, resulted in a $3 million, three-year grant from a philanthropic organization. This community centered initiative focuses on improving the health of children across the state through interventions that integrate medicine, nutrition, culinary arts, physical activity, lifestyle management and early education. This initiative began as an idea that was championed by the leadership and developed through a number of structured meetings and workshops. The collaboration includes a diverse membership made up of individuals from nutritional science, exercise science, and medicine. The existence of the institute with its diverse centers, and its strategic partnerships across the university contributed the formation of

the initiative and also attracted the attention of a philanthropic organization. In contrast to the collaboration mentioned above which was enabled in part by the colocation of a diverse membership, this initiative enabled in part by the relationships and resources afforded by the institute and nurtured through structured interactions. Other orchestrated interdisciplinary collaborations focus not on research or clinical interventions but rather conferences and workshops that bring together members from diverse disciplines. For example an annual conference on health and human performance, which was enabled in part by the venue and meeting space the institute provides.

Unrelated. Some residents report engaging in interdisciplinary collaborations but do not attribute these to their relationship with the institute. For example, a program run out of the institute uses grant dollars to fund interdisciplinary collaborations across the university around nutrition, but existed prior to moving to the institute. A member indicated having relationships with researchers working in other disciplines at the university, as well as individuals from other universities, that existed before becoming an institute member. Another spoke of collaborations that developed with members from another university-based institute after joining the institute but does not attribute this to being a member. In these examples, the institute appears to play a minimal role in these initiatives.

Evident in the examples above is that the institute does have a role to play the developing and sustaining interdisciplinary collaborations. However, as the example of the orchestrated interdisciplinary collaboration suggests, the larger and more diverse the initiative is, the more important structured interactions become for securing grants and the achievement of integration across disciplines.

Chapter Seven Summary and Conclusion

As evident in the discussion above interdisciplinary activities at the institute come about through a variety of ways—some enabled by proximity reflecting the emergent approach advanced by the founders, others more deliberately orchestrated through communication design, and still some collaborations develop without the aid of the institute at all. However, what is most notable with regard to this case is not the degree of integration and/or synthesis across disciplines as highlighted in the literature, rather it is the working out of practical problems necessary for organizing for interdisciplinarity.

The analysis offered here highlights the communicative nature of interdisciplinary work and highlights factors not considered in the design of the organization that complicate the realization of interdisciplinary aims, for example: the contingent relationship between privacy and interaction; the social and relational aspects of proximity and the ways in which communication alters perceptions of proximity; how individuals manipulate the materials of language in an attempt to manage their relationships and identities; how the awareness of others and the development interdependencies is enabled and made durable through communication and interactivity; and how culture is not a preexisting condition constituted through the articulation of values, but instead develops through communication processes. The conclusion to be drawn is that the focus on the building to create the quality of communication deemed necessary to enable interdisciplinary collaboration places an excessive burden on the physical environment and draws attention and resources away from the communication design work necessary for productive collaborations to develop and endure.

With these points in mind, chapter eight offers a number principles grounded in communication and design are offered to provide a productive way forward for nurturing and sustaining interdisciplinarity. Additionally, the concluding chapter notes the limitations of this research and offers recommendations for further research on interdisciplinary practice.

CHAPTER EIGHT. IMPLICATIONS AND FUTURE DIRECTIONS

As Maasen (2000) notes, interdisciplinarity "is primarily a matter of preparing the grounds for communication among a variety of specialized discourses to occur" (p. 177). As demonstrated here, communication is central to the development and sustainment of interdisciplinary practice. Organizing for interdisciplinarity is therefore fundamentally a communication design enterprise dependent upon methods for participation, discussion and the intentional creation, implementation, and facilitation of communicative interventions that enable knowledge exchange, the sharing of ideas, the working out of differences, and the embracing of communicative action that emerges in interaction (Aakhus, 2007; Harrison, 2014). This is not to deny the relevance of other pressing matters such as the availability of time and resources or other disciplinary or institutional constraints. However, evident here is that even if all other constraints were eliminated, the achievement of interdisciplinarity is made all the more challenging without attention to competing practical theories of communication that influence the nature of interaction and collective action. In taking account of material (i.e., physical environment) and technological constraints (administrative structure) as well as the sociocultural system in which practitioners are embedded, a design stance offers a productive way forward for organizing interdisciplinary practice (Gruber, de Leon, George, & Thompson, 2015).

The findings presented throughout the dissertation have the potential to advance both the study and practice of organizing for interdisciplinarity by making a number of important points. First, it illustrates the ways in which designs (i.e., artifacts, interfaces, buildings and protocols) for interdisciplinary practice have a rhetorical dimension in that they present arguments for how they should be taken up in practice (Buchanan, 1985).

Extending this position further is how designs for communication are hypotheses about how communication works, which are tested in practice (Aakhus, 2007; Jackson & Aakhus, 2014). As demonstrated here individuals can demonstrate agency by manipulating the materials of language and social interaction to resist or reject these ideas or redesign communication to better suit their needs. Finally, this research illustrates the provisional nature of practices—constantly emerging or under construction—highlighting their designability. Where there is alignment, a practice appears relatively coherent (Nicolini, 2012; Schatzki, 2002), but at the point of conflicting perspectives concerning the "right way" to organize and communicate tensions are heightened and conflict emerges. Designs for communication and interaction may fail to adequately address communicative problems, not function because of an implementation breakdown, or become fragmented because competing ideas result in tensions and inconsistent uses in practice (Barbour et al., 2018b). A key empirical outcome of this case is the articulation of the discourse about communication needed to achieve interdisciplinary practice and the importance of surfacing the underlying assumptions about communication embedded in physical and administrative structures or found in every day interactions and the implications this has for organizing and makes explicit the ways in which the physical environment becomes implicated in communication design. Together, these highlight the need for a distinct approach grounded in design for organizing, managing, and leading interdisciplinary organizations (Yoo, Boland, Lyytinen, 2006).

As demonstrated here, both CaD and GPT offer a productive framework for investigating, designing, implementing, and/or redesigning interdisciplinary organizations in that they concurrently attend to what is (i.e., descriptive), what should be

(i.e., normative), and what could be (i.e., prescriptive) (Aakhus, 2007; Jackson & Aakhus, 2014). This dissertation illustrates how applying communication theory to practical problems collectives experience has the potential to provide insight into challenges (i.e., organizing for interdisciplinarity) that has broad implications for addressing complex problems confronting society. The following section addresses some of the implications of this research and offers future directions organized around these positions.

Opportunities to Understand 'What Is'

The literature on interdisciplinarity, some of which has been examined in this dissertation, generally describes the current state of practice and provides insight into multiple factors that complicate its achievement. Likewise here, this investigation describes tensions arising from competing organizing logics, for example the persistence of bureaucratic structure deemed antithetical to interdisciplinary practice. This finding suggests a need for additional research examining the relationship between flexible network arrangements deemed preferable for collaborative and creative interdisciplinary endeavors and a persistence of and reliance on legacy hierarchical structures. As Doerfel (2016) notes, networks and hierarchy are often framed as oppositional when in fact they typically coexist and are necessary for the coordination of work in complex organizational arrangements. Still yet to be answered, is if there is an optimal balance between hierarchy and informal network arrangements constituted through communication for interdisciplinary organizations. Whereas organizational communication scholarship characteristically focuses on tensions arising from imbalances in power and authority (Deetz, 1992; Mumby, 1997), often unexamined are

the differing assumptions about how communication works or ought to work embedded in, or played out across different types of coexisting structures (i.e., formal bureaucratic and informal emergent). This highlights an important area for future research using case based fieldwork and qualitative network analysis (Doerfel, 2016; Doerfel & Harris, 2017) to examine how the coexistence of differing structural forms, communication practices and communication design logics embedded within each, influence the nature of interdisciplinary practice and ultimately the development of an interdisciplinary culture. Given that culture viewed in this case as an important enabling device for interdisciplinarity, future research should also investigate the relationship between organizational culture and communication design logics to understand the implication of fit, function, and fragmentation of communication logics in the development of a productive interdisciplinary culture (Barbour et al., 2018b). Finally, being this case centers on a single organization there is an opportunity to apply the theoretical and methodological framework outlined here to investigate other interdisciplinary organizations. For example, an investigation that compares and describes the nature of communication and the differences between virtual interdisciplinary institutes and/or institutes that use different configurations of space would enhance our understanding of the findings reported in this study.

Opportunities to Understand 'What Should Be'

As noted throughout this dissertation all designs, including the design of environments, administrative structures, and routines are rhetorical in that they present arguments about how they should be taken up in practice (Buchanan, 1985; Tompkins, Tompkins, & Cheney, 1989). This includes ideas concerning what interdisciplinarity

should be, its overall value, as well as the right (i.e., emergent) and wrong (i.e., bureaucratic) way to achieve desired results. Apparent however, is how 'what should be' and 'what is' do not always align as evident in this case with regard to the persistence of hierarchy despite attempts to design an administrative and physical structure that eschews bureaucracy in favor of emergence. As demonstrated here as well as in previous studies (Lengwiler, 2006) leadership and the design and implementation of administrative structure has implications for realizing interdisciplinary aims. However, it is unclear whether a leadership model that works well during the early design phase is effective for the implementation and use phase when attempting to build and run an interdisciplinary organization and culture. While an informal and emergent approach to leadership characterized by a lower level of control (i.e., emergent), may be appropriate for gathering ideas and obtaining buy-in, the implementation and ongoing use of the physical and administrative structure may require a different leadership approach centered on creating the conditions for interaction and collaboration to flourish. In that traditional leadership scholarship often takes a limited view of communication as primarily a technique for achieving desired ends (i.e., a rhetorical device), giving greater consideration to the ongoing relational and situated processes of social influence (Ruben & Gigliotti, 2016) enabled in part through communication design and the surfacing of competing practical theories would enhance our understanding of effective leadership for interdisciplinary practice. From a design perspective, leadership is about "the design and implementation of strategy and structure to facilitate social influence" (Ruben, in press).

Opportunities to Understand 'What Could Be'

What becomes evident through this investigation is how interdisciplinarity is not a matter of pre-determined processes and organizational arrangements; rather the practice of interdisciplinarity is a complex, context specific ongoing accomplishment requiring continuous reflection and reconfiguration. Therefore adhering to specific approaches, processes, and configurations becomes impractical. A more fruitful approach is to recognize and embrace the designability of interdisciplinarity as a communication design practice and attend to the working out of coherence enabled through language and social interaction. The following outlines a design approach grounded in the principles and pragmatics of communication as a starting point for creating the conditions for interdisciplinary practices to develop and endure through time.

Practices are inherently designable. A practice approach attends to the coherence of practice and the way action is grounded in a degree of shared understanding among its members. However a design stance calls attention to problematic aspects of a practice where groups struggle for coherence as they work out competing ideas about communication and differences concerning what can and/or should be accomplished (Aakhus, 2007). A design stance positions human needs and experiences at the forefront and views organizing as a process of co-creation constituted through communication.

Design is an ongoing and iterative accomplishment. Design is an ongoing accomplishment that does not end at the implementation phase (i.e., the opening of a building, creation of a workspace, enactment of a program, design of new practices). Design requires moving back and forth through phases of discovery, problem definition, ideation, and implementation (T. Brown & Wyatt, 2010), which requires both informal as

well as intentionally designed opportunities for engagement that enables collective reflection and redesign. As Orlikowski(2004) notes, "'good design' cannot be ascertained a priori . . . Good design in this view is not an intrinsic feature, stable property, or static quality of the representation (the designed artifact, building, program, organization), but a recurrently enacted accomplishment provisionally and ongoingly achieved by human actors trying to use the design to get something useful done" (p. 93).

Conflict is inevitable. Conflict is inherent in any practice in that members must contend with the friction between what is and what could be (Aakhus, 2007). Designs talk back at the point of failure or when the material realities of the artifact, system, or process resist human agency (Pickering, 1995). For collectives engaged in joint design work, tension arise due to the paradoxical nature of collaborative efforts—balancing a need for control with indeterminacy, attention divided between immediate and distant concerns, and the needs of the collective and also individual goals (Poole, 2013). This can result in the opening of a disagreement space (van Eemeren et al., 1993), requiring processes and procedures grounded in communication to deal with the resistance and develop collective communication competence through spending time together, engaging in shared undertakings, working towards trust, and surfacing differences, necessary for interdisciplinary collaboration (Thompson, 2009). Breakdowns in organizing processes therefore are more productively framed as opportunities for creativity, reinvention and the redesign of practice.

Reflection is at the heart of design. Without reflection on action enabled in part through collective communication design, organizations and/or collectives resort to familiar policies, practices, and strategies to manage problems only to have problems

arise again (Argyris & Schön, 1978). Designs for collective action are never neutral in that they often reflect individual interests that "are exempt from conscious attention and reasoning" (Schön & Rein, 1995, p. 23). Tensions arise in part because of a failure to surface and address competing ideas, disagreements over facts and their relevance, and disputes over how ideas are framed and acted upon. Over time, negative behaviors become characteristic of a practice and are reflected in a dysfunctional culture. Confronting tensions and dysfunction requires individuals and groups to engage in an assessment of the design logics embedded within the practice by examining and critiquing hidden assumptions and the meanings they have for members (Schön & Rein, 1995). When designs talk back, leaders and organizational members need structured opportunities listen and reflect on what the design is saying, that is to engage in "a reflective conversation with the situation"(Schön, 1983, p. 76). Therefore the success of interdisciplinarity as a communication design practice is dependent on critique and reflection to uncover underlying assumptions about communication, propose hypotheses in the form of designs for intervention, and test designs in practice (Aakhus, 2007; Harrison, 2014). The more intractable the problem or resistance, the more necessary a dialogic approach that incorporates both thinking and acting and positions communication at the core of the process becomes necessary (Schön & Rein, 1995).

Identity and face concerns matter. Collaborative activities are influenced by matters of identity and face concerns and are complicated more so when individuals are focused on constructing or maintaining their identity or role (Barbour & James, 2015; Lewis, 2006). This is a fundamental concern for interdisciplinary practice in that it requires bringing individuals together whose identities are grounded in various distinct

disciplinary practices, which can become more salient in the presence of conflict (Oetzel & Ting-Toomey, 2016). Additionally, an individual's self-image as either independent (focus on the self) or interdependent (focus on relational connectedness) has implications for the approach taken in dealing with conflict, for example independence is reflected in one taking a dominating stance, while a concern for interdependence can result in avoidance, obliging, or comprising (Markus & Kitayama, 1991). Communicative interventions must therefore be sensitive to these differences and how power (real or perceived) influences collective design (Barbour et al., 2018a) and provide opportunities for deliberate attention to these matters.

Attention to the generation of commitments. Interdisciplinarity is dependent on the generation of commitments. This requires the design and implementation of a variety of engagement techniques and strategies for action that go beyond surface appeals to values in order to facilitate the development of an interdisciplinary culture. For an interdisciplinary culture to develop, the design and implementation of shared strategies for action enabled in part through communication interventions that allow for collective activities and participatory decision making is necessary. This requires an understanding of engagement techniques and the implications different interventions have for the scope of participation and nature of the outcomes (Hansen & Spitzeck, 2010). For example brainstorming sessions for generating ideas or structured interventions to deal with procedural issues and other matters concerning organizing processes. A design stance takes seriously the ways in which speech is a form of action in that we accomplish things and construct our realities through language—generating commitments and obligations through promises, agreements, or invitations (Austin, 1962; Searle, 1969) and how

language and the activities it affords are significantly expandable through space and time (Aakhus & Jackson, 2005). Therefore the generation of interdisciplinary commitments is dependent in large part on creating the conditions for communication to happen. However as illustrated in this case while communicative interventions are a necessary condition to discipline communication in particular ways to generate a particular quality of communicating, thinking, and acting, it is in no way sufficient. The next step is to attend to the tensions revealed through communication and the communication design work groups engage in to manage problems related to meaning, coherence and action.

Limitations

Inherent in any research endeavor are limitations related to the research context, methods, data collection, and analysis. Clearly a single case study prohibits generalizability, however that is not the goal of qualitative interpretive studies. Rather the goal is to gain understanding into a world that is not your own and provide material for reflection deemed critical for the ongoing accomplishment of interdisciplinarity. Nevertheless, an investigation of a similar context using the same theoretical and methodological approach would likely enhance the findings presented here and contribute to theory building efforts. With regard to the collection of data, due to the highly fragmented nature of the organization and the diversity of members' activities, I was only able to capture a limited view of the types of activities members engage in and the various opportunities and/or challenges members experience, although interviews enabled me to develop a deeper understanding of member experiences. Additionally, the meetings I attended, although limited in number represent a sampling of collective activities and provide a general sense of the challenges organizational members

experience. Another limitation relates to conducting member checks. Because my time as a researcher in residence ended before I completed data analysis and a report of my findings, I was unable to discuss the relevance and validity of my conclusions with members, a condition I intend to remedy in the future.

Finally, interdisciplinarity is a process and a lengthy one at that. Collaborations take time to develop, collaboration and consensus building is never a straightforward matter, and the achievement of collective objectives is never guaranteed. The restricted time frame for this study is clearly a limitation when investigating a process that began before the start of this study and will undoubtedly continue long after. Nevertheless, the focus on multiple interactive episodes, occurring across a variety of situations has yielded both theoretical and practical knowledge concerning the design and redesign of physical and administrative structures as well as communicative processes and interactivity necessary for the pursuit of interdisciplinarity. In this sense the study has enriched our understanding of the complex ways aspects of the organization design—physical and administrative structures and the routines of practice—enable and/or constrain the achievement of interdisciplinarity. Finally, important to note is that this research does not consider the quality or usefulness of the interdisciplinary work being done at the research site.

Summary and Conclusion

The challenge of bringing different disciplinary practices including research, teaching, clinical interventions, and community outreach together to address complex challenges is underscored in this dissertation. This study demonstrates how the principles of language and interaction used as heuristic for thinking about designs for

communication and the achievement of interdisciplinarity is a productive approach in that it surfaces tensions not always evident. It also demonstrates how practices develop over time and therefore designing for interdisciplinarity is never complete, that is organizing in general and interdisciplinarity specifically requires a continuous process of engagement among organizational members. Leaders and managers must therefore move "beyond selecting an organization design and develop their ability to create new organizational forms, treating the word design not as a noun, but as a verb" (Yoo, Boland, & Lyytinen, 2006, p. 215). Creating the conditions for interdisciplinarity to flourish is about designing contexts for action (T. Brown & Martin, 2015) and creating opportunities for reflective practice (Schön, 1983) through communication design (Aakhus, 2007). Moving from organization design to organization designing positions strategy beyond something that organizations have to something that organizations do (Gruber, de Leon, George, & Thompson, 2015; Monge, 1993; Weick, 1993).

This case provides a glimpse into the early phase of an interdisciplinary practice showing how the organization begins with a thin design theory as illustrated in figure 4.1, and as the design is implemented and tested in practice members grapple with problematic and contested aspects (i.e., the design talks back). This creates a need for members to engage in collective design work to move towards a shared theory of how to orchestrate communication to generate interdisciplinary practice. That is the theory itself must evolve in response to competing ideas about communication works or ought to work to achieve interdisciplinary practice. As noted by Rhoten (2004), interdisciplinarity requires "reconceptualizations and reorganizations of new research" (p. 6). This case study highlights the struggle for reconceptualization and reorganization in a single case

and contributes to our understanding of the ways in which interdisciplinarity is fundamentally a communicative practice. In that organizations exist and persist as "discursive-material configurations [that] are reproduced and coproduced through ongoing interactions" communication design becomes an essential aspect of organizing for the achievement of interdisciplinarity (Brummans, Cooren, Robichaud, & Taylor, 2014, p. 173). The institute that is the subject of this case would benefit from a return to its roots that of a design enterprise as was the case before the building was complete. This requires a commitment to frequent reflection, redesign, and the working out of ideas for collective activity as a foundation of practice to avoid becoming an organization of "parallel problem solving" (Raasch, Lee, Spaeth, & Herstatt, 2013, p. 1139). In positioning interdisciplinarity in terms of communication design practice (e.g., Aakhus, 2007; Jackson & Aakhus, 2014) this research has offered a novel yet productive approach for advancing the organization of interdisciplinary practice by attending to both the communicative and material aspects of organizing and the ways in which practitioners must confront the inevitable contradictions, tensions, dilemmas related to organizing for interdisciplinarity (Aakhus & Laureij, 2012; Barbour & Gill, 2014; Barbour et al., 2018b).

APPENDIX A: Informed Consent

Interview Consent Form

You are invited to participate in a study entitled: Interdisciplinarity as Communication Design Practice that is being conducted by Christine Goldthwaite, a Ph.D. Candidate in the department of Communication in the School of Communication and Information at Rutgers University. The purpose of this research is to examine organizing and communication practices at the NJ Institute for Food, Nutrition and Health for my dissertation.

Approximately 50-75 subjects will participate in the study, and each individual's participation will last anywhere from 30 minutes to 20 hours over the course of a year depending on their willingness to participate and the frequency in which they are present in observed meetings.

During this study, you will be asked to answer some questions as to your role as well as your experiences with organizing and communication practices at the NJIFNH. This interview was designed to be approximately 60 minutes in length, but feel free to expand on the topic or talk about related ideas. If there are any questions you would rather not answer or that make you feel uncomfortable, please say so and we can end the interview or move on to the next question, whichever you prefer.

This research is confidential. Confidential means that the research records will include some information about you and this information will be stored in such a manner that some linkage between your identity and the response in the research exists. However, I will not identify you by name, unless you specify otherwise, in any reports using information obtained from this interview. Interview data will be de-identified by replacing your name with a fictitious name. Some of the information collected about you in this interview includes your name, gender, ethnicity, job title, and types of employees you manage. All recorded interviews will be transcribed in a timely manner (within 2 weeks of the recording date), all identifying information will be eliminated, and names will be replaced with pseudonyms in the final transcript. The recordings will be destroyed immediately after transcription. Field notes collected during this interview will be stored in a locked cabinet in the researcher's office. Audio recordings will be stored on a password protected hard drive in a locked cabinet in the researcher's office until transcription is complete. Per Federal Regulations this data must be stored for three years.

The research team (myself and academic advisor) and the Institutional Review Board at Rutgers University are the only parties that will be allowed to see the data, except as may be required by law. If a report of this study is published, or the results are presented at a professional or academic conference, only group results and anonymized names will be stated. All study data (field notes and transcripts) will be kept indefinitely as part of ongoing research. The data will likely be used to compare and contrast data collected in future research concerning organizing for social innovation.

Your participation is voluntary and you may choose not to participate, and/or withdraw at any time during the process without having to give an explanation. The intent and purpose of this interview is for research. There are no foreseeable risks to participation in this study although you may feel uncomfortable sharing or responding to the questions asked. You may refuse to answer any question that makes you uncomfortable. Other than that, there are no physical or psychological risks expected from your participation in this research.

The benefits of taking part in this study may be: practical insight regarding organizing more generally, and communication practices in the context of interdisciplinarity more specifically. More broadly, this study may provide important insight into organizing for interdisciplinarity, which could have future benefits for organizations. However, you may receive no direct benefit from taking part in this study.

The recording(s) will be used solely for analysis by the research team.

If you have any questions about the study or study procedures, you may contact myself at:

Christine Goldthwaite (Doctoral Candidate, Department of Communication, School of Communication and Information, Rutgers University).

Questions or comments about this research should be directed to myself at:
The School of Communication and Information
Rutgers, The State University
4 Huntington Street, New Brunswick, NJ 08901-1071
Email: christine.goldthwaite@rutgers.edu
Phone: (973) 722-6648

You may also contact my faculty advisor, Dr. Mark Aakhus (Associate Dean of Research).
Questions or comments about this research should be directed to him at:

The School of Communication and Information
Rutgers, The State University
4 Huntington Street, New Brunswick, NJ 08901-1071
Email: aakhus@rutgers.edu
Phone: (848) 932-8797

If you have any questions about your rights as a research participant, you can contact the Institutional Review Board at Rutgers (which is a committee that reviews research studies in order to protect research participants).

Institutional Review Board
Rutgers University, the State University of New Jersey
Liberty Plaza / Suite 3200
335 George Street, 3rd Floor, New Brunswick, NJ 08901
Phone: 732-235-9806
Email: humansubjects@orsp.rutgers.edu

You will be offered a copy of this consent form that you may keep for your own reference.

Once you have read the above form and, with the understanding that you can withdraw at any time and for whatever reason, you need to let me know your decision to participate in today's interview.

Your signature on this form grants the investigator named above permission to record you as described above during participation in the above-referenced study. The investigator will not use the recording(s) for any other reason than that/those stated in the consent form without your written permission.

Subject (Print) _____

Subject Signature _____Date _____

Principal Investigator Signature _____Date _____

Audio/Visual Addendum to Consent Form

You have already agreed to participate in a research study entitled: Interdisciplinarity as Communication Design Practice conducted by conducted by Christine Goldthwaite, a Ph.D. Candidate in the department of Communication in the School of Communication and Information at Rutgers University. The purpose of this research is to examine organizing and communication practices at the NJ Institute for Food, Nutrition and Health for my dissertation. I am asking for your permission to allow me to audiotape (sound) as part of this research study. You do not have to agree to be recorded in order to participate in the main part of the study.

The recording(s) will be transcribed and used for data analysis.

The recording(s) will include your voice and name (if stated in the course of the recording). If you say anything that you believe at a later point may be hurtful and/or damage your reputation, then you can ask the interviewer to rewind the recording and record over such information OR you can ask that certain text be removed from the dataset/transcripts.

The recording(s) will be stored on a dedicated password protected computer hard drive in the researchers personal office and locked in a secure filing cabinet with no link to your identity. All audio recordings will be transcribed in a timely manner (within 2 weeks of the recording date), all identifying information will be eliminated and names will be replaced with pseudonyms in the final transcript. The audio recordings will be destroyed immediately after transcription. Field notes and transcripts will be stored in a locked cabinet in the researcher's office. Only the researcher will have access to this data.

Your signature on this form grants the investigator named above permission to record you as described above during participation in the above-referenced study. The investigator will not use the recording(s) for any other reason than that/those stated in the consent form without your written permission.

Subject (Print) _____

Subject Signature _____ Date _____

Principal Investigator Signature _____ Date _____

APPENDIX B: Focus Group Consent Form

Focus Group Consent Form

You are invited to participate in a study entitled: Interdisciplinarity as Communication Design Practice that is being conducted by Christine Goldthwaite, a Ph.D. Candidate in the department of Communication in the School of Communication and Information at Rutgers University. The purpose of this research is to examine organizing and communication practices at the NJ Institute for Food, Nutrition and Health for my dissertation.

Approximately 50-75 subjects will participate in the study, and each individual's participation will last anywhere from 30 minutes to 20 hours over the course of a year depending on their willingness to participate and the frequency in which they are present in observed meetings and interactions.

During this focus group, you will be asked to answer some questions as to your role as well as your experiences with organizing and communication practices at the NJIFNH. This focus group was designed to be approximately 60 minutes in length, but feel free to expand on the topic or talk about related ideas. If there are any questions you would rather not answer or that make you feel uncomfortable, please say so and you can withdraw from the focus group or move on to the next question, whichever you prefer. PLEASE NOTE, respect the privacy of your fellow participants with regard to anything said in the focus group. Everything discussed in this session should remain confidential (i.e., not repeated or shared) and not discussed with anyone outside of the group or with other group participants once the focus group ends.

This research is confidential. Confidential means that the research records will include some information about you and this information will be stored in such a manner that some linkage between your identity and the response in the research exists. However, I will not identify you by name, unless you specify otherwise, in any reports using information obtained from this focus group. Focus group data will be de-identified by replacing your name with a fictitious name. Some of the information collected about you in this focus group includes your name, gender, ethnicity, job title. All recorded focus groups will be transcribed in a timely manner (within 2 weeks of the recording date), all identifying information will be eliminated, and names will be replaced with pseudonyms in the final transcript. The recordings will be destroyed immediately after transcription. Field notes collected during this focus group will be stored in a locked cabinet in the researcher’s office. Audio recordings will be stored on a password protected hard drive in a locked cabinet in the researcher’s office until transcription is complete. Per Federal Regulations this data must be stored for three years.

The research team (myself and academic advisor) and the Institutional Review Board at Rutgers University are the only parties that will be allowed to see the data, except as may be required by law. If a report of this study is published, or the results are presented at a professional or academic conference, only group results and anonymized names will be

stated. All study data (field notes and transcripts) will be kept indefinitely as part of ongoing research. The data will likely be used to compare and contrast data collected in future research concerning organizing for social innovation.

Your participation is voluntary and you may choose not to participate, and/or withdraw at any time during the process without having to give an explanation. The intent and purpose of this focus group is for research. There are no foreseeable risks to participation in this study although you may feel uncomfortable sharing or responding to the questions asked. You may refuse to answer any question that makes you uncomfortable. Other than that, there are no physical or psychological risks expected from your participation in this research.

The benefits of taking part in this study may be: practical insight regarding organizing more generally, and communication practices in the context of interdisciplinarity more specifically. More broadly, this study may provide important insight into organizing for interdisciplinarity, which could have future benefits for organizations. However, you may receive no direct benefit from taking part in this study.

The recording(s) will be used solely for analysis by the research team.

If you have any questions about the study or study procedures, you may contact myself at:

Christine Goldthwaite (Doctoral Candidate, Department of Communication, School of Communication and Information, Rutgers University).

Questions or comments about this research should be directed to myself at:
The School of Communication and Information
Rutgers, The State University
4 Huntington Street, New Brunswick, NJ 08901-1071
Email: christine.goldthwaite@rutgers.edu
Phone: (973) 722-6648

You may also contact my faculty advisor, Dr. Mark Aakhus (Associate Dean of Research).
Questions or comments about this research should be directed to him at:

The School of Communication and Information
Rutgers, The State University
4 Huntington Street, New Brunswick, NJ 08901-1071
Email: aakhus@rutgers.edu
Phone: (848) 932-8797

If you have any questions about your rights as a research participant, you can contact the Institutional Review Board at Rutgers (which is a committee that reviews research studies in order to protect research participants).

Institutional Review Board
Rutgers University, the State University of New Jersey
Liberty Plaza / Suite 3200
335 George Street, 3rd Floor, New Brunswick, NJ 08901
Phone: 732-235-9806
Email: humansubjects@orsp.rutgers.edu

You will be offered a copy of this consent form that you may keep for your own reference.
Once you have read the above form and, with the understanding that you can withdraw at any time and for whatever reason, you need to let me know your decision to participate in today's focus group.

Your signature on this form grants the investigator named above permission to record you as described above during participation in the above-referenced study. The investigator will not use the recording(s) for any other reason than that/those stated in the consent form without your written permission.

Subject (Print) _____

Subject Signature _____Date _____

Principal Investigator Signature _____Date _____

Audio/Visual Addendum to Consent Form

You have already agreed to participate in a research study entitled: Interdisciplinarity as Communication Design Practice conducted by conducted by Christine Goldthwaite, a Ph.D. Candidate in the department of Communication in the School of Communication and Information at Rutgers University. The purpose of this research is to examine organizing and communication practices at the NJ Institute for Food, Nutrition and Health for my dissertation. I am asking for your permission to allow me to audiotape (sound) as part of this research study. You do not have to agree to be recorded in order to participate in the main part of the study.

The recording(s) will be transcribed and used for data analysis.

The recording(s) will include your voice and name (if stated in the course of the recording). If you say anything that you believe at a later point may be hurtful and/or damage your reputation, then you can ask the facilitator to rewind the recording and record over such information OR you can ask that certain text be removed from the dataset/transcripts.

The recording(s) will be stored on a dedicated password protected computer hard drive in the researchers personal office and locked in a secure filing cabinet with no link to your identity. All audio recordings will be transcribed in a timely manner (within 2 weeks of the recording date), all identifying information will be eliminated and names will be replaced with pseudonyms in the final transcript. The audio recordings will be destroyed immediately after transcription. Field notes and transcripts will be stored in a locked cabinet in the researcher's office. Only the researcher will have access to this data.

Your signature on this form grants the investigator named above permission to record you as described above during participation in the above-referenced study. The investigator will not use the recording(s) for any other reason than that/those stated in the consent form without your written permission.

Subject (Print) _____

Subject Signature _____ Date _____

Principal Investigator Signature _____ Date _____

APPENDIX C: Interview Protocol

Title of Study: Interdisciplinarity as Communication Design Practice

Introduction

Thank you for taking the time to speak with me about your experiences at IFNH. My name is Christine Goldthwaite, I am a Ph.D. Candidate in the department of Communication in the School of Communication and Information at Rutgers University. My dissertation research focuses on organizing and communication practices related to interdisciplinarity. I am interested in the variety of ways that people gather, interact, meet and work together at IFNH, including when you or others are not physically present (i.e., virtual interactions).

I would like to audio-record this interview and take notes so I can analyze your responses. I will keep everything you say confidential, and no one but myself will have access to your responses. Your name will be made anonymous with no link to your actual identity in the analysis, the final report, or any subsequent publications or presentations of the study. Do you agree to participate? [Have interviewee sign consent form, researcher initials consent form, and give a copy to the participant.] Thank you! Do you have any questions before we begin?

General questions:

I would like to understand what takes place at IFNH by hearing more about your relationship to the organization:

1. How long have you been a member of IFNH?

2. Why did you decide to become a member and how did the opportunity arise?

3. Have you benefited from becoming a member of IFNH? If so, how? If not, why?

4. What are the typical types of projects (or activities) you work on in relation to your membership at IFNH?

5. Of the projects (or activities) you mentioned, which <u>one</u> is most enhanced by taking place at IFNH?
    a. Can you describe the particular ways the IFNH enhances the project?
    b. What problem, or set of problems, are resolved by conducting your work at IFNH? (i.e., access to resources, access to people, space to work, prestige from being part of IFNH)

   c. Are there any ways that the IFNH complicates or interferes with the work of the project? Can you give me a specific example?
      i. Probe if not mentioned: In what ways do the formal rules and/or procedures enhance and/or interfere with the work of your project?
   d. How do you think the physical space enhances your project (activities)?
   e. Does the physical space ever interfere with your ability to accomplish your objectives with regard to your project (activities)? In what ways?
   f. Are there any activities that you would not do at IFNH because the project or activity is not well suited to the way things work at IFNH?
      i. For each mentioned, ask the respondent to describe why that project would not be well suited to the IFNH.

6. How would you say your work (or activities) at IFNH relates to its mission?

7. Would you describe your work as interdisciplinary? In what ways?

8. Has your membership in IFNH contributed to new interdisciplinary activities? (e.g. new ideas, new relationships, new projects, etc.). Can you tell me more about this and how it came about?

9. What are your general impressions of how IFNH is organized?
   a. If you could completely change the way IFNH was organized, what would you change?
   b. Can you tell me a story about a time when something was not working the way you wanted at IFNH and how you dealt with the situation?

Questions about interactions and meetings:

10. I would like to understand the types of interactions you typically have with others in the course of your work.
    a. Who do you interact with on a typical day and what are trying to accomplish?
    b. What are the communication problems you face?
       i. What are the strategies you use for addressing these problems?
       ii. Why do you employ these strategies?
    c. What percentage of your interactions in a typical week are:
       i. With people in your immediate work group?
       ii. With other members of IFNH? Who are these other members?
       iii. With members of the University who are not part of IFNH? Who are these other University members?

11. How do you go about using the physical space at IFNH when you are interacting with others? Where are you interacting and what are you doing?
    a. Does the physical space ever interfere with your ability to interact with others? How so? Can you tell me a story that illustrates this?

12. How would you describe your overall experience with social interactions, those interactions that are not directly related to work, here at IFNH?

13. I would like to understand the types of meetings you typically have in the course of your work.
    a. Can you describe what a typical meeting is like and whom you are meeting with?
    b. What are you trying to accomplish in a typical meetings?
    c. What is the biggest problem you face in the typical meetings you attend? Can you tell me as story about an example?
    d. What are the communication problems you face in regard to meetings?
        i. What are the strategies you use for addressing these problems?
        ii. Why do you employ these strategies?
    e. What percentage of the meetings you attend are pre-planned versus impromptu?
        i. Is an agenda typically used in the pre-planned meetings you attend?
        ii. Would you say that the using an agenda is useful? How so?

14. Is there anything else we haven't discussed yet that you think is important for me to know about in thinking about organizing and communication practices at IFNH?

General Probes

You talked about _____, would you say this is a typical occurrence or is this an exception to your typical experience?

You mentioned that you thought_____; could you tell me more about that?

You mentioned when you were doing _____: could you tell me more about that?

You mentioned that, _____happened; could you tell me more about that?

You talked about _____, could you describe that experience in as much detail as possible?

APPENDIX D: Focus Group Protocol

Title of Study: Interdisciplinarity as Communication Design Practice

Consent Process
Consent forms for focus group participants will be completed in advance by all those who agree to participate. The following is summary of the information in the consent form that will be communicated to participants before beginning.

Hello. My name is Christine Goldthwaite with the School of Communication and Information at Rutgers. Thank you for taking the time to participate. This focus group is part of my dissertation research focused on organizing and communication practices here at IFNH. As members of IFNH, I would like to hear from you about your experiences working and interacting with others here.

- *The purpose of this study is to learn about organizing and communication practices in general and how the facilitate enables or constrains your ability to do your work.*
- *The information you give me is completely confidential, and I will not associate your name with anything you say in the focus group.*
- *I would like to tape the focus groups so that I make sure to capture the thoughts, opinions, and ideas I hear from the group. No names will be attached to the focus groups and the tapes will be destroyed as soon as they are transcribed.*
- *You may refuse to answer any question or withdraw from the study at anytime.*
- *I understand how important it is that this information is kept private and confidential. I ask participants to respect each other's confidentiality as well.*
- *If you have any questions now or after the focus group, you can always contact me, Christine Goldthwaite at christine.goldthwaite@rutgers.edu; or by phone 973-722-6648.*

Introduction:

1. Explanation of the process
   Ask the group if anyone has participated in a focus group before.

   About focus groups
   - I learn from you (positive and negative)
   - Not trying to achieve consensus, I am gathering information

   Logistics
   - Focus group will last about one hour
   - Feel free to move around

- Where is the bathroom? Exit?
- Help yourself to refreshments

2. Ground Rules
   - Everyone should participate.
   - Information provided in the focus group must be kept confidential
   - Stay with the group and please don't have side conversations
   - Turn off cell phones if possible
   - Have fun

3. **Turn on Audio Recorder**
   Please note that this session will be recorded to ensure I adequately capture your ideas during the conversation. However, the comments from the focus group will remain confidential and your name will not be attached to any comments you make. The audio recording of this session will be destroyed after transcription.

4. Ask the group if there are any questions before we get started, and address those questions.

   1. Let's do a quick round of introductions. Can each of you tell me your major and how long you have been a member of IFNH?
   2. How did you become a member?
   3. What is/are the benefits of being a member of IFNH?
   4. Are there any downsides to being a member of IFNH?
   5. What are the typical types of projects (or activities) you work on in relation to your membership at IFNH?
   6. Would you describe your work as interdisciplinary? In what ways?
   7. Has your membership in IFNH contributed to new interdisciplinary activities? (e.g. new ideas, new relationships, new projects, etc.). Can you tell me more about this and how it came about?
   8. What are your general impressions of how IFNH is organized?
      a. If you could completely change the way IFNH was organized, what would you change?
      b. Can you tell me a story about a time when something was not working the way you wanted at IFNH and how you dealt with the situation?
   9. How do you go about using the physical space at IFNH when you are interacting with others? Where are you interacting and what are you doing?
      a. Does the physical space ever interfere with your ability to interact with others? How so? Can you tell me a story that illustrates this?

Questions about interactions and meetings:

   10. I would like to understand the types of interactions you typically have with others in the course of your work.
      a. Who do you interact with on a typical day and what are trying to accomplish?

   b. What are the communication problems you face?
      i. What are the strategies you use for addressing these problems?
      ii. Why do you employ these strategies?
   c. What percentage of your interactions in a typical week are:
      i. With people in your immediate work group?
      ii. With other members of IFNH? Who are these other members?
      iii. With members of the University who are not part of IFNH? Who are these other University members?

11. How would you describe your overall experience with social interactions, those interactions that are not directly related to work, here at IFNH?

12. Is there anything else we haven't discussed yet that you think is important for me to know about in thinking about organizing and communication practices at IFNH?

Thank you for your time.

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