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UNSOUGHT AND UNSOLICITED KNOWLEDGE: A PROBLEM-SOLVING-PROCESS
FRAMEWORK FOR KNOWLEDGE EXCHANGES IN ORGANIZATIONS

by

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A Dissertation submitted to the

Graduate School-Newark

Rutgers, The State University of New Jersey

in partial fulfillment of the requirements

for the degree of

Doctor of Philosophy

Graduate Program in

Ph.D. in Management

written under the direction of

Daniel Z. Levin, Ph.D.

and approved by

Newark, New Jersey

October, 2012

ABSTRACT OF THE DISSERTATION

UNSOLICITED AND UNSOUGHT KNOWLEDGE: A PROBLEM-SOLVING-PROCESS FRAMEWORK FOR KNOWLEDGE EXCHANGES IN ORGANIZATIONS

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This dissertation starts with the premise that a well-functioning learning organization should be able to effectively and efficiently resolve both known-unknowns as well as unknown-unknowns. Furthermore it takes a bottom-up, emergent perspective on organizational learning by assuming that this is done, in large part, by organizing for and encouraging various forms of knowledge exchange interactions among its members (e.g., Argote, 1999). By reviewing a number of different literature streams (e.g., knowledge search-transfer, advice sharing-acceptance, innovation championing-adoption), I highlight that each focuses on a different form of knowledge exchange. Furthermore, I suggest that these literatures have implicitly assumed that whether a recipient or a source initiated an exchange corresponded to whether the exchange and the knowledge it involved was solicited / sought (and thus likely to only resolve known-unknowns) or unsolicited / unsought (and thus offers the potential to resolve unknown-unknowns). However, I argue, initiation in modern, complex, knowledge-based organizations is frequently mutual or coincidental and thus may be a poor proxy for unsolicited / unsought knowledge. In order to understand instances of unsolicited / unsought knowledge across all forms of knowledge exchange, I propose that knowledge

exchange interactions can be contextualized within a recipient's overall problem-solving process. By contextualizing knowledge-exchanges within a multi-phase problem-solving process (e.g., problem formulation, problem validation, solution formulation, solution validation), I am able to examine where recipients are cognitively when they start an interaction as well as the implications for the type of knowledge provided by sources during the interaction. A survey of over 1200 respondents describing over 700 knowledge exchange interactions at four multinational Research and Development companies provided evidence of my propositions. In each of three sections / studies, I debunk what I argue are assumptions built into literature focused on either source- or recipient-initiated exchanges. Collectively my results seem to suggest that initiation is not particularly relevant for differentiating the type of knowledge exchange (or more precisely whether an exchange may resolve unknown-unknowns) and highlight unsolicited / unsought knowledge as a more relevant construct.

PREFACE & ACKNOWLEDGEMENTS

I would like to dedicate this dissertation to my wonderful wife, Maria Marquez Carrillo, and our beautiful newborn son, Thomas Robert McNamee. Maria has been wonderfully and unquestionably supportive throughout this process and if it was not for her I would not be where I am today. Thomas is such a wonderful bundle of potential and, at one month old, is already adding beauty to our lives. Thomas, you will often hear stories about how your father defended his dissertation 5 days after you came home from the hospital, please be patient, we all like to reminisce.

I would also like to sincerely thank Dr. Daniel Z. Levin, my advisor and dissertation chair, whose patient guidance and support made this dissertation possible. Finally, I would like to thank the rest of my committee: Dr. Chao C. Chen, for his mentorship throughout the years; Dr. Terri R. Kurtzberg, for her example of how to excel at teaching and research while staying grounded; and Dr. Rob Cross, for his inspirational work that brought problem-solving process and knowledge-exchange literatures closer together.

Finally, I would like to thank my parents, Bob & Lee McNamee. Although they still don't understand that completing the dissertation is not the end of a process but instead is only the start to a long career of writing research papers, they continue to give me unending support and are ultimately responsible for fostering the creative spirit that has led me down this path.

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INTRODUCTION

The knowledge-based view (KBV) or knowledge-based theory of the firm considers knowledge to be the most important resource in determining a firm's sustainable competitive advantage (Kogut & Zander, 1992; Grant 1996; Spender, 1996). In describing this perspective, Kogut & Zander (1992) suggest "firms are social communities that serve as efficient mechanisms for the creation and transformation of knowledge into economically rewarded products and services." (p. 627). Although KBV research is often approached from macro-level or strategic perspectives, an increasingly prevalent perspective considers that organizational knowledge systems are 'emergent' with knowledge creation at the individual level and knowledge exchange or transfer at the dyadic or small group level ultimately driving organizational learning, change or adaptation, and innovation (Grant, 1996; Crossan et al., 1999; O'Conner & Veryzer, 2001; Reid & De Brentani, 2004; Felin & Hesterly, 2007; Boeddrich, 2004). For example, two of the most significant scholars in the domain of organizational learning, Senge (e.g., Senge, 1990) and Argyris (e.g., Argyris, 1982; Argyris & Schon, 1978), although they differ in many aspects of their theories, both see individual level learning and related cognitive processes as critical factors in driving overall organizational effectiveness (Edmondson & Moingeon, 1998).

The motivation that drives people to seek to learn new knowledge has been examined at many levels of analysis and implicitly underlies research on knowledge exchange and organizational learning. "The construction of new knowledge is a pervasive human pursuit for both individuals and collectives" (Kruglanski & Webster,

1996, p. 263). Edmondson and Moingeon (1998) defined organizational learning (OL) as “a process in which an organization’s members actively use data to guide behavior in such a way as to promote the ongoing adaptation of the organization” (p. 28). OL perspectives often presume the existence, effectiveness, and efficiency of an adaptive, experiential learning system: “Classical models of learning, including organizational learning, rest on conceptions of behavior that is goal-oriented and feedback-driven.” (Sproull, 2010, p. 60). Quite simply, OL assumes that organization members know their goals and, through trial and error, they learn how to better achieve them. This feedback, trial-and-error, or single loop learning (e.g., Argyris, 1976) was described in Szulanski’s (1996) famous article exploring within-firm “stickiness” under the initiation stage of the transfer process:

“A transfer begins when both a need and the knowledge to meet that need coexist within the organization, possibly undiscovered. The discovery of the need may trigger a search for potential solutions, a search that leads to the discovery of superior knowledge. Alternatively, the discovery of superior knowledge may reframe as unsatisfactory a hitherto satisfactory situation (cf. Rogers, 1983; Zaltman, Duncan, & Holbek, 1973; Glaser, Abelson, & Garrison, 1983).” (Szulanski, 1996, p. 28).

Recipient-initiated search has been described as “focused search” (Huber, 1991), “directed search” (McGrath, 2001), or problemistic search (Cyert & March, 1963). Alternatively, “slack search” (Cyert & March 1963) relies on the chance recognition of suboptimal performance via the discovery of superior knowledge or practices (e.g., Rogers, 1983; Szulanski, 1996). However, there have been numerous criticisms of OL perspectives based exclusively on experiential based learning. “Experience is often a

poor teacher, being typically quite meager relative to the complex and changing nature of the world in which learning is taking place.” (Levinthal & March, 1993, p. 96). Another criticism commonly levied against experiential learning perspectives is that individuals and organizations stop seeking alternatives once they have found seemingly effective routines (i.e., the competency trap) (e.g., Levitt & March, 1988). In fact, it has been suggested that the same expertise that allows people to develop significant competencies in one area, may make them especially blind to errors or ignorance in other areas. A major part of these problems is that organizational actors are often unaware of many of the interpretive cognitive processes and implicit assumptions through which they perceive and approach their environment (Daft & Weick, 1984; Goleman, 1985).

Levinthal and March (1993) have suggested that the first grand problem of decision making is dealing with the problem of ignorance. Theories which focus on concepts such as errors, ignorance, non-knowledge, nescience, and negative knowledge, have highlighted numerous forms of unknowns and an even larger set of terms to describe these states of unknowing (Gross, 2007). Most of these perspectives agree on a high-level differentiation (i.e., a meta-level) in the taxonomy of unknowns: known-unknowns vs. unknown-unknowns (e.g., Kerwin 1993; Smithson, 1989). These two types of unknowns are fundamentally different, with known-unknowns referring to cases where an individual has recognized their own knowledge need or gap, while unknown-unknowns refer to things like unrecognized errors, untested assumptions, and suboptimal know-how that people are unaware of possessing. I propose that a simple

differentiation between know-unknowns and unknown-unknowns can help provide a relatively clear bridge between individual level knowledge flows and the higher-level constructs of organizational learning, organizational change, and innovation.

Foundational Perspective: a well-functioning learning organization should be able to effectively and efficiently resolve both known-unknowns as well as unknown-unknowns and it does this in large part by organizing for and motivating various types of knowledge flows throughout the networks of its members.

In order to better understand barriers to knowledge flows and the corresponding efficient and effective resolution of known-unknowns and unknown-unknowns in organizations, it is necessary to dig deeper into the complex epistemic (i.e., knowledge or problem solving based) and social motivations that underlie individuals' learning as well as knowledge search and acceptance behaviors. One of the primary goals for this paper is to present a framework whereby knowledge exchanges can be understood within a recipient's broader problem-solving process. Contextualizing exchanges within this process is important because it allows for recipient-initiated and source-initiated exchanges to be analyzed side-by-side within the same model. By integrating the literatures we may see how the lessons and perspectives in one literature can be useful when applied to another literature, we can assess whether the assumptions and boundary conditions of each literature are reasonable, we can note instances of the underlying phenomenon of interest that do not fit into the traditional boxes that the

literatures have created, we can more comprehensively understand how various individual and organizational factors apply across all literatures and within the integrated perspective, and finally we can create parsimony by acknowledging the underlying phenomenon that runs across and ties together these various literatures. In this paper I attempt to integrate literatures by 1) breaking down a number of assumptions common in all literatures about the relationship between sources vs. recipient initiation and known- vs. unknown-unknowns by introducing the concept of unsolicited and unsought knowledge, 2) examining how the motivations of sources and recipients as well as their relationships affect the flow of unsolicited / unsought knowledge as well as knowledge from different phases of the problem-solving process, and finally, 3) assessing the characteristics of unsolicited / unsought knowledge as well as knowledge from different phases of the problem-solving process.

This rest of the dissertation is organized as follows. First I highlight the criticality of knowledge recombination, transfer, and exchange in organizations and this is followed by a review of a few disparate literature streams that describe specific forms of knowledge exchange. I group these literatures into those that focus on recipient-initiated exchanges vs. those that examine source-initiated exchanges. Then I close this overall introduction by highlighting three sets of apparent assumptions held by literature that focuses on exchanges initiated by either sources ('push') or recipients ('pull'). The assumption that various phenomena correspond to initiation: problem recognition, motivation, and knowledge characteristics are each critiqued in the various studies / sections of this dissertation. In section one I discuss the prevalence of mutual

and coincidental initiation in modern, complex organizational settings. I introduce the concept of unsolicited / unsought knowledge and argue that it exists in both recipient- and source-initiated exchanges. I outline a 2x2 matrix of initiation by unsolicited / unsought knowledge and highlight the off-diagonals of recipient initiation and unsolicited / unsought knowledge as well as source initiation and solicited / sought knowledge that seem to be understudied and underappreciated in past research. In order to appreciate these possibilities I propose to contextualize knowledge exchanges within a recipient's overall problem-solving process. In section 2 I discuss recipient and source engagement as well as individuals' motivational states and relationships that affect their engagement in exchanges. I explore two larger stories that demonstrate the utility of the perspective I have established. The first of these looks at several types of motivation arrayed along an internal to externally driven continuum and examines how these motivations drive knowledge searching and sharing and also moderate recipients' engagement in the face of various forms of knowledge in the problem-solving process. The next looks at how higher-expertise sources exchanges knowledge within the problem solving process and highlights an apparent barrier to the transfer of expert knowledge in organizations. Finally, in section 3 I discuss knowledge characteristics and look at how they correspond to the problem solving process and unsolicited / unsought knowledge within the process. In addition, this section examines how knowledge characteristics affect or moderate the apparent usefulness of unsolicited / unsought knowledge. Implications are discussed highlighting the difficulty of resolving unknown-

unknowns in organizations and inherent higher degree of noise in unsolicited / unsought exchanges and unsolicited / unsought knowledge.

THEORY / LITERATURE REVIEW

KNOWLEDGE RECOMBINATION AND TRANSFER

The division of labor in organizations has led to the diversification of expertise and consequently the distribution of specialized knowledge across members of the organization. This specialization has been important for organizations to achieve production efficiencies and, as domains have become more complex, it has been critical for individuals to develop the necessary deep expertise in specific manageable areas of knowledge and technology (Grant, 1996). However, in the rapidly evolving organizational context, problems are usually ill-defined and complex (Lyles & Mitroff, 1980), and the knowledge necessary to resolve organizational tasks is frequently distributed across multiple individuals (Argote & Ingram, 2000; Thomas-Hunt et al., 2003). Thus problem solving requires multiple individuals working together to find answers to questions or otherwise resolve organizational problems (Paulus, 2000; Boh et al., 2007; Huang, 2008). Levine and Moreland said it quite simply: "Interest in collaboration rests, implicitly or explicitly, on the assumption that human cognition is an interpersonal, as well as intrapersonal, process" (2004, p. 165) (see also Levine et al., 1993; Larson & Christensen, 1993; Laughlin, 1996; Laughlin & Ellis, 1986; Laughlin, 1980).

Many researchers, who consider the micro-processes that create knowledge based advantages of firms, focus on knowledge (re)combination as the fundamental building block of innovation and organizational learning (e.g., Fleming & Sorensen, 2001; Fleming & Sorensen, 2004; Olsson & Frey, 2002; Weitzman, 1996, 1998; Brown & Duguid, 2001). It has been claimed that “all new resources, including knowledge, are created through two generic processes: namely, combination and exchange.” (Nahapiet & Ghoshal, 1994, p. 247-248). The first of these fundamental processes, the (re)combinatorial process, has been argued to provide the foundations for both incremental and radical innovation (Nahapiet & Ghoshal, 1994) or more generally to be the core of the production function for new knowledge (Weitzman, 1998).

Recombination is closely linked to the second fundamental process, knowledge exchange: in cases where “resources are held by different parties, exchange is a prerequisite for resource combination.” (Nahapiet & Ghoshal, 1994, p. 248). While the concept of exchange is inherently bi-directional, most KBV/OL research has focused on a relatively uni-directional knowledge transfer process, from sources to recipients, which also satisfies as a pre-requisite for recombination highlighted above (e.g., Reagans & McEvily, 2003). Argote and Ingram (2000: 151) define knowledge transfer as “the process through which one [entity] is affected by the experience of another.” while Sussman and Siegal (2003) assert that “for knowledge transfer to occur, learning must transpire in the mind of the recipient” (p. 48). Both sources and recipients are integral to the exchange/transfer process. If either of them is disengaged or unable to collaborate or exchange knowledge the process cannot occur successfully.

KNOWLEDGE DEFINITION

There are a number of different definitions of knowledge across literatures with different perspectives taking this concept to mean subtly different things that can significantly affect theory development and empirical design. Some basic working definitions have been suggested to differentiate data, information, and knowledge. Data has been described as a “set of discrete objective facts about events” (Davenport & Prusak, 2000, p. 2) while Information is described as data that has been transformed by giving and communicating meaning (Davenport & Prusak, 2000; Dixon, 2000). Knowledge, on the other hand, is described as “a fluid mix of framed experience, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experiences and information” (Davenport & Prusak, 2000, p. 5) or “the meaningful links people make in their minds between information and application in action in a specific setting” (Dixon, 2000, p. 13). In practice these concepts may not be entirely distinct, and employees may differ significantly in the way they would define data, information, and knowledge. Thus, my focus is more generally on how people exchange “information, knowledge, or ideas” and I attempt to quantify the “knowledge” being exchanged along continuums such as its tacitness (vs. codifiability), complexity (containing multiple interconnected components), and novelty (difference from what was known previously). This is done so that I avoid constraining my focus and thus may be able to integrate what have traditionally been disparate literatures (additional discussion below).

KNOWLEDGE TRANSFER LITERATURES

Despite the systemic perspective inherent in both KBV and OL perspectives, most research at the level of the dyadic knowledge exchange / transfer has focused on relatively isolated aspects of the underlying phenomenon. In an attempt to break down barriers and create a more integrated perspective of knowledge exchange / transfer I took a transdisciplinary perspective (e.g., Winqvist, 1982) that looked for phenomenon that 1) have the primary purpose of resolving some form of unknown; 2) address the exchange or transfer of some form of knowledge; 3) involve a human source and recipient (e.g., interpersonal exchanges); and 4) the exchange outcome is at least in part based on a recipient learning something, absorbing knowledge in some way, or changing their perspective or behavior as a result of the exchange. This broader conception of knowledge exchange led me to consider a few literatures (e.g., advice giving-taking or innovation championing-adopting) from a knowledge exchange perspective that I suggest is beneficial to understanding a more integrated view of OL as the systemic resolution of ignorance in organizations.

Recipient-Initiated Knowledge Exchanges

In modern organizations dealing with complex problems, the minimal knowledge exchange necessary to create a functioning learning organization is that of recipient-initiated *knowledge pull*¹. Since organizational members cannot know everything, they

¹ 'Push' and 'pull' are terms used in technology marketing and product innovation literatures. In these domains 'demand-pull', 'need-pull', or 'market-pull' are terms used to describe the process by which product development is driven by recognition of needs

must be able to learn knowledge on demand and/or access knowledge on an as needed basis. These types of exchanges are discussed by a large and influential literature I will refer to as the knowledge search-transfer literature (e.g., Hansen, 1999). The focus of this literature is usually on exchanges initiated by recipients (*searchers*) who have recognized their own problem, need, or knowledge gap and have started to search for solution(s) to fill this gap. Since searchers own the problem under consideration as well as any related performance gaps, these recipients are assumed to be motivated to engage in the exchange. In this literature, sources (*transferors*) are the reactive members in an exchange and their decision to transfer knowledge in response to a request is seen as a form of discretionary, helping, or organizational citizenship behavior (OCB) (e.g., Kelloway & Barling, 2000; Goodman & Darr, 1998; Andrews & Delahaye, 2000) since knowledge transfer is costly in terms of time and effort (Szulanski, 1999; 2000). Research in this space is often focused on understanding the factors which affect a source's propensity to transfer knowledge in response to a request; for example: intrinsic motivation (e.g., Lam & Lambermont-Ford, 2008), social ties (e.g., Hansen, 1999; Levin & Cross, 2004), incentive systems (e.g., Quigley et al., 2007), task interdependence or shared outcomes (e.g., Siemsen et al., 2007), and perceived

or problems in the market, whereas 'supply-push', 'technological opportunity', and 'technology push' are terms used to describe a process whereby technology or ideas are developed without a pre-existing problem or market need being identified (Fischer, 1980; Zmud, 1984; Holt, 2002). By applying these conceptions to an integrated knowledge exchange perspective, knowledge/solution source initiated (push) and knowledge need/problem owner initiated (pull) forms of knowledge exchange can be differentiated (Holt, 2002). Thus the above described knowledge search-transfer literature, where the knowledge recipient seeks out knowledge from a knowledge source, can be characterized as a pull (i.e., problem owner or need initiated) process.

managerial / organizational support (e.g., Bock et al., 2005). The fairly narrow focus on source motivation (i.e., if only we could get sources to share more of their knowledge the world would be great) in this literature seemingly implies that the ‘knowledge’ exchanged is ‘proven’, valid, or good, or has some pre-exchange proven value in the resolution of the given problem.²

Source-Initiated Knowledge Exchanges

In addition to recipient-initiated knowledge exchanges, a second major type of knowledge exchange that I consider in my integrated OL perspective are source-initiated knowledge exchanges (i.e., *knowledge push*). Interpersonal knowledge push, per se, is relatively understudied in management literature. However, literature that focuses on phenomena like advice giving-taking (e.g., Swol & Sniezek, 2005) or innovation championing-adopting (e.g., Schon, 1963; Howell & Higgins, 1990; Tornatzky & Klein, 1982) deals with closely related phenomena that, I argue, represent subsets of this underlying source-initiated form of knowledge exchange.

The advice giving-taking literature resembles knowledge transfer literature in many ways with advice paralleling knowledge very closely: “Advice is generally viewed

² A closely related literature looks at what motivates sources to contribute knowledge to repositories or other electronic communities. I refer to this literature as knowledge sharing-via-repositories. This literature also frequently focuses on sources’ motivations and looks at largely the same factors as knowledge search-transfer. However, the repository creates an intermediary between sources and recipients that makes this different than other interpersonal exchanges. For example, we can learn very little about unsolicited / unsought knowledge from this literature since searchers would only come across unsolicited / unsought knowledge by happenstance (there is no give-and-take or dialogue) and continuous improvement of search engines is actually designed to eliminate unsolicited / unsought knowledge. A brief discussion of the implications of this practice is included in the discussion at the end of this dissertation.

as information that communicates an opinion about what could or should be done about a problem or issue.” (Sussman & Siegal, 2003: 49). More recently the concept of advice has been broadened further to include: 1. recommendations about which alternative to choose, 2. recommendation concerning which alternative not to choose, 3. information about alternatives, and 4. recommendations concerning how to make the decision (Bonaccio et al., 2010). Advice exchanges often take the form of knowledge push processes; for example: advice shared during interventions (e.g., Snethen et al., 2006), advice given by parents to their children (e.g., McDowell et al., 2003), advice given by physicians to patients (e.g., Lancaster & Stead, 2004), and decision making in the presence of expert advice (e.g., Jungermann, 1999). Research in this domain typically focuses on assessing factors that affect a recipient’s propensity to receive, accept, or take advice (Bonaccio & Dalal, 2010); for example: source expertise or reputation (e.g., Marti & Garcia-Molina, 2004), trust (e.g., Van Swol & Sniezek, 2005; Levin et al., 2006), perceived advice quality (e.g., Harvey et al., 2000), minority group status of source (e.g., Thomas-Hunt et al., 2003), task difficulty (e.g., Gino & Moore, 2007), and psychological reactance (e.g., Fitzsimons & Lehmann, 2004). Ego-centric advice discounting is a frequently used concept in this space measuring the degree to which a recipient does not heed the advice offered and instead relies on their own, typically naïve, judgment regarding a decision making or prediction task (e.g., Yaniv & Kleinberger, 2000). In a recent review of this literature a few key elements are highlighted as being common across many studies: 1) advice giving-taking research is frequently done via experimental designs which focus on contextual influences to advice

taking, 2) advice is usually ‘guaranteed’ and neither recipient solicitation nor source motivation is assessed, 3) recipients’ motivation to take or accept advice is usually the focus, and 4) advice utilization (or intent to use) is the ultimate outcome (Bonaccio & Dalal, 2006).

In another literature I refer to as innovation championing-adopting, sources or champions essentially promote or sell ideas, organizational change, new products, or technology (Roure, 2001). In this and related innovation focused literatures, ‘acceptance’ is variously researched (with some conceptual variation) under the names acceptance, adoption, or diffusion. “The adoption of innovations is conceived to encompass the generation, development, and implementation of new ideas or behaviors” (Damanpour, 1991, p. 556). The act of acceptance (as it is often called in creativity literature) and adoption (as it is often referred to in innovation literature) encompasses the basic presentation of a piece of knowledge (e.g., an idea) by the source, the consequent evaluation of that knowledge by the recipient, and finally the decision to accept or reject the knowledge being offered in the exchange. Obviously the innovation literature covers a much broader scope than this since it looks forward into implementation and innovation success. However, I am only focused on the front end of the process, where prospective adopters are faced with the option to accept, learn, and act on (or reject, ignore, and resist the change represented by) the knowledge presented to them—the go/no-go decision³. All of the various research streams that

³ I consider this decision to accept an idea or innovation to be closely related to learning. The go decision reflects an implicit acceptance of some underlying knowledge or change in perspective on the part of the recipient which closely relates to the learning

consider adoption assume that there are a number of barriers to ideas being accepted by other organizational members, and thus major research efforts in this domain (e.g., Rogers & Shoemaker, 1971; Kelly & Kranzberg, 1978; Kimberly & Evanisko, 1981; Pennings & Buitendam, 1987) have focused on variables that facilitate or hinder the adoption of technological innovations such as: subjective norms or social pressures to use (e.g., Fishbein & Ajzen 1975), internalization (e.g., Deutsch & Gerard, 1955), expert power (e.g., Kelman, 1958), voluntary vs. compulsory adoption (e.g., Hartwick & Barki, 1994), image / status management (e.g., Moore & Benbasat, 1991), task-technology fit (e.g., Goodhue 1995), result demonstrability (e.g., Moore and Benbasat, 1991), and ease of use (e.g., Davis et al., 1989). The inertia / resistance to change inside organizations is so significant (Hamel, 2006) that a “new idea either finds a champion or dies.” (Schon, 1963: p. 663). “[In] order to overcome the indifference and resistance that major technological change provokes, a champion is required to identify the idea as his or her own, to promote the idea actively and vigorously through informal networks, and to risk his or her position and prestige to ensure the innovation’s success” (Howell & Higgins, 1990, p.317).

As I highlight above, the knowledge domain assumes that knowledge is inherently proven, valid, or true; however, the term knowledge seems to be systematically avoided in source-initiated knowledge exchange literatures with terms

definitions given previously. The actual amount learned during a specific interaction is still an open question. However, the basic idea that idea acceptance / innovation adoption requires recipients to accept some knowledge and thus can be considered to be a form of knowledge transfer is critical if readers are to accept this literature as a meaningful form of knowledge exchange literature.

like advice, opinions, ideas, and innovation preferred in these domains. For example, in the innovation / creativity domain, ideas are novel, uncertain, unrealized, unproven, and untested—although tenable or at least with the potential to be useful (Guildford, 1950; 1967; Stein, 1963; Amabile, 1996; Gurteen, 1999; Fleming et al., 2007). In reality, though, the contrast between knowledge and ideas is not nearly so stark, because, with the possible exception of natural laws or philosophical truths/universals (Armstrong, 1989), there is very little in the complex world of organizational problem solving that can be generalized across all contexts. Knowledge can typically only be surely 'known' in the context in which it has been previously tested – it can never be proven in an absolute sense (Gurteen, 1999). "A knowledge transfer perspective focuses on knowledge abstracted from a particular setting and moved from one person to another for use in a different context" (Cross & Sproull, 2004). Since no two problems or contexts are exactly the same, especially given ongoing changes in the macro-social and -economic context, nearly every piece of knowledge that is transferred or applied carries some degree of uncertainty and novelty. Therefore, whenever a source suggests knowledge may be applied to the new problem or context / situation or otherwise utilized by a prospective recipient, the knowledge thus transferred could also be considered a creative idea. Drucker (1998) famously said: "If we apply knowledge to tasks we already know how to do, we call it 'productivity'. If we apply knowledge to tasks that are new and different we call it 'innovation'. Only knowledge allows us to achieve these two goals." (p. 10) (see also Drucker, 1999; 2001). For the recipient side of the exchange, the innovation literature has already more or less assumed this interplay

between proven knowledge and contextual novelty by arguing that something can be considered novel so long as it is new to the person, organization, or context of adoption regardless of how proven or established it might be in its original context (Daft, 1982; Damanpour & Evan, 1984; Zaltman et al., 1973; Pierce & Delbecq, 1977; Damanpour, 1987, 1991). Once we acknowledge that knowledge transfer, almost by definition, describes the transmission of knowledge novel and previously unknown to the recipient, then the acceptance of this knowledge by the recipient is inherently an innovative or creative act as defined in this literature. This suggests that all knowledge transfer is to some extent creative/innovative for both sources and recipients and opens up the creativity and innovation literatures to be interpreted within my knowledge exchange framework. Similar arguments can be made breaking down the somewhat artificial barrier between advice and knowledge although the enabling vs. coercive way that knowledge is transferred is certainly an important factor affecting the acceptance on the part of recipients. At this point the only assertion I desire to make is that we can learn about a more integrated perspective of knowledge exchange interactions by considering advice giving-taking and innovation championing-adopting as source-initiated forms of knowledge exchange.

Four Roles in Knowledge Transfer

The literature reviewed above suggests a fundamental high-level differentiation among knowledge exchange / transfer interactions based on who initiates the interaction: source or recipient. Each of these dyadic exchange / transfers has a source as well as a recipient suggesting that there are four 'roles' that can be differentiated in

past literature describing knowledge exchanges. The ‘pull’ model (typical in knowledge search-transfer) includes a (1) searcher (i.e. the proactive recipient of information, knowledge, or ideas) and a (2) transferor (i.e. the reactive source of information, knowledge, or ideas) and can be contrasted with the ‘push’ model (typical in advice giving-taking and innovation championing-adopting literatures) which includes a (3) sharer⁴ (i.e. the proactive source of information, knowledge, or ideas) and an (4) acceptor (i.e. the reactive recipient of information, knowledge, or ideas). These roles are depicted in figure 1.

[Insert Figure 1 About Here]

Knowledge Transfer & Ignorance

Given that knowledge search-transfer is recipient-initiated, on the surface these pull exchanges seem more likely to resolve searchers’ known-unknowns—a searcher must recognize their own knowledge need or gap in order to start searching for knowledge to fill that gap. As such knowledge pull exchanges are equally susceptible to the same critiques levied against experiential learning perspectives—unfortunately, it seems to be very difficult for people to recognize their own ignorance (Argyris, 1982) and thus initiate search processes to resolve it. An OL environment that relies excessively (or exclusively) on recipient-initiated knowledge exchanges is prone to becoming ineffective, since all knowledge is gradually updated, improved upon, or becomes outdated as situations and contexts evolve. Although individuals may become

⁴ The terms transferor and sharer are often used synonymously in existing literature but are differentiated here to help clarify apparent source roles in push vs. pull interactions.

aware of inaccurate knowledge due to their sub-optimal performance or may otherwise come across knowledge that updates or corrects some of their incorrect assumptions in their ordinary knowledge search or work activities, an effective and efficient OL system cannot rely exclusively on an individual's chance identification of their own knowledge needs. This argument might suggest that the effective resolution on unknown-unknowns could require source-initiated knowledge exchanges. It has been argued that interventions may be necessary to push individuals to engage in the learning process in support of the ultimate goal of organizational adaptation and effectiveness (e.g., Senge 1990; Argyris, 1982). Furthermore, Argyris (1977) has asserted that underlying assumptions cannot be effectively questioned without another perspective to measure them by. Looking across the source-initiated knowledge exchange literatures (advice giving-taking & innovation championing-adopting), in push exchanges recipients have usually not approached a source seeking knowledge and recipients are usually not even be aware that they have an opportunity for improvement (i.e., a problem, knowledge need, or knowledge gap). Thus these forms of knowledge exchange seem, on the surface again, to be more likely to potentially resolve unknown-unknowns and this is seemingly an implicit assumption in much of this literature. The fact that organizational innovation is almost always conceptualized by looking at champions who push innovation about or adopters who decide whether or not to accept a new innovation after they have been exposed to it drives this point home.

Underlying Assumptions Across Literatures

The above discussion has highlighted that various literatures ordinarily assume that three interrelated things correspond w/ initiation:

1. **Problem recognition** – i.e., recipients have identified their own problems or knowledge needs in recipient-initiated knowledge exchanges, while in source-initiated knowledge exchanges recipients have not identified their own problem or knowledge need (and by implication recipient-initiated exchanges transfer solicited / sought knowledge and potentially resolve recipients' known-unknowns while source-initiated exchanges transfer unsolicited / unsought knowledge and potentially resolve recipients' unknown-unknowns).
2. **Motivation** – i.e., the participant that initiates an exchange is motivated to be involved and consequently exhibits higher effort and engagement during the interaction, while the reactive participant's motivation, effort, and engagement is questionable and usually assumed to be lower.
3. **Recipient's Perception of the Validity of Knowledge** – i.e., various literatures that look at source initiated knowledge exchange avoid the term "knowledge", frequently using terms like idea, innovation, or advice—implicitly conveying the assumption that source-initiated knowledge exchanges convey knowledge that is less 'proven' or otherwise has different characteristics than the knowledge exchanged in recipient-initiated exchanges.

In the rest of this paper I address the above apparent implicit assumptions in each of three main sections / studies. My overall purpose is to assess to what extent

initiation does in fact correspond to the above assumptions or if, instead, unsolicited / unsought knowledge exists in both recipient-initiated (pull) and source-initiated (push) forms of knowledge exchange and thus is the more relevant and important construct. More specifically I hope to contribute to a better understanding of knowledge exchanges by contextualizing these interactions within a recipient's overall problem-solving process while recognizing the importance of this process to a number of relevant phenomena. Section 1 looks at initiation, unsolicited / unsought knowledge, the problem-solving process, and problem recognition, section 2 looks at unsolicited / unsought knowledge, the problem-solving process, and source and recipient motivation, and section 3 looks at how unsolicited / unsought knowledge and the problem-solving process correspond to various knowledge characteristics like novelty, complexity, and tacitness.

SECTION 1: UNSOLICITED / UNSOUGHT KNOWLEDGE & PROBLEM RECOGNITION

SECTION 1: THEORY AND LITERATURE REVIEW

Thus far my summary has remained consistent with past literature which tends to assume that initiation equates to the accurate recognition of a problem or knowledge need. However, a dichotomy based on initiation may be somewhat artificial, since much initiation may be mutual or coincidental. Although mutual or coincidental initiation may at first seem counterintuitive, a simple example can demonstrate the reasonableness of this assertion. Search processes are often long and convoluted, with searchers

approaching multiple individuals throughout the search process. In these messy, real-world search situations, an “unsolicited” knowledge source may find out about the recipient’s problem via indirect routes such as informal social networks, which were triggered by the recipient’s proactive efforts to resolve their own problem. However, in the end, the exchange may actually happen when the source approaches the recipient, suggesting this exchange might seem to be source-initiated, even though both parties had a hand in causing the exchange. The original premise of this paper is that a well-functioning learning organization should be able to effectively and efficiently resolve unknowns. In many cases, it may be more efficient for recipients to broadcast a need and rely on sources to proactively provide knowledge if and when available. This precludes the need for a recipient to approach every available source to establish who has relevant knowledge. See Cohen et al., A Garbage Can Model of Organizational Choice (1972) for a classic and exceptionally detailed discussion of complex forms of exchange initiation with numerous examples of problems looking for solutions and solutions looking for problems both actively and passively in a typically complex organizational context. Cases like this inherently break down the assumption that recipients are less likely to recognize their own problems in source-initiated knowledge exchanges.

A theoretical perspective that can provide some additional insight into cases like this can be found in research on transactive memory (Wegner, 1995; Wegner, 1987; Moreland, 1999). Transactive memory is a form of metaknowledge that deals with issues of “who knows what” while Transactive Memory Systems (TMS) are commonly

defined as a “shared system that people in relationships develop for encoding, storing, and retrieving information about different substantive domains” (Ren & Argote, 2011, p. 191). In describing an effective and efficient transactive memory system, Wegner (1995) highlighted three necessary components: directory updating, information allocation, and retrieval coordination. Directory updating deals with the fact that each component of the system must keep updated information regarding what information is stored in each other part of the system. Information allocation highlights the fact that the overall efficiency of the network is improved if information is transferred from its entry point in the system in order to be stored in the most appropriate location. Finally, retrieval coordination describes the necessity for the system to rely on accurate search rules given the storage structure of the system. The information allocation aspect of TMS suggests that when individuals create or become aware of a new piece of knowledge they should transfer this knowledge to appropriate experts within the organization. Thus knowing “who knows what” also allows for, or even requires, knowing “who needs to know what”—the same metaknowledge that allows for effective knowledge pull should allow for effective and accurate knowledge push.

Transactive memory ordinarily develops via repeated interactions over time and in this context reciprocity becomes an increasingly important factor. “[People] typically know one another and interact over time, creating expectations of obligation and reciprocity that are enforceable through social sanctions” (Wasko & Faraj, 2005, p. 37). A great deal of research has highlighted the importance of both direct and generalized reciprocity in knowledge exchanges (e.g., King & Marks, 2008). Literature on direct

reciprocity consistently shows that if individual 'A' transfers knowledge to individual 'B' this increases the likelihood that Individual 'B' transfers knowledge to individual 'A' when the roles are reversed (e.g., Wasko & Faraj, 2005). Taking this a step further, generalized reciprocity (e.g., Putnam, 1995) or indirect reciprocity (e.g., Seinen & Schram, 2006), where a norm of knowledge sharing develops since it is expected that others would share if the tables were turned, has been shown to be a very important motivator of knowledge transfer as well as source-initiated knowledge sharing. When reciprocity norms are high, individuals are likely to take turns approaching one another and sources are just as prone to proactively share knowledge based on an accurate understanding of a recipient's unspoken need as they are to transfer knowledge when approached by recipients.

These arguments suggest that initiation as a dichotomous, source vs. recipient, variable may be overly simplistic and that initiation may be quite a poor proxy for recipients' pre-exchange problem recognition or knowledge search activities. If this is the case, then it may be critical to explicitly examine the extent to which knowledge received during an exchange is unsolicited / unsought vs. solicited / sought, regardless of who initiated the interaction.

New Definitions: *Unsought* knowledge describes knowledge which a recipient was not seeking prior to a knowledge exchange interaction while *unsolicited* knowledge describes knowledge that was not requested by a recipient from a source prior to or during an exchange.

In many ways this dissertation is designed to explore the off-diagonals of initiation by unsolicited / unsought knowledge (and correspondingly unsolicited / unsought exchanges that involve exclusively unsolicited / unsought knowledge) and introduces concepts like the problem-solving process as a context for knowledge exchanges particularly to highlight theory, empirical evidence, and implications of these overlooked off-diagonals while using a novel research design that allows the assessment of various factors across recipient- and source-initiated forms of knowledge exchange. These off diagonals are depicted in figure 2.

[Insert Figure 2 About Here]

Both *unsolicited* and *unsought* knowledge are potentially associated with unknown-unknowns since recipients may not have identified their own problem or knowledge need prior to the exchange. These are two distinct but oft corresponding concepts—unsolicited knowledge is frequently unsought, however, knowledge may also be sought but unsolicited (e.g., when a source infers a knowledge need of a recipient as described above) and a solicited knowledge exchange can possibly lead to the exchange of unsought knowledge (e.g., when a source shares different or unexpected knowledge as discussed below). Although the term “unsolicited knowledge” does not appear in academic literature, there is a sparse literature on unsolicited advice (e.g., Gibbons et al., 2003) and imposed (i.e., unsought) support or help (e.g., Deelstra et al., 2003). The few studies that have looked at these phenomenon have found that unsolicited advice may be ignored and thus have little to no effect on behavior (Bonaccio & Dalal, 2006;

Hung & Yoong, 2010) while imposed help or support is perceived as intrusive, critical, and inappropriate (Deelstra et al., 2003; Goldsmith & Fitch, 1997) and may threaten recipients' self-esteem (Deelstra et al., 2003; Harber et al., 2005; Reinhardt, Boerner, & Horowitz, 2006). "[Recipients] evaluate people providing such help unsympathetically, especially when judges are not facing a problem for which help is necessary (Deelstra et al., 2003)." (Bonaccio & Dalal, 2006, p. 136-137). However, these research streams tend to conflate unsolicited with unsought knowledge, so I hope the above formal definitions can help distinguish different forms of knowledge irrespective of initiation. There is also some literature around doctor's advice to their patients that discusses examples where unsought knowledge, for example to quit smoking (e.g., Russell et al., 1979) or to lose weight (e.g., Klem et al., 1997), is provided during a recipient-initiated exchange (i.e., a doctor's visit). Although this literature would seemingly place it into the bottom left off-diagonal above, the research does not approach this from an initiation vs. unsolicited / unsought advice perspective (since doctors don't make proactive patient visits this is unlikely to be explored in this literature). More systematically approaching knowledge exchange from a problem-solving perspective allows me to test the basic assumptions found in most knowledge exchange literatures—that initiation is related to recipient's seeking of knowledge (i.e., recipient's pre-exchange problem recognition, openness to knowledge, or active seeking behavior), sources providing of knowledge, and the degree of *unsolicited / unsought* knowledge included in exchanges.

This brings me to my first set of Hypotheses:

- **Hypothesis 1-1a:** In recipient-initiated (pull) forms of knowledge exchange, recipients are more likely to have recognized their knowledge need, be open to knowledge, and/or be actively seeking knowledge than they will be in source-initiated (push) forms of knowledge exchange (consistent with assumptions of past literature).
- **Hypothesis 1-1b:** In source-initiated (push) forms of knowledge exchange, sources will be more likely to provide knowledge than they will in recipient-initiated (pull) forms of knowledge exchange (consistent with assumptions of past literature).
- **Hypothesis 1-1c:** Source-initiated (push) forms of knowledge exchange are more likely to include unsolicited / unsought knowledge than recipient initiated (pull) forms of knowledge exchange (consistent with assumptions of past literature).

COGNITIVE BARRIERS TO LEARNING & KNOWLEDGE FLOWS

Ever since Simon (1955) recognized that people are not perfect, unbounded, information-processing machines, there has been a desire to understand how individuals handle the virtually limitless information that makes up the complex environments in which they live and work (Schwartz et al., 2002). Traditionally, communication theories like Uncertainty Reduction Theory (URT) (Berger & Calabrese, 1975) and Anxiety/Uncertainty Management (AUM) (Gudykunst, 1995) or psychological theories like Intolerance for Ambiguity (IA) (Budner, 1962) or Need for Cognitive Closure (NFC) (Kruglanski & Webster, 1996) explain an individuals' innate desire for knowledge as driven by their desire to reduce or otherwise manage ambiguity and uncertainty in

their environment (Brashers, 2001; Smithson, 2008; Van Hiel & Mervielde, 2002; Kruglanski, 2001). Although much of the literature on decision making treats uncertainty as being synonymous with probability (e.g., Kahneman & Tversky, 1979), another perspective prevalent in these domains considers uncertainty more broadly as the absence or lack of clarity of information (Smithson, 2008). “Uncertainty exists when details of situations are ambiguous, complex, unpredictable, or probabilistic; when information is unavailable or inconsistent, and when people feel insecure in their own state of knowledge or the state of knowledge in general” (Brashers, 2001, p. 478).

The most straightforward way for a person to deal with ignorance and uncertainty is by attempting to reduce it, either actively by collecting information (Lipshitz & Strauss, 1997; Dawes & Kagan, 1988; Galbraith, 1973, 1974) or passively by deferring decisions until more information becomes available (Lipshitz & Strauss, 1997; Hirst & Schweitzer, 1990). However, an alternative to reducing ignorance and uncertainty is to suppress it. Suppression techniques include a range of tactics like denial (i.e., ignoring undesirable information or ignoring ignorance and uncertainty in general) or rationalization (i.e., engaging in token or heuristic based search behaviors that don’t create real change or learning) (Lipshitz & Strauss, 1997). In order to better understand the different ways in which people deal with ignorance and uncertainty by either seeking or suppressing information, a number of dual process / dual system theories of information search and decision making have evolved (Kruglanski, 2001; Smithson, 2008; see for example the Elaboration Likelihood Model by Petty & Cacioppo, 1986 or Heuristic-Systematic Model by Chaiken & Eagly, 1989). Dual process models

assume that if a knowledge gap exists, if this gap is evaluated as important, and if they are given the time to do so, people will engage in a form of primary, central, systematic processing which is typically assumed to be careful, slow, rational, and analytical (Kruglanski, 2001; Smithson, 2008; Epstein et al., 1992; Petty & Cacioppo, 1986; Chaiken & Eagly, 1989). Conversely, in cases where a knowledge gap exists but is relatively unimportant or time pressures are high, individuals will rely on a secondary, peripheral, or heuristic processing which is assumed to be fast, intuitive, associative, and based primarily on cognitive cues or shortcuts (Kruglanski, 2001; Smithson, 2008; Epstein et al., 1992; Petty & Cacioppo, 1986; Chaiken & Eagly, 1989). Both individual differences (e.g., maximization tendencies or intolerance for ambiguity) and contextual factors (e.g., organizational culture / climate or time pressures) can drive people towards a preference for one process or another.

Uncertainty Reduction Theory (URT) has dominated communication theory for nearly 30 years and emphasized what seemed to be a universal tendency for people to seek information in order to reduce their uncertainty (Kramer, 1999; Bradac, 2001; Brashers, 2001). In more recent years, theories like Anxiety/Uncertainty Management (AUM) have suggested that an individual's experience of uncertainty is subjective and that additional information can sometimes increase a recipient's level of uncertainty (Bradac, 2001; Brashers, 2001; Planalp & Honeycutt, 1985). Although, it was always assumed that individuals prefer to have options or freedom in making decisions, research has shown that adding options can be a mixed blessing (e.g., Simonson & Tversky, 1992; Tversky & Shafir, 1992; Schwartz et al., 2002). Information that increases

the number of potential or considered options has been argued to increase individual's feelings of uncertainty (Frey et al., 1996; Kruglanski, 1989; Brashers, 2001) as well as their regret once they do make a choice (Schwartz et al., 2002). In fact, information that contradicts prior knowledge has been shown to create an even greater sense of anxiety than information that is ambiguous or lacking interpretability in its own right (Smithson, 1999, 2008). Having a greater variety of information increases the number of options and potential paths forward creating the double jeopardy of intractable information and greater probability for choosing incorrectly.

“People have vested interests in ignorance and uncertainty; these are not always unwanted. People have reasons for not knowing and not wanting to know” (Smithson, 1989, p. 84). As I have already argued, people seem to have difficulty accepting unsolicited / unsought knowledge, advice, and ideas. One of the ways that this lack of receptiveness may be exhibited is if recipients' are disengaged (i.e., exhibit lower effort) during exchanges that they did not initiate or that involve unsolicited / unsought knowledge. A second way that this barrier may be exhibited is via recipients' evaluation of the usefulness of exchanges that include unsolicited / unsought knowledge. The perceived usefulness of an exchange is quite subjective and may be indicative of recipient's intention to learn and change their behavior as a result of an exchange. Taking a subjective (instead of objective) stance on perceived usefulness of knowledge exchanges allows me to highlight barriers to knowledge transfer but also requires some justification. I am not asserting that every exchange or knowledge provided by sources during an exchange is accurate/valid and thus useful. However, what I am asserting is

that a systematic reduction in the perceived usefulness of all exchanges or knowledge of a certain type—in this case *unsolicited / unsought* exchanges and knowledge—may be indicative of a barrier and thus may hinder individuals’ and organizations’ ability to reduce some forms of ignorance—in this case unknown-unknowns. If experiential learning is as flawed as was previously argued and resolving unknown-unknowns as important to organizations as I have argued, then some significant portion of *unsolicited / unsought* exchanges and *unsolicited / unsought* knowledge has real value. However, despite its apparent value, we can also expect that people generally have little appetite for *unsolicited / unsought* exchanges and knowledge and will likely put up barriers to its transmission.

Thus my next set of Hypotheses highlights the effects of *unsolicited / unsought* exchanges on recipients’ engagement and perception of exchange usefulness:

- **Hypothesis 1-2a:** Recipients will exert more effort and be more engaged in recipient-initiated (pull) forms of knowledge exchange than in source-initiated (push) knowledge exchanges (consistent with assumptions of past literature).
- **Hypothesis 1-2b:** Recipients will exert less effort and be less engaged in *unsolicited / unsought* exchanges in comparison to *solicited / sought* exchanges.
- **Hypothesis 1-2c:** Recipient-initiated (pull) knowledge exchanges will be perceived to be more useful than source-initiated (push) knowledge exchanges (consistent with assumptions of past literature).
- **Hypothesis 1-2d:** *Unsolicited / unsought* exchanges will be perceived to be less useful than *solicited / sought* exchanges.

Initiation and Unsolicited / unsought Knowledge

As per the assumption in past literature, hypotheses 1-1a to 1-1c examine the extent to which initiation (i.e., who approaches whom – whether recipient approached a source or source approached a recipient) corresponds to unsolicited / unsought knowledge. Building on this, hypotheses 1-2a to 1-2d assess the extent to which barriers exist to source-initiated knowledge exchanges or alternatively whether unsolicited / unsought exchanges are a more relevant barrier inducing phenomenon. However, even if initiation turns out to be a poor proxy for unsolicited / unsought exchanges (as I suspect it will be), initiation is still an important factor to consider since it is related to a complex set of social-psychological factors and may further compound the exchange of solicited / sought vs. unsolicited / unsought forms of knowledge. A couple of fundamental social psychology theories are relevant to understanding the effect of initiation on recipients in knowledge exchange interactions⁵. In particular, cognitive dissonance theory (Festinger et al., 1956) is a fundamental psychological process that is relevant to a number of persuasion tactics and seems to be relevant to help understand how initiation affects recipients. Cognitive dissonance describes the fact that individuals do not like to have two opposing realities competing within their minds and so individuals typically shift their perceptions / cognitions in order to match reality and reduce potential contradictions (Cooper, 2007). Cognitive dissonance has been used to explain a tremendous range of phenomena and there are a few interrelated ways that it

⁵ For information regarding the broader social psychological theoretical context see Social Influence Theory (Kelman, 1958) and Persuasion Theory (e.g., Cialdini, 2001).

may affect the perception of unsolicited / unsought knowledge in exchanges that were recipient-initiated. First, by simply approaching a potential source seeking knowledge, searchers have implicitly or explicitly acknowledged a knowledge need or gap as well as their own ignorance in the relevant domain necessary to fill that gap. Simultaneously, they have acknowledged that the source possesses some relevant expertise in this domain and thus may hold the appropriate knowledge to fill that gap. Rejecting knowledge offered by a source may be inconsistent with this and could cause cognitive dissonance. Related to this is the effort-justification paradigm of cognitive dissonance which suggests that dissonance can increase the perceived value of an outcome whenever an unpleasant effort must be undertaken to achieve that outcome (Aronson & Mills, 1959). Thus, the simple but sometimes embarrassing effort associated with seeking out and approaching a source may cause a recipient to perceive the knowledge offered by that source to be more valuable. Finally, it has been shown that the amount individuals pay for advice is positively related to their intention to utilize that advice (Gino, 2008). As I discussed previously, there is a great deal of research that has shown that reciprocity is an important factor in predicting behavior during knowledge exchange interactions. Thus a recipient's request for knowledge from a source carries some real social capital costs in the form of a social obligation to "return the favor" and share knowledge at a later date. This would suggest that recipients may increase their perception of the overall value of exchanges or provided knowledge if they approached that source and thus implicitly agreed to provide their own valuable time and knowledge at some future date.

This brings me to my next hypothesis related to initiation and unsolicited / unsought knowledge:

- **Hypothesis 1-3a:** Recipients will exert less effort and be less engaged in unsolicited / unsought exchanges especially when exchanges are source-initiated (and this relationship will be less apparent when exchanges are recipient-initiated).
- **Hypothesis 1-3b:** Unsolicited / unsought exchanges will be perceived to be less useful especially when exchanges are source-initiated (and this relationship will be less apparent when exchanges are recipient-initiated).

PROBLEM-SOLVING PROCESS

As I have already highlighted problem recognition is an especially important yet understudied aspect of knowledge exchange, however, problem recognition and problem solving are not distinct processes. Unfortunately, most knowledge exchange literature has assumed that solutions are the primary “knowledge” being exchanged in interactions (Cross & Sproull, 2004). Thus, few management studies have attempted to connect the details of specific knowledge exchanges to the overall, higher-level, problem-solving process that recipients may be going through at the time of an exchange. In literature that brings in a process based perspective, problem solving or decision making processes are often described as beginning with the recognition of a knowledge gap and ending with the decision to implement and consequent actual implementation of a solution to fill that gap (Huitt, 1992). From an innovation

standpoint the entire problem-solving process is firmly in the “fuzzy front end” which includes all activities from the search for new opportunities, to the formation of an initial idea, to the iterative development of a likely or valid solution, and finally ending with the go/no go decision regarding the specific idea or solution (Khurana & Rosenthal, 1998; Kijkuit & Van den Ende, 2007).

A complete, if somewhat idealistic, picture of the problem-solving process is described in the literature on the Creative Problem Solving (CPS) Process (Osborn 1952, 1953, 1957, 1963, 1967; Isaksen et al., 1994; Treffinger et al., 2006). The CPS involves: (1) understanding the problem (including establishment of broad goals, needs, or challenges; an extensive problem-formulation phase involving data gathering and problem-space exploration; and finally a focus on the critical aspects or root causes which become the final problem statement); (2) idea / solution finding (including a process of generating a large quantity of novel ideas followed by idea evaluation and idea-revision processes which eventually results in the choice of a best idea for going forward to resolve the problem statement); and (3) acceptance finding (including the exploration of the socio-political organizational environment and focus on the best path for successful implementation). The CPS literature often approaches the problem-solving process from a normative perspective and CPS training teaches this as a non-linear process (Isaksen & Dorval, 1993; Isaksen & Treffinger, 2004). However, evidence has also suggested that people differ significantly in their perception of the overall process, with some people naturally approaching problem solving in a fairly linear manner while others move fluidly around in the process (Perschyn 1992; Isaksen &

Pershyn, 1994; Isaksen & Treffinger, 2004). Within this overall process, CPS research has highlighted micro- divergent (i.e., generative or creative) and convergent (i.e., critical or focusing) sub-processes in each stage of the process. For example, in coming up with a solution to a problem, individuals following the CPS would generate multiple alternative potential solutions via processes like brainstorming and consequently would shift gears in order to evaluate and judge these generated options. In this evaluative sub-phase, options would be discarded or modified and the final best idea(s) would move forward to the next step in the process.

The way individuals approach the problem-solving process has a significant impact on the quality of their final solutions (Fontenot, 1993). For example, past research has shown that spending time diverging and exploring in the problem formulation stage has a positive effect on the final creative product (Csikszentmihalyi & Getzels, 1971). In fact, many studies have found that problem finding (i.e., generating a good problem statement) is actually more difficult than problem solving (e.g., Basadur et al., 1986; Getzels & Smilansky, 1983; Smilansky, 1984; Smilansky & Halberstadt, 1986). Insufficiently exploring the problem can lead to treating symptoms instead of causes (e.g., MacDuffie, 1997) thus creating inferior solutions that are simply temporary fixes. An individual that desires to solve the deeper issues and truly improve things in the organization should spend more time generating knowledge relevant to exploring the problem. However, a great deal of research has also shown that people do not intuitively understand the complexities of a comprehensive problem-solving process and

may approach problems in suboptimal ways (Ivany, 1969; Clinton & Torrance, 1986; Fontenot, 1993).

The CPS process can help inform us regarding the often implicit steps that people go through in solving problems, even though in daily practice, many of these steps are rushed through, completed more or less unconsciously, or skipped entirely. For simplicity sake, I adopt a problem-solving process framework that involves first, knowledge about problems and second, knowledge about solutions. Within each of these portions of the process I suggest there is a formulation phase (where options are generated) and consequent evaluative, feedback, or validation phase (where selections are made and confidence is built regarding these choices). I don't claim that this is an exhaustive description of the process or that these steps are necessarily completely distinct. I simply propose that this process perspective can provide a useful framework for understanding some of the key knowledge processes that are necessary for people to identify and consequently solve problems.

[Insert Figure 3 About Here]

Knowledge Transfers and the Problem-solving process

Recently, some knowledge search-transfer research has provided evidence that the knowledge transferred in response to a query may in fact take a number of forms that I argue parallels the process highlighted above. Cross (2000) and Cross & Sproull (2004) undertook extensive qualitative investigations to understand the variety of useful knowledge that managers identified as being exchanged in their organizations. Via an iterative process of identifying and refining themes, they came up with 5 primary

components of what they call *actionable knowledge*: solution finding, problem reformulation, validation, referrals (to other people or information sources), and legitimation. Two of these forms of knowledge, referrals and legitimation, are outside of my focus on dyadic exchanges which attempt to resolve unknowns. Of these, *legitimation* is largely a politically motivated form of validation wherein an individual can refer to their past interactions with high-status others to gain acceptance or support from future individuals, while *referrals* point to third-party sources and are basically an alternative path to the primary knowledge being sought by the recipient. The definitions for the 3 knowledge exchanges which correspond to various steps of the problem-solving process on which I am focused are included below:

1. *Problem Reformulation*: "People also valued information sources for their ability to help define or redefine problem dimensions" (Cross & Sproull, 2004, p. 450).
2. *Solution Finding*: "Sources provided information that helped generate solutions for an important project" (Cross & Sproull, 2004, p. 450).
3. *Validation*: "Informants also reported valuing interactions with other people who helped them develop confidence in their solutions or plans" (Cross & Sproull, 2004, p. 450).

It is apparent in the descriptions above that in order to seek solutions, searchers must have an established problem which needs resolving and, similarly, that a pre-condition to seeking feedback or validation is that searchers must have a tentative solution which needs evaluation. It is for this reason that it might be argued that these

three forms of knowledge exchange, by their very definition, happen to some extent in a sequential order. Thus I propose that the problem-solving process provides a useful framework for understanding where people are, or believe they are, cognitively, when they interacting with others in their search for knowledge. Again, I am not claiming that all problem solvers explicitly think about themselves as going through this process or as being at some point in the process, rather I am referring more to their beliefs about what they know and what they don't know as well as their consequent epistemic goals when they approach potential sources looking for knowledge.

[Insert Figure 4 About Here]

The Process as a Barrier to Knowledge Transfer

In addition to understanding where people believe they are in the overall process, the process-based framework also allows us to understand the implications for the variety of knowledge that searchers may encounter during knowledge exchange interactions. In this process-based perspective, the simplest case of knowledge pull involves searchers at different phases in the overall problem-solving process looking for a certain type of knowledge which they consequently either receive or don't receive (as depicted in figure 4 above). In these cases, if searchers receive the expected or solicited / sought form of knowledge then the exchange may be considered successful or useful from their perspective. However, knowledge exchanges can also take unexpected turns and this can have considerable implications for recipient's overall progress towards finding a valid solution to their problem and consequently their receptivity to the knowledge presented by sources. For example, it is quite possible to recognize an ill-

formed problem or opportunity, engage in specific search to understand the boundaries or other features of the problem, and consequently receive the solicited / sought type of knowledge that helps the searcher formulate the problem's specifications. However, this exchange is much different than another instance in which a person seeks a solution to what he or she believes to be a well-understood or established problem but instead encounters a potential knowledge source who challenges the original question, problem, or premise driving the search. Although the searcher has also received knowledge about a possible formulation of the given problem, in this case, this knowledge was *unsolicited* and likely *unsought*. If they decide to accept this knowledge they would be forced to move back in their overall process to consider a new conceptualization of their problem or knowledge gap and consequently restart the search for potential solutions based on this new conceptualization of the problem. In another case, searchers who are trying to better understand their problem and thus seeking problem formulation type knowledge may instead receive solutions to their as yet ill-formed problem space, and if accepted this knowledge may push the searcher to move forward more quickly in the problem-solving process than they initially intended. In this case the knowledge is again *unsolicited* / *unsought* but it may have dramatically different implications for the knowledge searcher. The process-based framework, with examples of knowledge exchanges that push recipients forwards and backwards in the process is depicted in figure 5.

[Insert Figure 5 About Here]

Unfortunately, although the original research by Cross and Sproull suggested some of these possible unexpected outcomes when they highlighted that a problem reformulation and validation type of exchange “puts the trajectory of a project into that person's hands” (Cross & Sproull, 2004, p. 451), they did not differentiate knowledge sought vs. knowledge received. Thus it is unclear how much of the useful or actionable knowledge in their research was *solicited / sought* vs. *unsolicited / unsought*. In addition, the mechanism by which they elicited forms of knowledge was predisposed towards actionable knowledge that helped subjects to complete a project (Cross & Sproull, 2004). This may have focused respondents’ attention of ambiguity-reducing / closure-encouraging types of knowledge and thus may not have identified all types of useful knowledge. For example, disconfirming evidence may not be immediately thought of when subjects are asked to recall knowledge that helped to complete a project, since disconfirming evidence potentially drives a searcher ‘back to the drawing board’ to consider new ideas. However, if it avoids a poor idea being put forward into implementation, then this type of knowledge may nonetheless be very valuable to the organization. Finally, this process based framework also allows us to better understand traditional source-initiated knowledge exchanges involving completely unsolicited / unsought knowledge as described in innovation championing-adopting and frequently in advice giving-taking literatures—I refer to these as *unsolicited / unsought exchanges* in order to reflect the fact that they deal with a topic or problem which a recipient was previously not considering at all. An individual that does not recognize that they have a knowledge need or gap is effectively in a state where they believe they have a valid

problem-solution match (i.e., they believe their knowledge / behavior set is currently optimized). For an individual to accept that they have a knowledge need or problem, they must move cognitively to a state of problem formulation. This move is represented by the longest backward arrow pointing from 'validated solution' back to 'problem formulation' in figure 5 above and helps explain the well-explored cognitive resistance to change and innovation in individuals and organizations.

Convergence & Divergence in the Problem-solving process

In my discussion I have already highlighted the micro-divergent and convergent (generation-to-validation) phases within problem and solution parts of the process. In addition, there is an overall divergent to convergent trend inherent in the switch from problems to solutions. Every situation contains many potential problems or opportunities on which people can focus, every prospective problem has a range of potential conceptualizations or boundary conditions, every finalized problem has many potential solutions, and every set of solutions has a smaller number of useful or valuable solutions. As individuals move through the problem-solving process, making decisions and converging on a final problem-solution match, they are reducing their overall ambiguity and moving towards closure. This overall convergence trend has been depicted in the front-end ideation stages of a number of StageGate type models of new product innovation (see for example the Product Development Funnel, Wheelwright & Clark, 1992). Unfortunately, many individuals and organizations are focused primarily on closure or convergence and thus resistant to divergence: "I don't want my people even thinking about alternatives. They spend two weeks thinking about an alternative only to

learn that what we have is 90% as good. The result is that they wasted two weeks and I'm behind schedule. I get some complaints about stifling creativity, but all I want is to be good enough and on schedule" (Burt, 2004, p.369). The divergence-to-convergence inherent in both the major problem-to-solution as well as two minor generation-to-validation trends is depicted in figure 6.

[Insert Figure 6 About Here]

The divergence and convergence inherent in the process was mentioned (although not discussed) in Cross & Sproull's (2004) research on actionable knowledge. First in discussing problem reformulation: "Such sources often prompted informants to think more broadly about a problem or to attend to dimensions that the informant had not considered" (p. 450) and then in discussing validation: "Furthermore, validation also yielded an efficiency benefit: once informants were assured that their thinking was sound, they did not continue to collect and analyze additional information" (p. 451). This process model suggests that instead of looking at various forms of knowledge in isolation, it might be more important to assess how unsolicited / unsought knowledge potentially pushes a recipient forward or backward in the problem-solving process. Again it was unfortunate (or fortunate since it left open the potential for this contribution) that Cross's research did not examine solicited vs. unsolicited forms of each type of knowledge, since the above statement regarding problem reformulation seems to imply unsolicited / unsought problem knowledge as I have defined it in this paper.

Past research has shown that people are resistant to postponing closure or increasing their ambiguity as well as to being forced to converge too quickly (i.e., being pushed backwards or forwards in the problem-solving process). The need for non-specific cognitive closure, or need for closure (NFC), is defined as the motivated desire for any definitive, non-ambiguous information (Kruglanski & Webster, 1996). Closure is effectively argued to be the end state of a decision or knowledge-search process—the point at which people settle on a choice or on a piece of knowledge as being seemingly valid / relevant and thus close the issue or problem from further consideration. NFC research has highlighted two interrelated phenomena: seizing and freezing (i.e., urgency and permanency tendencies). The *need to seize* (i.e., urgency tendency) describes a person's motivation to rapidly resolve information uncertainties or knowledge gaps by accepting some of the earliest information encountered that seems likely to be valid and appropriate. "People under a heightened need for closure may perceive that they desire closure immediately. Any further postponement of closure is experienced as bothersome, and the individual's overriding sense is that he simply cannot wait" (Kruglanski & Webster, 1996, p. 265). On the other hand, the *need to freeze* (i.e., permanency tendency) describes a person's tendency to resist change and block additional information once a decision has been made—the assumption being that additional information will increase ambiguity for recipients. "Individuals under a heightened need for closure may thus desire an enduring closure and, in extreme cases, abhor losing closure ever again" (Kruglanski & Webster, 1996, p. 265). The problem-solving process model provides the potential for a very strong framework upon which to

understand NFC. If the earliest part of the problem-solving process contains the greatest ambiguity, as I have already asserted, and the process as a whole involves a series of sequential choices each of which carries some feeling of closure and reduction in ambiguity and uncertainty, then this would explain an individual's desire to move forward quickly in the process, their lack of receptiveness to most types of information later in the process (since implicitly it would push them backwards if accepted), and finally their reluctance to start the process all over again. "When closure concerns loom large, for example, individuals may pursue closure-promoting activities... They may generate fewer competing hypothesis or suppress attention to information inconsistent with their hypotheses" (Kruglanski & Webster, 1996, p. 264). Conversely, individuals who desire or seek divergence can be resistant to being forced to move more quickly through the problem-solving process. "Closure may not be desired universally. Although in some circumstances people may strive to attain it, in other situations they may actively avoid it or exhibit littler preference for it over ambiguity" (Kruglanski & Webster, 1996, p. 280). In these cases, people may be reluctant to commit to a specific decision and thus may withhold judgment until they have access to more information, are able to resolve their remaining ambiguity, and are more confident in their final choice. The underlying motivation for this type of behavior is described as *fear of invalidity* (i.e., fear of making mistakes or of making an incorrect choice) and is very similar to the avoidance of potential regret which is used to explain individuals tendencies towards *maximization* (i.e., considering all potential options or feeling a

need to have complete information prior to making a decision) in a related literature on 'The Paradox of Choice' (Schwartz et al., 2002).

This brings me to my next set of Hypotheses:

- **Hypothesis 1-4a:** Recipients will exert less effort and be less engaged when presented with divergent (convergent) knowledge when they seek convergent (divergent) knowledge.
- **Hypothesis 1-4b:** Divergent (convergent) knowledge will be perceived to be less useful when convergent (divergent) knowledge is sought.

In addition, the same arguments made previously regarding the moderating effect of initiation apply to unsolicited / unsought knowledge from different parts of the problem-solving process. Again it seems that if they initiate an interaction, recipients may make themselves more open to unsolicited / unsought knowledge that may move them unexpectedly forward or backward in the problem-solving process.

- **Hypothesis 1-5a:** Recipients will exert less effort and be less engaged when presented with unsolicited / unsought divergent (convergent) knowledge especially when interactions are source-initiated (and this relationship will be less apparent when interactions are recipient-initiated).
- **Hypothesis 1-5d:** Unsolicited / unsought divergent (convergent) knowledge will be perceived to be less useful especially when interactions are source-initiated (and this relationship will be less apparent or even disappear altogether when interactions are recipient-initiated).

Employee Performance & Unsolicited / Unsought Knowledge

Finally, as I have argued previously this research is based in part on the assumption that the perceived usefulness of knowledge exchanged is at least partly subjective. There are very few ways to test this assumption but one way may be through the reaction of higher-performance employees in the face of unsolicited knowledge. Acknowledging that even if knowledge is unsolicited / unsought it may sometimes be valuable (e.g., disagreeing feedback that avoids an inappropriate solution being put into practice or unsolicited problem reformulation that creates the opportunity for a more successful ideation process) might lead us to conclude that higher-performance recipients may be more open to unsolicited / unsought knowledge. Although alternative hypotheses could also be proposed⁶, it seems more likely that higher-performance sources simply make better choices that lead to their higher-performance and that one example of these better choices may be captured in their openness to consider unsolicited / unsought knowledge. If this is true it could imply a normative conclusion (i.e., that employees should generally be more open to unsolicited / unsought knowledge from other parts of the problem-solving process and that this will improve their overall performance in an organization).

⁶ Example alternative hypotheses: 1) sources save their most valuable unsolicited / unsought knowledge for higher-performance recipients; 2) higher-performance recipients have the luxury to consider unsolicited / unsought knowledge since failures or inefficiencies are overlooked due to the halo effect of their high-performance rating; 3) higher-performance recipients are more capable of taking advantage of unsolicited / unsought knowledge; or 4) higher-performance recipients have more confidence in their ability to take advantage of unsolicited / unsought due to their most recent positive performance appraisal.

- **Hypothesis 1-6a:** In comparison to lower performance recipients, higher-performance recipients will exert more effort and be more engaged when presented with unsolicited / unsought divergent (convergent) knowledge (i.e., divergent when convergent is sought or convergent when divergent is sought).
- **Hypothesis 1-6d:** In comparison to lower performance recipients, higher-performance recipients will perceive unsolicited / unsought divergent (convergent) knowledge to be more useful (i.e., divergent when convergent is sought or convergent when divergent is sought).

SECTION 1: METHOD

SAMPLE & PROCEDURE

A web-based survey was distributed to a random sampling of employees in four (4) different multinational research and development companies. Companies were from telecommunication, automotive, and chemical (two companies) industries. The survey was described as “part of a larger study that looks at the way people exchange or share knowledge within organizations in order to accomplish organizational tasks” and respondents were assured of confidentiality which was further enhanced by the survey being administered by a university researcher and not personnel from subjects’ companies. Participation in the survey was optional although a top manager in charge of the division in question sent an email to all potential respondents indicating the study was part of the company’s strategy to improve collaboration and that their participation and candor was very much appreciated. The actual invitation to participate in the survey

was sent out by qualtrics.com and included a unique link for each employee. Up to three reminder emails were sent out weekly over the following weeks to non-respondents. The organizations that participated were interested in having an analysis done of their climate for collaboration and creativity as well as their employees' collaborative behavior. In exchange for access to the organization's employees, the researcher agreed to share the final results with the organization. It was emphasized that, although employee-level results would be collected, all data delivered would be aggregated to business unit / departmental level to protect employee anonymity and this was also explained to participants in the instructions and invitation. Participating divisions included personnel from R&D, Production / Operations, Marketing & Sales, and Administration / IT Support functions, as well as a smaller number of HR, Customer Service, and Finance / Accounts personnel. See figure 7a for a summary of the functional backgrounds of survey respondents. Respondents ranged in age from under 24 years old to over 65 and had tenures with the company from 1 year to more than 35 years, at their job from 1 year to almost 35 years, and in their industry from 1 year to more than 40 years. The vast majority of respondents have at least a 4-year college degree with more than half having masters or doctoral degrees (i.e., these are personnel that might be considered prototypical knowledge workers). See figure 7a-f for descriptive statistics of the subjects who responded to the main portion of the survey. Table 1 reports the sample size and response rates for the primary survey in all four companies.

[Insert Figure 7a-f About Here]

[Insert Table 1 About Here]

The main portion of the survey that was distributed started with questions about organizational climate, individual motivators / de-motivators, and subjects' knowledge sharing behaviors. Part of the knowledge sharing behaviors section asked respondents to indicate how frequently they engaged in knowledge exchange interactions of five different types: 1. "I went to other people looking for their knowledge or ideas"; 2. "Other people came to me looking for my knowledge or ideas"; 3. "I went to other people to share/give/offer my knowledge or ideas to them"; 4. "Other people came to me to share/give/offer their knowledge or ideas to me"; 5. "I collaborated with someone (i.e., we came together to exchange knowledge or ideas), but it is complex or unclear as to who initiated the interaction or who's knowledge was primarily being sought / provided." and respondents were asked to identify how frequently they engaged in each type of knowledge exchange with a response scale that ranged from "never" to "several times per day". Figure 8a-j display the frequencies of responses given to these items along with the relative frequencies for items (calculated by dividing the response on the specific items by the average response given across all items). As these figures show, survey respondents (subjects) reported playing the role of transferor most frequently, followed by searcher role, then sharer role, and finally acceptor / adopter role least frequently. This suggests that recipient-initiated exchanges may happen with somewhat more frequency than source-initiated exchanges but also highlights an apparent recall bias. It seems that recipients tend to recall instances in which they were the source as opposed to recipient in an exchange. Assuming perfect recall, the frequency of searching and transferring should be approximately the same, as

should the frequency of sharing and accepting / adopting (unless I have a response bias where sources are more likely to respond to the survey). Finally, subjects reported the lowest frequency of engaging in Mixed / Complex forms of exchanges suggesting that people tend to categorize exchanges into the types highlighted.

[Insert Figure 8a-j About Here]

For the “exchange portion” of the survey, the survey engine then randomly selected an exchange type from among the first 4 exchange types above that a respondent indicated they engaged in at least “less than once per month” (i.e., not “never”). Instructions for this section were as follows: “For the following sections please think about the most recent time you interacted with another member of [Organization] when: [Exchange Type]... Please try your best to think about the type of interaction described in the statement above. It is fine if the most recent interaction of this type was simple, complicated, successful, frustrating, or anything in between - we are simply looking for the most recent interaction of that type”. For this dissertation, I decided to focus on the first four exchange types and ignore the “mixed / complex” type, since I hoped to examine factors that differed across the four primary roles (searcher, transferor, sharer, acceptor) that I proposed were important in an integrated perspective of organizational knowledge flows. Subjects were asked to put a nickname or the initials of the person they had interacted with in order to help ground them in an actual, real interaction with a real person. The survey then asked a series of questions about that exchange, including the specific details of the exchange context, type of knowledge sought prior to the exchange, type of knowledge provided during the

exchange, effort and engagement of both the source and recipient, outcomes of the exchange, and the relationship between the source and recipient. For these questions, the survey asked about the subject as well as their perception of their dyadic partner in the exchange.

For company 2 & 3 the survey was split in two so that the exchange portion was delivered as a follow-up, optional “exchange survey” and subjects were asked about two separate exchanges of different types. In analyses throughout this paper I used only the first interaction of the appropriate type from each respondent (i.e., I only analyzed one response per subject). I had some support from the HR departments of the various companies that participated in the survey and each provided business unit / department assignments for all employees that were surveyed. Additional data was also provided by some companies. For example, Company 3 provided employee performance data. Table 2 reports the sample size and response rates for the exchange survey in all four companies.

[Insert Table 2 About Here]

ITEMS & SCALES

Survey questions were developed after an extensive review of existing scales and items were used in their original form or adapted as necessary to create a consistent format and wording. Where necessary new items were developed that were grounded in theory and based on past published studies. The survey was pilot tested in multiple waves with batches of test subjects and pilot tested surveys included free-response feedback space to maximize the continuous improvement of the survey. The final

question and response format was designed for ease of readability and standardized formats for both questions and response ranges are used. Unless otherwise noted responses were based on a 7-point Likert scale with answers ranging from 1 (disagree very strongly) to 7 (agree very strongly) which included a middle neutral (neither agree nor disagree) score in order to maximize respondents' options.

The survey asked questions about sources and recipients regardless (in most cases) of whether they were survey respondents (i.e., subjects) or the exchange partner (e.g., other). In cases where questions focused on subject's perception of their exchange partner, I or me was replaced with the nickname or initials that subjects had provided to describe their dyadic partner or "he/she" as necessary (in this paper the interaction partner's nickname is replaced with the placeholder "[NAME]"). Given that I knew which of the four types of knowledge exchanges was sampled in each case, I could code whether subjects were sources (i.e., "Other people came to me looking for my knowledge or ideas" or "I went to other people to share/give/offer my knowledge or ideas to them") or subjects were recipients (i.e., "I went to other people looking for their knowledge or ideas" or "Other people came to me to share/give/offer their knowledge or ideas to me") as well as whether the exchange was initiated by the source (i.e., "I went to other people to share/give/offer my knowledge or ideas to them" or "Other people came to me to share/give/offer their knowledge or ideas to me") or recipient (i.e., "I went to other people looking for their knowledge or ideas" or "Other people came to me looking for my knowledge or ideas"). I then computed source focused items as subject's self-perception in cases when a subject was the source and

subject's perception of others in cases where the other person was the source. I similarly calculated recipient focused items as subject's self-perception in cases when a subject was the recipient and subject's perception of others when the other person was the recipient. Other perceptions were only measured when it seemed that exchange partners could assess these variables with some accuracy. For example, subjects evaluated the engagement and effort of both themselves and their exchange partner as well as how useful the knowledge exchanged was to themselves or how useful it seemed to be to their exchange partner (depending on who was the intended recipient in the exchange). However, some variables were still only measured for subjects. For example, motivational states (see section 2) were only gathered for subjects and employee performance was only available for subjects. The survey was designed in this way so that relevant variables from both sides of every exchange would be available and so that source-initiated exchanges could be compared to recipient-initiated exchanges. It has the added benefit of allowing the comparison of individuals' self perceptions in the roles of searchers, transferors, sharers, acceptors to the other perceptions of exchange partners. It is unclear whether self- or other-perception is more accurate in these cases. Both have some risk for bias—individuals might over or underestimate certain values when they pertain to self or other. Although a comprehensive comparison of self- vs. other-perception is somewhat outside the scope of this paper, I have explored this sufficiently to validate the legitimacy of combining data across self and other perception. Some exploration of this is included below.⁷

⁷ Several robustness tests of the primary hypotheses were done that reproduced

Dependent Variables

Exchange Usefulness. To measure exchange usefulness I asked subjects: “For me [NAME], this interaction...” which was followed by two items intended to measure subjective usefulness of the exchange: “was (or will be) exceptionally useful to me [NAME]” and “was (or will be) extremely helpful for me [NAME]”. Table 7 shows the results from a principle components exploratory factor analysis with a direct oblimin rotation. Items in this scale loaded onto one factor (Factor 2) with Cronbach’s $\alpha = 0.88$.

Mediators / Dependent Variables

Recipient Engagement. To measure the effort and engagement level of recipients during the exchange I asked subjects: “Throughout the interaction I [NAME]...” which was followed by three items intended to measure engagement: “I [NAME] was truly engaged in the interaction”, “I [NAME] was wholeheartedly involved in the interaction”, and “I [NAME] was really enthusiastic about the interaction”. Table 7 shows the results from a principle components exploratory factor analysis with a direct oblimin rotation. Items in this scale loaded onto one factor (Factor 1) with Cronbach’s $\alpha = 0.87$.

Source Engagement. To measure the effort and engagement level of sources during the exchange I asked the same set of questions as I asked about recipients. Table 7 shows the results from a principle components exploratory factor analysis with a

results after removed the effects of initiation (accomplished via SPSS GLM function which was used to partial out the effect of subject role dummy variables from primary IVs and DVs). Results were the same or similar to those reported which further supported the method of combining exchanges across exchange types.

direct oblimin rotation. Items in this scale loaded onto one factor (Factor 3) with Cronbach's $\alpha = 0.88$.

Independent Variables

Questions about the problem-solving process started out with the following instructions: "The following section asks to what extent you and [NAME] sought certain types of knowledge prior to the interaction as well as the type of knowledge that you and [NAME] provided during the interaction. If you or [NAME] were not seeking a certain type of knowledge before the interaction or a type of knowledge was not provided during the interaction, please select an appropriate level of disagreement with those statements." This was followed by these definitions: **"Problem-Opportunity:** Knowledge of this type describes or explores a problem, need, opportunity, situation or other knowledge gap that underlies the interaction in question. **Answer-Solution:** Knowledge of this type provides specific answers to questions, solutions to problems, or otherwise describes some resolution(s) to the knowledge gap which motivates the interaction."

Knowledge Sought. To measure the degree to which recipients identified a need for knowledge and had made efforts prior to the exchange to locate needed knowledge I asked "Going into the interaction, I [NAME] was looking for (i.e., recognized a need for, was open to, or was actively seeking)..." with four follow-up items: 1. "A new or different way to understand the problem-opportunity", 2. "Feedback on the way I [NAME] already understood the problem-opportunity", 3. "A new or different answer-solution", 4. "Feedback on an answer-solution I [NAME] was already considering". This

set of questions were designed based on the above discussion of the problem-solving process to measure the range of knowledge that could be sought during the exchange.

Knowledge Provided. To measure the degree to which sources provided knowledge during the exchange I asked “During the interaction, I [NAME] provided or tried to provide (i.e., described, shared, or otherwise spent your time explaining)...” followed by the same four follow-up items: 1. “A new or different way to understand the problem-opportunity”, 2. “Feedback on the way [NAME] / I already understood the problem-opportunity”, 3. “A new or different answer-solution”, 4. “Feedback on an answer-solution [NAME] / I was already considering”. This set of questions were designed based on the above discussion of the problem-solving process to measure the range of knowledge that could be provided during the exchange.

Recipient Employee Performance. Employee performance was provided by the Human Resources Department of Company 3. This data reflected the subject employee’s most recent performance review and was measured with a 3-level ordinal variable: 1) “Exceeds Expectations”, 2) “Meets Expectations”, and 3) “Below Expectations”. As this data is only available for subjects, analyses that use this variable only focus on roles where subjects are either sources (i.e., where transferors or sharers performance is relevant) or recipients (i.e., where searchers or acceptors performance is relevant) but cannot analyze data across all four roles simultaneously.

Controls

Company Dummy Variables. Dummy variables were included for each participating company to take into account variance due to company level differences.

Company 1 was arbitrarily chosen as the comparison / control group and thus left out of analyses.

Interaction ID. A dummy variable was included to control for whether or not data came from the first or second observation for multi-exchange surveys (Company 2 & 3). This was only relevant in cases where the second exchange was selected instead of the first (e.g., when the first exchange was not reasonable but the second one was or when specific types of interactions were analyzed and the first exchange was not the appropriate type but the second one was).

Interaction Days Ago. This was measured via a single question: "How many days ago did the interaction occur?" and was included in order to control for potential recall bias related to lag between survey completion and the last interaction of a certain type the subject had engaged in.

Interaction Duration. This was measured as the length of time that the interaction lasted (measured in hours and minutes and converted to minutes and logged for analyses).

Interaction Group Size. Was measured with a single question: "The interaction was mostly..." 1 "one-on-one", 2 "in a small group or email/electronic space with < 10 people", or 3 "in a large group or email/electronic space with 10+ people".

Strong Ties. Were measured based on two items utilized in many past studies of tie strength: "Prior to the interaction, my Relationship with [NAME] was..." 1 "Very distant", 2 "Distant", 3 "Somewhat distant", 4 "Neither close nor distant", 5 "Somewhat Close", 6 "Close", 7 "Very close" and "Prior to the interaction, about how often did you

communicate with [NAME]?" 1 "Never", 2 "Less than once a month", 3 "Around once a month", 4 "Around once a week", 5 "Around once a day", 6 "A few times a day", 7 "Several times a day". (Cronbach's $\alpha = .80$)

Relationship Length (Logged). Was measured as the number of years the subject had known their interaction partner and was logged for analysis. Unreported factor analysis revealed that this was exogenous to tie strength.

Physical Proximity. Was measured with a single item: "Please indicate [NAME]'s physical proximity to you..." 1. "Worked immediately next to me", 2. "Worked on the same floor and same area", 3. "Worked on the same floor but different area", 4. "Worked in the same building but on a different floor", 5. "Worked in the same city but in a different building", 6. "Worked in the same country but in a different city", 7. "Worked in a different country".

Organizational Proximity. Was measured with a single item: "Please indicate [NAME]'s formal organizational proximity to you..." 1. "Worked in my immediate workgroup", 2. "Worked in another workgroup in my department", 3. "Worked in another department of my business unit or service unit", 4. "Worked in another business unit or service unit within my division", 5. "Worked in another division of [Organization]".

Higher Rank Source. Was measured as a single item: "What is [NAME]'s level or rank relative to your own...Formal hierarchical rank/level in the organization" 1. "Much Lower than mine", 2. "Lower than mine", 3. "Somewhat lower than mine", 4. "The same

as mine", 5. "Somewhat higher than mine", 6. "Higher than mine", 7. "Much higher than mine".

Greater Expertise Source. Was measured as a single item: "What is [NAME]'s level or rank relative to your own... Level of expertise specifically regarding the topics discussed" 1. "Much Lower than mine", 2. "Lower than mine", 3. "Somewhat lower than mine", 4. "The same as mine", 5. "Somewhat higher than mine", 6. "Higher than mine", 7. "Much higher than mine".

Recipient Sought All (Avg). In order to control for the total amount of seeking in analyses focused on the problem-solving process the average value of the four items measuring knowledge seeking was calculated. "Going into the interaction, I [NAME] was looking for (i.e., recognized a need for, was open to, or was actively seeking)..." with four follow-up items: 1. "A new or different way to understand the problem-opportunity", 2. "Feedback on the way I [NAME] already understood the problem-opportunity", 3. "A new or different answer-solution", 4. "Feedback on an answer-solution I [NAME] was already considering". (Cronbach's $\alpha = .63$)⁸

⁸ Although these total / average values have low Cronbach alpha reliability (suggesting the items may not represent a singular underlying construct), including these average values was chosen as the best way to be sure that results found were based on the process continuum and not based on total levels of seeking or providing. When the process model is being analyzed a recipient who reports they are seeking: New Problems (1), Problem Feedback (1), New Solutions (3), Solution Feedback (1) is considered to be similar to one who is seeking: New Problems (3), Problem Feedback (3), New Solutions (5), Solution Feedback (3). In both cases these recipients are more open to or seeking new solutions than anything else. If they receive something different (e.g., problem or feedback knowledge) they may be less engaged or find it to be less useful. However, the fact that one is generally seeking everything a bit more than the other might also affect results so I want to be able to control for this.

Source Provided All (Avg). In order to control for the total amount of providing in analyses focused on the problem-solving process the average value of the four items measuring knowledge providing was calculated. “During the interaction, I / [NAME] provided or tried to provide (i.e., described, shared, or otherwise spent your time explaining)...” followed by the same four follow-up items: 1. “A new or different way to understand the problem-opportunity”, 2. “Feedback on the way [NAME] / I already understood the problem-opportunity”, 3. “A new or different answer-solution”, 4. “Feedback on an answer-solution [NAME] / I was already considering”. (Cronbach’s $\alpha = .62$)⁸

Feedback Valence. In addition to the problem generation, problem feedback, solution generation, and solution feedback items, two additional items were included in the survey describing knowledge that sources provided during the exchange. These items asked to the extent that feedback provided by sources disagreed vs. agreed with recipients knowledge held prior to the exchange: “Did feedback I / [NAME] provided contradict or validate the knowledge or ideas that [NAME] / I had prior to the interaction?” was followed by the items: “Feedback on the way [NAME] / I already understood the problem-opportunity” and “Feedback on an answer-solution [NAME] / I was already considering” with responses ranging from “Totally Contradicted” to “Totally Validated”. In addition, “not applicable” scale choices were available in cases where no feedback was provided. (Cronbach’s $\alpha = .63$)

Recipient-initiated exchange. Dummy variable set to 1 if an exchange is recipient initiated (i.e., knowledge pull or subject is searcher or transferor)

Subject Initiated Exchange. Dummy variable set to 1 if the exchange was initiated by the subject (i.e., subject is searcher or sharer)

Subject Searcher Dummy. Dummy variable set to 1 if the subject is in searcher role in the exchange (i.e., this is the interaction of Recipient Initiation * Subject Initiation)

ANALYSES

Reasonable Exchanges

In order to be sure that survey respondents understood our instructions and actually recalled a specific exchange that was the most recent of a specific type, I only retained exchanges that took less than 480 minutes (1 workday or 8 hours) and happened less than 60 days ago. See figure 9a and 9b for frequencies of values and ranges for these variables. These were very conservative filters and left 687 of 722 exchanges in the total sample (25 observations were dropped for violating the above conditions, 10 observations were dropped for missing data).

[Insert Figure 9a-b About Here]

As described previously, for company 2 and 3 two interactions per subject were measured. For regression analyses I only used the first interaction for each subject to avoid biasing results (in the future I plan to use multi-level modeling to provide further evidence based on within subject designs). If the first observation was an invalid exchange then the second observation would be used if it was a valid exchange. As I mentioned, for some variables I only have data available for subjects (e.g., motivations

or employee performance). For analyses involving these variables it is necessary to focus on cases where subjects are recipients or where subjects are sources—since recipient and source factors are most relevant in my analyses. Thus I coded the first observation of that type for each subject (and select these observations in relevant analyses). By selecting the first observation of a given type for each respondent this increases the relevant sample size without inflating the sample with multiple observations per subject. Counts for these various samples are included in table 3.

[Insert Table 3 About Here]

Unsolicited Exchanges

The degree to which an exchange itself was unsolicited / unsought acts as an important bridge between my discussion of initiation and unsolicited / unsought knowledge. Given the fact that my measurement model of knowledge sought and provided is based on four items which correspond to a theorized underlying problem-solving process, I believe the most compelling way to measure an unsolicited / unsought exchange is based on the maximum value of these four items. My assumption of an underlying problem-solving process would lead us to assume that recipients may be very interested in certain types of knowledge but not in others and, corresponding to this, that sources may provide certain types of knowledge and not others. Thus the degree to which recipients were seeking some type of knowledge and the degree to which sources provided some type of knowledge is captured in the maximum value across the relevant items and is likely indicative of the degree to which an exchange itself was unsolicited / unsought. Average value scores, on the other hand, risk being

lowered if individuals sought or provided specific forms of knowledge at the expense of others (this is reflected in the relatively low Cronbach alpha scores reported above under average values). Thus this maximum value based overall seeking / providing measure serves a different purpose than the previously described average value based control. The correlations displayed in table 4 between maximum values and average values for seeking and providing are quite high (seeking: .680, $p < .001$; providing: .640, $p < .001$) but not so high as to suggest they necessarily measure the same thing. This relationship is displayed graphically in figure 10a and 10b. In addition, analyses not reported here, found largely consistent results when average values were used instead of maximum values. Finally, in the survey used for Company 4 items were added to directly measure overall seeking and providing.⁹

[Insert Figure 10a-b About Here]

[Insert Table 4 About Here]

Problem-solving process

Given that these items were developed with an expectation of exposing an underlying process, the problem-solving process can be considered to be a proximity scale wherein items are expected to stand in ordinal relationship to each other (Garson, 2009) and not be directly correlated with each other as per a Lickert scale. Thus it is appropriate to analyze this portion of the data with multidimensional scaling (MDS)

⁹ For company 4 items were added that directly measured overall pre-exchange seeking and during-exchange providing so that unsolicited / unsought exchanges could be measured directly. These results were reproduced with these variables and provided the same or similar results (not reported here) as those based on maximum value calculations.

rather than factor analysis (this is consistent with methods used to evaluate underlying scales with similar constructs in Cross et al., 2001). Multidimensional scaling in SPSS v19 revealed that two underlying dimensions, problems-to-solutions and generation-to-feedback, modeled the data better than a single overall process dimension and showed that there was not a significant improvement with three underlying dimensions. These results were consistent with my presupposition that an overall problem to solution process as well as generation to validation sub-processes were relevant for understanding the problem-solving process (figure 11a and 11c). MDS results were consistent for recipient seeking as well as source providing. The stress (the primary measure of model fit for MDS) for models with between one and three dimensions is displayed in figure 11b, and figure 11d for seeking and providing respectively. Models with two dimensions displayed stress levels well below commonly acceptable thresholds (e.g., for Stress-I / Kruskal: .20=poor, .1=fair, .05=good, 0.025 excellent, 0=perfect) (Kruskal, 1964).

[Insert Figure 11a-d About Here]

[Insert Table 5 About Here]

Given these results, two continuums were calculated for seeking as well as providing. For the problem-to-solution dimension, problem generation and problem feedback were subtracted from solution generation and solution feedback. For the generation-to-feedback dimension, problem generation and solution generation were subtracted from problem feedback and solution feedback. It should be noted that these scales do not range from “low” scores to “high” scores. Rather they range from

problems to solutions and from generation to feedback. Scales have been constructed so that lower scores correspond to divergence (problems and generation) while higher scores correspond to convergence (solutions and feedback). Furthermore, the problem-solving process scales created via the above do not consider the total degree of seeking or providing (since they focus on the skew to one end of the scale or the other). Thus in analyses that seek to assess the impact of these process scales on important outcome variables, I control for average degree of seeking and/or providing to remove this potential confound (See footnote 8 above).

Comparison to Cross et al., 2001 MDS Results

My interpretation of these MDS results is inconsistent with Cross et al.'s (2001) interpretation of their MDS results based on qualitative data describing similar problem solving constructs. However, it may be possible to reinterpret their MDS results (Cross et al., 2001, figure 2, p. 221) with the theoretical lens presented in this paper. A reinterpretation of their MDS results might suggest problems-to-solutions on the vertical dimension and generation-to-feedback on the horizontal dimension (see figure 12). The fact that validation appears towards the problem side of the scale is likely partially driven by the lack of explicit differentiation between solution feedback and problem feedback as well as the explicit differentiation between validation and legitimization. Legitimation is implicitly a form of feedback that is near the end of the problem-solving process immediately prior to pitching the final idea to external stakeholders: "The ability to cite a respected source as having reviewed a solution can serve to increase the credibility of a proposed solution" (Cross et al., 2001, p.219). On

the other hand validation, as it is defined in the paper, occurs throughout the earlier phases of the problem-solving process: “these interactions were important solely because they bolstered the respondent’s belief in her/his own thinking and allowed her/him to more confidently introduce and move their ideas forward in other social contexts” (Cross et al., 2001, p. 219). Similarly, given that problem reformulation included both problem generation and problem feedback this can explain why problem reformulation occurs close to the middle of the generation-to-feedback scale. The combination of problem generation and problem feedback can be seen in the description of ‘problem reformulation’ in Cross et al., 2001: “First, there was the kind of problem reformulation in which the contact prompted the respondent to think more broadly about a problem or to attend to dimensions that the respondent had not considered yet. Second, there was the kind in which the contact was able to predict the consequences of actions the respondent was planning, enabling the respondent to make alternative choices” (p. 219). Unfortunately, I am not privy to the interview data that was collected as a part of the groundbreaking research of Cross (2000), Cross et al., (2001), and Cross & Sproull (2004) so it is difficult to see if there might be some qualitative support for this two-dimensional interpretation of the data and results. Research that contextualizes knowledge exchanges within the problem-solving process is still extremely rare so with this research I hope to continue to add to this discussion.

[Insert Figure 12 About Here]

Orthogonal Problem-to-Solution & Generation-to-Feedback Scales

The interpretation of orthogonal problem-to-solution and generation-to-feedback scales may need to be clarified. Although my prior discussion presupposed a macro problem-to-solution process with micro generation-to-feedback sub-processes, I cannot actually say that one of these processes is super-ordinate to the other since they are orthogonal (see figure 14a and 14b). Given that many people approach problem solving in a non-linear manner, it may be just as likely that people first spend time diverging or generating options for both problem framing as well as solution formulation and then converge or seek feedback on both problem and solutions. This is consistent with the underlying data which shows, for example, that many individuals report that they were simultaneously seeking problem generation and feedback (but not solution generation or feedback) while many other individuals indicated they were simultaneously seeking problem and solution generation (but not seeking either problem or solution validation). Figure 13 is included to help readers understand actual responses that make up this data. Each of the smaller charts in this figure depict an actual example response of an individual subject on source provided problem generation, problem feedback, solution generation, and solution feedback.

[Insert Figure 13 About Here]

Differentiated vs. Undifferentiated Exchanges

Finally, a substantial number of individuals did not differentiate the type of knowledge that was being sought or provided (see figure 14a-b). Unfortunately, I cannot

distinguish whether or not this is based on reality (i.e., recipients were really open to all types of knowledge and sources provided all types of knowledge) or respondents' difficulty in distinguishing these problem solving stages, lack of survey engagement, or survey fatigue. I suspect it is largely a result of the later survey based limitations since in the past it has often been found to be difficult to train subjects to differentiate solution based knowledge from problem based knowledge. I believe that although the 0,0 point on the continuums (where problems-to-solutions and generation-feedback are not distinguished) is the tallest single point in the graph, a sufficient amount of respondents do differentiate types of seeking and providing within the problem-solving process to allow my analysis of this phenomenon (79% non 0,0 values for seeking; 70% non 0,0 values for providing). Counts for exchanges in the different quadrants depicted in figure 14 are shown in table 6.

[Insert Table 6 About Here]

[Insert Figure 14 About Here]

Unsolicited / Unsought Knowledge

Unsolicited / unsought exchanges were calculated as the interaction of knowledge sought (maximum value based) and knowledge provided (maximum value based) while unsolicited / unsought knowledge was calculated as the interaction of knowledge sought and knowledge provided within the problem-to-solution and generation-to-feedback scales. As with all interaction terms, care needs to be taken in interpreting these variables and corresponding results. When searching and providing are either both high or both low this variable is positive, however, when results are in

the off-diagonals (high x low or low x high) this variable is negative. Off-diagonals for maximum value based measures include both unsolicited / unsought exchanges (low seeking, high providing) as well as under-delivered exchanges (high seeking, low providing). It is for this reason that all results include interaction graphs so that accurate interpretations can be made regarding the effects of unsolicited / unsought exchanges or knowledge specifically.

DVs & Mediators: Engagement, Constraint, and Outcomes

Exploratory factor analysis was conducted for all items designed to measure dependent variables (e.g., exchange usefulness) and mediators (e.g., recipient engagement and source engagement) since these scales had not been included together in exactly these forms in a survey before. These results are reported in table 7 and the convergent validity of these scales was further confirmed by the high Cronbach alpha reliabilities reported above under each variable's description.

[Insert Table 7 About Here]

Self vs. Other Perception

A great deal of exploration was done to confirm the reasonableness of combining subject's self-perception and other-perception across observations and controls were included in regressions where appropriate as a robustness test. For example, one of the most subjective variables (or those most likely to be biased by self vs. other perception) is that of effort / engagement (imagining that subjects might exaggerate their own effort and engagement in exchanges). As the histograms in figure

15a and figure 15b show there are only minor differences in the distribution of these values for self vs. other perception for either sources or recipients. Table 8 shows T-tests and Levene's test of equality of variance which further confirm that mean values for source and recipient engagement as well as exchange usefulness are all unaffected by self vs. other perception. It may be worthy to note that there is a significant difference in variance for recipients engagement—sources perceiving greater variation than recipients perceived of themselves (Levene $F(1, 485) = 4.73, p < .05$). Boxplots for these variables are included in figure 15c.

[Insert Figure 15 About Here]

[Insert Table 8 About Here]

HYPOTHESIS TESTING

Initiation vs. Seeking, Providing, & Unsolicited Knowledge

To test Hypotheses 1-1a to 1-1c about the levels of seeking, providing, and unsolicited / unsought knowledge across source vs. recipient initiation, I did a simple T-test comparison of knowledge sought, knowledge provided, and unsolicited knowledge for source initiated vs. recipient initiated knowledge exchanges. These results are displayed in table 9. Contrary to hypothesis 1-1a, I find no evidence that recipients have a higher overall degree of seeking knowledge in recipient-initiated exchanges. Results provide very weak support for hypothesis 1-1b since there is no significant difference in knowledge provided based on maximum values and only a marginally higher amount of knowledge in push exchanges based on average values (Means = 5.24 vs. 5.08; $p < .10$)

which seems to be partially driven by a marginal increase in problem knowledge provided in push exchanges (Means = 5.08 vs. 5.00; $p < .10$). Finally, contradicting hypothesis 1-1c, there is no significant difference in unsolicited knowledge (neither maximum nor average value based) between source-initiated vs. recipient-initiated knowledge exchanges. Additional results show that there are no significant mean differences in seeking or providing within the problem solving process, not is there significantly more unsolicited / unsought problem-solving knowledge provided in push exchanges. There is a significant different in variance with greater standard deviation for unsolicited generation-to-feedback in recipient initiated exchanges. Overall, these results are consistent with my suppositions but inconsistent with past literature which would presume more significant differences between push and pull forms of knowledge exchanges. Indeed the marginally higher result for knowledge providing average and insignificant result for knowledge providing maximum suggests that a combination of knowledge from different phases of the problem-solving process is more frequently shared in push exchanges (as opposed to more knowledge per se).

Hypothesis 1-1a: In recipient-initiated (pull) forms of knowledge exchange, recipients are more likely to have recognized their knowledge need, be open to knowledge, and/or be actively seeking knowledge than they will be in source-initiated (push) forms of knowledge exchange (consistent with assumptions of past literature). **(Not Supported)**

Hypothesis 1-1b: In source-initiated (push) forms of knowledge exchange, sources will be more likely to provide knowledge than they will in recipient-initiated (pull) forms of

knowledge exchange (consistent with assumptions of past literature). **(Not Supported or Very Weakly Supported)**

Hypothesis 1-1c: Source-initiated (push) forms of knowledge exchange are more likely to include unsolicited / unsought knowledge than recipient initiated (pull) forms of knowledge exchange (consistent with assumptions of past literature). **(Not Supported)**

[Insert Table 9 About Here]

The similar levels of unsolicited knowledge across source and recipient-initiated exchanges is further confirmed by exploratory graphs (figure 16a-b) highlighting the numbers of exchanges that were to some extent unsolicited / unsought based on maximum values for recipient seeking and source providing. Figures 16a-b highlight in red those exchanges where the overall level of providing was higher than the overall level of seeking.

[Insert Figure 16a-b About Here]

Figure 17a-d highlight unsolicited knowledge from a process standpoint. The centerline, (highlighted in green) shows where recipient seeking and source providing are at the same phase in the problem-solving process. Exchanges that propose to push recipients to the left and towards divergence in the process (i.e., cases where providing of problem-to-solution knowledge or generation-to-feedback continuums are lower than the equivalent seeking continuums) are to the left of this line. Exchanges that propose to push recipients to the right and towards convergence in the process (i.e., cases where providing of problem-to-solution knowledge or generation-to-feedback continuums are higher than the equivalent seeking continuums) are to the right of this

line. These graphs show that there is a significant amount of unsolicited / unsought knowledge in both recipient-initiated and source-initiated exchanges suggesting that initiation may not be a very good proxy for recipients' problem recognition as the literature seemingly presumes.

[Insert Figure 17a-d About Here]

Unsolicited / Unsought Exchanges

To test Hypotheses 1-2a to 1-2d I conducted a series of hierarchical regression analyses with Step 1 including controls for company, a number of factors describing the exchange context, and a number of factors related to source-recipient relationship, Step 2 added recipient initiation (hypotheses 1-2a and 1-2c), Step 3 added seeking and providing centered main effects, and Step 4 added the unsolicited exchange interaction term (hypotheses 1-2b and 1-2d), and Step 5 added controls for whether the subject (survey respondent) initiated the exchange as well as the interaction of recipient and subject initiation (i.e., subject in proactive recipient / searcher role). To reduce collinearity (Tabachnick & Fidell, 2001), in Step 3 and 4 I included centered values for main effects and used these centered values to calculate the necessary interaction terms. Controls added in Step 5 were included as a robustness check to make sure results were consistent for self vs. perceived other observations. In order to better understand the results I graphed each of these exchanges in order to isolate unsolicited knowledge from other forms of knowledge.

As shown in table 10a model 2 and table 10b model 2, results did not support either hypothesis 1-2a or 1-2c. Contradicting the implicit and explicit assumptions of

past literature, whether an exchange was source-initiated or recipient-initiated did not predict either recipient's engagement level or recipient's perception of the usefulness of the exchange. However, as shown in table 10a model 4 and table 10b model 4, results confirmed hypotheses 1-2b and 1-2d and show that recipients were significantly less engaged when presented with unsolicited knowledge and that unsolicited knowledge was perceived to be less useful than solicited knowledge. These results are graphically displayed in figure 18a and figure 18b. As shown in model 5, results are robust and not affected by the inclusion of subject initiation nor subject as searcher role controls. Finally, interaction results based on average values for seeking and proving (not reported here) were similar but weaker than those for maximum values (Unsolicited / Unsought on Engagement: $B = .058$; $p = .047$; Unsolicited / Unsought on Usefulness: $B = .081$; $p = .018$).

Hypothesis 1-2a: Recipients will exert more effort and be more engaged in recipient-initiated (pull) forms of knowledge exchange than in source-initiated (push) knowledge exchanges (consistent with assumptions of past literature). **(Not Supported)**

Hypothesis 1-2b: Recipients will exert less effort and be less engaged in the exchange when presented with unsolicited / unsought knowledge in comparison to solicited / sought knowledge. **(Supported)**

Hypothesis 1-2c: Recipient-initiated (pull) knowledge exchanges will be perceived to be more useful than source-initiated (push) knowledge exchanges (consistent with assumptions of past literature). **(Not Supported)**.

Hypothesis 1-2d: Unsolicited / unsought knowledge will be perceived to be less useful than solicited / sought knowledge. **(Supported)**

[Insert Figure 18a-b About Here]

[Insert Table 10a-b About Here]

Initiation & Unsolicited / Unsought Exchanges

Hypothesis 1-3a and 3b were tested with hierarchical regression analysis with steps similar to those above. Step 1 including controls for company, a number of factors describing the exchange context, and a number of factors related to source-recipient relationship. Step 2 added seeking and providing centered main effects as well as the centered main effect of recipient initiation. Step 3 added 2-way interaction terms of unsolicited knowledge (seeking with providing) as well as initiation with seeking and initiation with providing. Step 4 added the 3-way interaction term of initiation with unsolicited / unsought knowledge. Step 5 added controls for subject initiation as described above.

As shown in table 11a model 3-4 and 11b model 3-4, although the 3-way interactions of initiation with unsolicited / unsought knowledge were not significant in either of the regressions, the 2-way interactions of initiation with seeking and/or providing were significant (much more so when predicting exchange usefulness). Model 5 in table 11a and 11b were used to create the graphical results in figure 19a and 19b respectively. These results show that the aggregated effects of the significant 2-way interactions involving providing and initiation or seeking and initiation respectively seemed to support my hypotheses. Although support was relatively weak for Hypothesis

1-3a, figure 19a shows that engagement is lower when exchanges are both unsolicited / unsought and source-initiated (push). Support for Hypothesis 1-3b was quite strong and showed that unsolicited / unsought exchanges are only perceived to be less useful when the exchange is source-initiated (push). A very interesting and not altogether unexpected result was that solicited / sought exchanges that were source-initiated (push) were the most useful exchanges of all. This would tend to support the efficiency based argument that I have made—an effective and efficient OL environment may need to rely on source-initiated knowledge flows involving solicited / sought knowledge. These findings also collectively seem to add a great deal of support to the argument made previously that perceived usefulness of exchanges, in particular unsolicited / unsought exchanges, is subjective. Initiation should have little effect on the perception of usefulness if unsolicited / unsought exchanges are objectively less useful than solicited / sought exchanges. In addition, lending further support to the argument that initiation is a poor proxy for problem recognition and unsolicited / unsought knowledge, these results show that initiation (as a main effect) is not a significant predictor of recipient engagement or exchange usefulness—initiation is only significant when combined with variables related to the degree to which an exchange was solicited / sought vs. unsolicited / unsought. Finally, results are robust and only marginally affected by the inclusion of subject initiation and subject searcher role controls (graphical results are based on model 6 and so take these controls into account).

Hypothesis 1-3a: Recipients will exert less effort and be less engaged when presented with unsolicited / unsought knowledge especially when interactions are source-initiated

(and this relationship will be less apparent when interactions are recipient-initiated).

(Partially Supported)

Hypothesis 1-3b: Unsolicited / unsought knowledge will be perceived to be less useful especially when interactions are source-initiated (and this relationship will be less apparent when interactions are recipient-initiated). **(Partially Supported)**

[Insert Figure 19a-b About Here]

[Insert Table 11a-b About Here]

Unsolicited Knowledge within the Problem-Solving Process

To test hypotheses 1-4a and 1-4b I ran regressions with similar steps as those described above. These results are displayed in table 12a-b. Step 1 including controls for company, a number of factors describing the exchange context, and a number of factors related to source-recipient relationship as well as a control for recipient initiation, Step 2 added controls for total amount of knowledge sought and provided as well as disagreeing feedback, Step 3 added seeking and providing for problem-to-solutions and generation to feedback centered main effects, Step 4 added the unsolicited knowledge interaction terms for both problem-to-solution and generation-to-feedback, and Step 5 added controls for subject initiation as described above. Model 5 of table 12a and table 12b were used to create figure 20a and 20b respectively.

Results partially supported my hypotheses. Recipients were significantly less engaged and perceived exchanges to be less useful when faced with unsolicited problem-to-solution knowledge but results for unsolicited generation-to-feedback knowledge were not significant. This may suggest that the superordinate problem-to-

solution process, visualized in the problem solving process model but discounted by MDS results, still has some legitimacy. Unsolicited knowledge that pushes people forwards or backwards in the macro divergent-to-convergent trend inherent in the move from problems to solutions seems to be most salient to, and unappreciated or even blocked by recipients. Finally, results were robust and remain consistent with the inclusion of subject initiation and subject role controls.

Hypothesis 1-4a: Recipients will exert less effort and be less engaged when presented with divergent (convergent) knowledge when they seek convergent (divergent) knowledge. **(Partially Supported – Unsolicited Problem-to-Solution Knowledge)**

Hypothesis 1-4b: Divergent (convergent) knowledge will be perceived to be less useful when convergent (divergent) knowledge is sought. **(Partially Supported – Unsolicited Problem-to-Solution Knowledge)**

[Insert Figure 20a-b About Here]

[Insert Table 12a-b About Here]

Initiation & Unsolicited Knowledge within the Problem-solving process

To test hypotheses 1-5a and 1-5b I ran regressions with similar steps as those described above. Step 1 including controls for company, a number of controls describing the exchange context, and a number of controls related to source-recipient relationship, and controls for total amount of knowledge sought and provided as well as disagreeing vs. agreeing feedback, Step 2 added centered main effects for seeking and providing for problem-to-solutions and generation to feedback as well as for recipient initiation, Step 3 added two-way interaction terms for unsolicited knowledge (both problem-to-solution

and generation-to-feedback) and initiation with seeking and providing, Step 4 added three-way interactions for initiation with unsolicited problem-to-solution and generation-to-feedback, and Step 5 added controls for subject initiation as described above. Table 13 model 5 was used to create figure 21a and figure 21b.

Results were mixed with insignificant results (not shown) for recipient engagement (no support for hypothesis 1-5a) but highly significant results (table 13) for the three-way interaction of initiation with unsolicited generation-to-feedback on exchange usefulness (some support for hypothesis 1-5b). Figure 21a shows that for source-initiated (push) forms of knowledge exchange, solicited generation is perceived to be significantly more useful than unsolicited feedback while solicited feedback is perceived to be significantly more useful than unsolicited generation as expected. Conversely, figure 21b shows that for recipient-initiated (pull) forms of knowledge exchanges, unsolicited generation may actually be perceived to be slightly more useful than solicited feedback or indeed, solicited generation. In addition to lending support to the primary argument that initiation only matters when interacted with unsolicited / unsought knowledge (i.e., initiation only matters when exchanges involve unsolicited / unsought knowledge), these results also seem to add further evidence that usefulness is indeed subjective.

Hypothesis 1-5a: Recipients will exert less effort and be less engaged when presented with unsolicited / unsought divergent (convergent) knowledge especially when interactions are source-initiated (and this relationship will be less apparent when interactions are recipient-initiated). **(Not Supported).**

Hypothesis 1-5b: Unsolicited / unsought divergent (convergent) knowledge will be perceived to be less useful especially when interactions are source-initiated (and this relationship will be less apparent or even disappear altogether when interactions are recipient-initiated). **(Partly Supported – Unsolicited Generation-to-Feedback Knowledge)**

[Insert Figure 21a-b About Here]

[Insert Table 13 About Here]

Recipient Performance & Unsolicited Knowledge

To test hypotheses 1-6a and 1-6b I ran regressions with similar steps as those described above. Step 1 including controls for company, a number of controls describing the exchange context and source-recipient relationship, controls for total amount of knowledge sought and provided as well as disagreeing vs. agreeing feedback, and a control for whether the exchange was recipient initiated, Step 2 added centered main effects for seeking and providing for problem-to-solutions and generation to feedback as well as recipient employee performance, and Step 3 added two-way interactions terms for unsolicited knowledge (both problem-to-solution and generation-to-feedback) as well as for recipient employee performance with seeking and providing, and Step 4 added three-way interactions for recipient employee performance with unsolicited problem-to-solution and generation-to-feedback¹⁰. Table 14a model 5 was used to create figure 22a-b while table 14b model 5 was used to create figure 22c-d.

¹⁰ Because this analysis is based on recipients only (I only have performance data for subjects so I cannot look at higher-performance recipients from both sides of the

Results were again mixed with significant interaction effects for recipient employee performance and unsolicited generation-to-feedback on recipient engagement (some support for hypothesis 1-6a) and for exchange usefulness (some support for hypothesis 1-5b) as shown in table 14a-b as well as figures 22a-d. It turns out that higher-performance recipients are more engaged when they receive unsolicited problem knowledge or unsolicited solutions and, in addition, these same higher-performance recipients find this unsolicited problem and solution knowledge to be more useful. Finally, for higher-performance recipients there is also a slight unexpected decrease in both engagement and perceived usefulness for solicited knowledge. It is unclear exactly why this might be but it could be the result of increased expectations on the part of higher-performance recipients (although I have no basis to draw conclusions about this).

Hypothesis 1-6a: Higher-performance recipients will be more engaged when presented with unsolicited divergent (convergent) knowledge than lower performance recipients.

(Partly Supported – Unsolicited Problem-to-Solution Knowledge)

exchange) I can include several additional subject controls. To remain consistent with prior models I reported simpler models here. However, results remain consistent when controls for functional background of subject, subject age, subject education, subject tenure (in job, at company, and in industry) as well as subjects perception of collaborative climate, judgmental climate, subject's motivations (intrinsic, identification, positive introjection, negative introjection, extrinsic, and fear of loss of unique value), and perception of organization flux and anxiety about future prospects are also included. Thus these results seem to be quite robust and are unlikely to be due to other individual differences.

Hypothesis 1-6b: Higher-performance recipients will find unsolicited divergent (convergent) knowledge to be more useful than lower performance recipients. **(Partly Supported – Problem-to-Solution Knowledge)**

[Insert Figure 22a-d About Here]

[Insert Table 14 About Here]

SECTION 1: DISCUSSION

Section 1 of the dissertation was intended to answer some of the fundamental questions put forth in the introduction and theory development sections. First, does initiation correspond with unsolicited / unsought knowledge? It seems that this is unlikely—at least in the 1200+ employees across four organizations with several hundred examples of knowledge exchanges that I measured. Recipient’s pre-exchange problem recognition / openness to knowledge / search processes did not seem to differ across recipient-initiated vs. source-initiated exchanges. Initiation may indeed be mostly coincidental or mutual in the complex knowledge environments of modern organizations. On the other hand, unsolicited / unsought exchanges and knowledge seem to exist, to be phenomena worthy of analysis, and recipients seem to resist them / it—both via their reduced engagement during exchanges and their perception of lower levels of usefulness for the knowledge shared / transferred by sources during the exchange. However, both recipient-initiated and source-initiated exchanges frequently include unsolicited / unsought knowledge. One of the most important contributions of this paper is the suggestion that the problem solving process may be a useful way for contextualizing knowledge exchanges. However, the way that people solve problems is

quite complex and more work needs to be done to look at unsolicited / unsought knowledge within the problem solving process. For example, although unsolicited / unsought knowledge that shifts people along the problem-to-solution axis of the problem solving process seems to be universally rejected or blocked, unsolicited / unsought knowledge that shifts people along the generation-to-feedback axis is only perceived to be less useful in some specific cases (e.g., in source-initiated exchanges). In addition, although initiation is a poor proxy for unsolicited / unsought knowledge it is still a very important phenomenon. For example, source-initiated exchanges that are solicited / sought are perceived to be some of the most useful exchanges of all. Finally, giving credence arguments made regarding the subjectivity of exchange usefulness while simultaneously suggesting normative conclusions is the receptivity of high-performance source to unsolicited problem and solution knowledge. More research needs to be done to confirm the causality in these instances, however, the results are extremely interesting and seemingly provide justification for the perspectives put forth. Unsolicited knowledge may be very important in facilitating organizational learning, change, and innovation as well as performance.

SECTION 2: MOTIVATION AND RELATIONSHIPS IN KNOWLEDGE EXCHANGES

In section 1 of this dissertation I highlighted the fact that recipient vs. source initiation was a poor proxy for problem recognition since I found no evidence that recipient- vs. source-initiation corresponded to seeking, providing, unsolicited / unsought exchanges, or unsolicited / unsought knowledge. In addition, in multiple

regression analysis I noted that initiation did not predict recipient engagement nor exchange usefulness, however, both unsolicited / unsought exchanges as well as unsolicited / unsought knowledge within the problem-solving process were important predictors of both recipient engagement and exchange usefulness. Initiation did interact with unsolicited knowledge in interesting ways but the main effect of initiation was not significant in any of the analyses. This section of the dissertation is focused on understanding how motivation interacts with unsolicited / unsought knowledge while also highlighting a specific ‘story’ regarding higher expertise sources and unsolicited / unsought knowledge intended to show the implications of the perspectives put forth in this paper.

In the introduction I highlighted what I argue is a common misconception of past literature: “the participant that initiates an exchange is motivated to be involved and consequently exhibits higher effort and engagement during the interaction, while the reactive participant’s motivation, effort, and engagement is questionable and usually assumed to be lower.” (p. 20). I start out by formalizing these implicit [strawman] hypotheses:

- **Hypothesis 2-1a:** Recipients will exhibit higher levels of engagement when they initiated a knowledge exchange (i.e., in recipient-initiated / pull exchanges).
- **Hypothesis 2-1b:** Sources will exhibit higher levels of engagement when they initiated a knowledge exchange (i.e., in source-initiated / push exchanges).

In addition to examining differences in engagement across exchanges initiated by sources and recipients (Hypotheses 2-1a and 2-1b) as described above, it is

reasonable to examine what drives individuals to initiate proactive knowledge sharing and/or searching behavior. These proactive behaviors are what create the four exchange roles described previously as well as what sets up knowledge exchanges to be either recipient-initiated or source-initiated. In the following sections (Hypotheses 2-2x) I examine the effects of six different types of motivation (placed within the self determination theory framework as described below) on the frequency that subjects initiated knowledge exchanges as either searcher (proactive recipients) or sharers (proactive sources). Although both of these are proactive exchange roles, knowledge searching is related to a searcher's own epistemic goals / problems while knowledge sharing is usually considered to be prosocial and extrarole as discussed in section 1. Thus I expect that some motivational states will be similar among members who initiate more interactions in general (in both push and pull conditions), as well as more specifically among those that frequently initiate pull interactions vs. those that frequently initiate push interactions. Although a small amount of research has started to look at how different motivations simultaneously predict both searching and sharing behavior (e.g., Cabrera et al., 2006) this research has not utilized a robust and comprehensive framework for motivation as I do in this paper. Therefore, one of my contributions is to the sparse stream of research that looks at motivational states as they predict participation in multiple interdependent exchange roles.

In order to further build on these results, the next reasonable step would be to assess what motivational states affect sources and recipients engagement when they are involved in recipient-initiated or source-initiated exchanges. For example,

intrinsically motivated recipients might be especially engaged when faced with source-initiated, push exchanges or sources with high levels of extrinsic motivation may be especially engaged when involved in recipient-initiated, pull exchanges. However, given my premise that initiation is a less relevant construct than unsolicited knowledge, I do not believe that this will be the case. As I have argued, in today's knowledge-centric organizations initiation in most exchanges may be largely coincidental or mutual. Results (not reported here) found that recipients' motivational states did not significantly interact with initiation to predict recipients' engagement levels. Similarly, sources' motivational states did not interact with initiation to predict source's engagement levels or exchange outcomes. Obviously it is impossible to confirm a null hypothesis in this way; however, the relative lack of impact observed across several motivational states when interacted with initiation from both recipients' and sources' perspectives seems to suggest other areas may be more worthy of my research efforts.

Following this, it would next be feasible to assess what drives source to provide unsolicited knowledge as well as what motivational factors make recipients more receptive to receive unsolicited knowledge. Given that my primary goal is to establish the problem-solving process as a context in which knowledge exchanges happen, I focus on unsolicited knowledge within this process (as opposed to overall unsolicited / unsought exchanges). The discussion below and the related analyses (Hypotheses 2-3x) assess the extent which different motivational states interact with unsolicited knowledge in the problem-solving process to predict recipient engagement and exchange outcomes (i.e., what makes recipients open to unsolicited knowledge). Finally,

at the end of this section, I highlight the implications of my perspective through a specific and detailed 'story' that assesses a number of hypotheses related to higher expertise sources (Hypotheses 2-4x). This section also includes an exploration of what motivations drive sources to provide unsolicited problem-solving knowledge (this is discussed although there were no planned / explicit hypotheses beyond those related to higher expertise sources).

SECTION 2: THEORY / LITERATURE REVIEW

Ever since the Hawthorn studies of the 1920's employee motivation has been recognized as a critical factor that arouses, directs, and sustains organizational behavior. Barling et al. (1996) described the fundamental formula for Industrial-Organizational psychology as $[\text{Performance} = \text{Ability} * \text{Motivation}]$ (Kelloway & Barling, 2000). Similarly, Amabile's (1983, 1996, 1997, 1988) componential model of creativity suggests that expertise and creative thinking skills make up an individual's raw potential for creativity but that these are modified by the individual's motivational states which determine what behaviors people will actually do. As I highlighted in the introduction, various research streams have examined sources' motivation (i.e., knowledge search-transfer research and knowledge sharing-via-repositories) and/or recipients' motivation (i.e., advice giving-taking and innovation championing-adopting research) in knowledge exchange interactions. For a successful exchange to occur both parties involved in the exchange must be motivated to participate: "Each group member needs to be motivated for intellectual exchange, to share the relevant knowledge and to process

carefully the pertinent information provided” (Paulus, 2000, p.250-251) (see also Lin et al., 2005).

Also as highlighted in the introduction, knowledge sharing and transfer is typically considered to be a form of prosocial, voluntary, organization citizenship, or helping behavior on the part of knowledge sources (e.g., Gagne, 2009). However, the underlying motives for these prosocial behaviors may be important to understand: “Bolino’s (1999) proposition that organizational citizenship behaviors (OCB) can be enacted either for altruistic or for impression management reasons. He proposed that OCB enacted for impression management reasons (e.g., ingratiation and self-promotion) may lead to different outcomes for organizations, such as having a less positive impact on overall organizational effectiveness, than does OCB enacted for altruistic reasons” (Gagne & Deci, 2005, p. 351). Thus it may be important to understand sources’ underlying motives that encourage proactive knowledge sharing as well as what encourages the sharing of unsolicited knowledge. Furthermore, when it comes to knowledge recipients, high levels of engagement are also not always a given. Merely pointing out an apparent knowledge need, suboptimal situation, or problem does not mean that a recipient will openly accept the existence of the need or the proffered knowledge / solution (Renzulli, 1982). “Lack of motivation [on the part of recipients] may result in foot dragging, passivity, feigned acceptance, hidden sabotage, or outright rejection in the implementation and use of new knowledge (cf. Zaltman, Duncan & Holbek 1973).” (Szulanski, 1996, p.31). Thus it may also be critical to understand recipients’ underlying motives that encourage knowledge search as well as engagement

during knowledge exchanges—particularly in the face of unsolicited / unsought knowledge.

INTERNALLY-EXTERNALLY DRIVEN MOTIVATION CONTINUUM

It has been repeatedly shown that various different motivational mechanisms combine and/or interact to drive both knowledge source's and recipient's engagement in a knowledge exchanges (e.g., Quigley et al., 2007). Organizational Creativity literature ordinarily considers a dichotomous concept of motivation including intrinsic and extrinsic motivation (Amabile, 1996; Shalley, Zhou, & Oldham, 2004). Similarly, knowledge search-transfer and knowledge sharing-via-repositories literatures often take extreme motivational perspectives ranging from intrinsic / altruistic / good-of-the-organization to extrinsic / zero-sum gain / game theoretic perspectives (Lam and Lambermont-Ford, 2008). In these basic dichotomous motivational frameworks, intrinsic motivation refers to doing something because it is inherently interesting or enjoyable while extrinsic motivation refers to doing something because it leads to a separable outcome (Ryan & Deci, 2000):

“The fullest representations of humanity show people to be curious, vital, and self-motivated. At their best, they are agentic and inspired, striving to learn; extend themselves; master new skills; and apply their talents responsibly. That most people show considerable effort, agency, and commitment in their lives appears, in fact, to be more normative than exceptional, suggesting some very positive and persistent features of human nature.” (Deci & Ryan, 2000, p. 68)

In recent years many studies have moved beyond the extrinsic-intrinsic dichotomy to include a large set of motivational factors such as fear of loss of unique

value, evaluation apprehension, expert reputation, direct and indirect reciprocity, and identification to examine what factors influence the extent to which sources transfer or proactively share knowledge or recipients seek out, accept, and utilize external knowledge (Hayes & Clark, 1985; Katz & Allen, 1982; Levin & Cross, 2004; Mayer et al., 1995; Srinivas, 2000; Szulanski, 1996; Quigley et al., 2007). Unfortunately, these studies frequently focus on a narrow subset of motivations and/or lack strong theoretical foundations upon which to build their motivational framework. A reasonably comprehensive paradigm which proposes a continuum of motivations has been outlined in Deci & Ryan's Self-Determination Theory (SDT – 1985, 2008). This perspective explores several levels of motivation (e.g., Intrinsic, Integrated, Identified, Introjected, and External) that are arrayed along a continuum from internally driven to externally driven. SDT argues that internally driven or autonomous motivation is more authentic and linked to psychologically healthier, more self-actualized individuals. When motivations are internally driven, an individual will engage in activities voluntarily because it is interesting or enjoyable (intrinsic) or because it is personally meaningful or consistent with the individual's values (identified). On the other hand, when motivations are externally driven or controlled, an individual will engage in activities due to external pressures such as contingent rewards (extrinsic) or internal pressures such as fear of rejection or desire for acceptance and recognition (introjected) (Deci & Ryan, 1985; Ryan & Deci 2000). SDT provides a useful, comprehensive, and straightforward framework to capture both intrinsic and extrinsic motives as well as the various social and identity motives that have been found to be important in creativity and knowledge

sharing literatures (Gagne, 2009). Although intrinsic motivation has consistently been found to be extremely important in driving a range of behaviors, in many instances organizations don't have the luxury to rely exclusively on intrinsic motivation—many activities necessary to organizations are simply not fun in and of themselves (Ryan & Deci, 2000). Thus SDT developed a much more extensive set of more or less extrinsic / externally driven motivations as shown in figure 23.

[Insert Figure 23 About Here]

Motivation in Knowledge Exchanges

SDT provides a framework¹¹ to help understand the process whereby social and organizational contexts facilitate and shape the internalization and integration of motivations and consequent greater personal commitment to resultant behaviors. Applying the SDT motivational continuum to knowledge exchange is reasonably straightforward at the intrinsic end of the spectrum since this is typically assumed (and found) to be a nearly universally positive motivator that encourages knowledge transfer/sharing, creativity, and learning. In addition, although there is some disagreement as to whether extrinsic motivation has a positive or negative effect on knowledge transfer/sharing, it is reasonably clear what extrinsic motivation refers to in organizations (e.g., payment, bonuses, or promotions). However, understanding the

¹¹ It has rightly been pointed out in multiple critiques of motivation theory (Landy & Becker, 1987; Pinder 1984; Mitchell, 1997) that no single theoretical perspective can provide a complete explanation of the knowledge sharing and transfer process (Quigley et al., 2007). However, I propose the SDT framework allows the majority of motivations that have been found to be important in knowledge exchange and creativity literatures to be integrated in a single meaningful perspective.

identification and introjection (i.e., social motives) midpoints of the continuum requires that I first define a few key concepts so that we can appreciate the complex positive and negative effects that these motivators can have on knowledge exchange.

The first of these is the concept of intellectual capital which is regularly described as the collective knowledge and capabilities that firms have access to or leverage (Nahapiet & Ghoshal, 1998; Youndt, Subramaniam, & Snell, 2004; Subramaniam & Youndt, 2005). Intellectual capital is an overarching concept and is considered to include multiple distinct sub-dimensions including human capital and social capital (Davenport & Prusak, 1998; Nahapiet & Ghoshal, 1998; Schultz, 1961; Subramaniam & Youndt, 2005). Human capital includes the knowledge, skills, and capabilities residing with and utilized by individuals (Schultz, 1961). Social capital describes the information, influence, and solidarity that individuals have access to due to the goodwill embedded in their personal relationships with others (Adler & Kwon, 2002) or, in simpler terms, the resources accessed via a person's social networks (Burt 1997; Portes, 1998; Lin 1999; Inkpen & Tsang, 2005). Although these two forms of capital are distinct, some research has looked at how social capital can facilitate the development of human capital based on the argument that a person's social networks provide the structure that enables their access to new knowledge and corresponding learning (e.g., Coleman, 1988).

In addition to human and social capital it is also critical to understand the parallel concepts of expert reputation (i.e., expert status) and social status¹² which are sometimes subsumed under the concept of social hierarchy. “Social hierarchy is an implicit or explicit rank order of individuals or groups with respect to a valued social dimension” (Magee & Galinsky, 2008, p. 354). In organizations, one way explicit rank ordering is accomplished is via career ladders and formal rank (Weber, 1946). However, many other forms of status rewards are available in today’s organizations that are more implicit. In Magee & Galinsky’s definition, the term ‘valued social dimension’ reflects that there must be some dimension (i.e., a characteristic, possession, or behavior) that differentiates higher from lower ranked group members. Social Identity Theory (SIT) provides similar insight into understanding this rank ordering process since individuals are ascribed higher rank within the group based on the extent that they exhibit defining or prototypical characteristics, behaviors, or other dimensions of that group (Hogg, 2001; Hogg & Terry, 2001). In today’s knowledge-centric organizations the two characteristics that are frequently most relevant are an individual’s expertise or knowledge (expertise status) and their helping or collaborative behavior (social status).

For these social systems to become normative, there must be some degree of shared understanding about what these dimensions are since one of the fundamental purposes of social hierarchy is providing incentives to individuals in groups and

¹² Despite the differentiation of social capital, social status, and expert status discussed in this section, in my empirical models integrated measures of positive introjection and negative introjection emerged and each included a combination of these various social motives. In future studies, additional items may be created such that these various aspects of introjection might be distinguished but this is not possible with the current data.

organizations so that they expend effort in a way that is valued by the collective (Magee & Galinsky, 2008). Indeed, a great deal of research has shown that informal hierarchy and social norms develop very quickly within groups and that new group members rapidly adapt and enforce these social norms (e.g., Anderson et al., 2001; Balet al., 1951; Berger et al., 1980; Eagly & Karau, 1991; Hollander, 1985; Bar-Tal, 2000). Social norms can become internalized by individuals when their relatedness to the social environment is high: “The term internalization refers to the process through which an individual acquires an attitude, belief, or behavioral regulation and progressively transforms it into a personal value, goal, or orientation” (Deci & Ryan, 1985, p. 130)¹³. A critical element that influences the internalization process is the level of relatedness to the relevant social context (i.e., socializing environment):

“SDT postulates that when people experience satisfaction of the needs for relatedness and competence with respect to a behavior, they will tend to internalize its value and regulation, but the degree of satisfaction of the need for autonomy is what distinguishes whether identification or integration, rather than just introjection, will occur. Stated differently, satisfaction of the needs to be connected to others and to be effective in the social world support people’s tendency to internalize the values and regulatory processes that are ambient in their world.” (Gagné & Deci, 2005, p. 337)

Thus individuals can either process social norms as external pressures to avoid rejection and become more accepted (introjection) or they can internalize these socially accepted behaviors and make them their own (identification and internalization). These

¹³ The internalization process described in SDT can trace its roots back to some very fundamental theories of social influence. See for example the compliance, identification, internalization forms of social influence outlined in Kelman, 1958.

topics are discussed further in the context of knowledge exchange under the topics of introjected and identification motivation below.

Costs & Benefits in Knowledge Exchanges

The perceived costs and benefits accrued when individuals exchange knowledge have been the core to several knowledge exchange research streams and can help further shed light on the role that human capital, social capital, expert status, and social status play in this comprehensive model of knowledge exchanges. Various research programs / perspectives typically assume that certain negative motivations predominate for knowledge sources but that another set of motivations may offset this. In figure 24, I attempt to show the typical trade-offs discussed in the literature¹⁴. Interestingly, research on knowledge search-transfer and sharing-via-repositories typically focuses on certain motivations while creativity research emphasizes a somewhat different set of motivations. For example, the knowledge exchange literature typically assumes that knowledge sharing is associated with sources' fear of becoming more redundant (i.e., possessing less unique knowledge / less valuable human capital) and that this fear of loss of unique value keeps sources from sharing knowledge (Davenport & Prusak, 1998; Goodman & Darr, 1998; Hansen et al., 2005; Kostova, 1999; Bock et al., 2005; Quigley et al., 2007). However, sources may be encouraged to share if they see the potential to gain social / relational capital (in the form of stronger relationships or future reciprocity)

¹⁴ Although I am not testing these tradeoffs per se in this paper, I highlight them here in order to display the complexity of the motivational models that come about when a number of literatures are considered under the more general heading of knowledge exchange.

and/or expert status / reputation (by being recognized as a more competent expert). Conversely, the creativity literature often discusses the fear of being judged by and alienated from colleagues (i.e., the fear of losing social capital) when sharing creative, radical, disruptive, or potentially socially unacceptable ideas (e.g., Camacho & Paulus, 1995). This fear of being judged is seemingly offset against the potential social status gains (strengthening ties to management) or expert status / reputation gained if their ideas are accepted or found to be valuable. Indeed the fear of being judged is studied in the knowledge sharing-via-repositories and knowledge search-transfer (less so) as evaluation apprehension. However, in this space the concept is typically associated with fear of making a mistake or sharing invalid knowledge and consequently with the risk of losing expert status. Obviously, these costs and benefits are highly subjective and vary by individual (Yuan et al., 2005) but collectively these motivators and demotivators have been found to be very significant in their effect on people's knowledge exchange behavior.

[Insert Figure 24 About Here]

MOTIVATION IN KNOWLEDGE EXCHANGES

The motivational continuum highlighted above should affect the way people collaborate, exchange knowledge, and solve problems. Part of this, as mentioned previously, is that it should affect the frequency with which people will proactively engage in pull and push exchanges. However, potentially more importantly it may affect the way that people approach the problem-solving process and the way they collaborate or exchange knowledge within the problem-solving process. Reflecting back

on the multi-step problem-solving process and the problem-to-solution and generation-to-feedback dimensions I have highlighted is critical to understand this. When it comes to problem solving, knowledge exchange and collaboration around solution generation is the bare necessity—if someone does not have an answer to their question they need to find one by seeking an exchange partner (or other non-human source) that can provide solution generation. On the other hand an individual's exploration of problem knowledge, particularly collaboratively, is somewhat optional. People only have to spend more time exploring the problem space if they want to solve deeper issues: "Creative problem solving begins by asking: What is the real problem? We can picture a detective looking for clues and asking many questions to identify the causes of a problem." (Lumsdaine & Lumsdaine, 1994/1995, p. 6). Although past research has shown that individuals that spend time on problem formulation come up with more original and higher quality solutions. (e.g., Mumford et al., 1996), many people ordinarily address surface level symptoms and ignore deeper issues. In fact, many less innovative organizations are often designed to reward exactly this type of behavior since Band-Aid approaches take less time and require less change. Thus looking back at the SDT framework I would expect individuals that are more internally motivated to be more interested in solving deeper issues and thus more likely to be engaged when exchanging problem knowledge. On the other hand, externally motivated individuals should be more interested in exhibiting "productivity" and completing the process. Therefore, these externally motivated individuals may be more engaged when they receive solutions. Collectively this might suggest that we would see patterns similar to

the following for collaborations involving problems vs. solutions for internally vs. externally driven recipients.

[Insert Figure 25 About Here]

In many ways feedback is likewise somewhat optional in comparison to generation. Once someone has a potentially viable solution they have all they need to go forward. Gathering feedback is really only necessary in order to externally validate the solution and or to gather the perspectives of various stakeholders (sometimes in order to get their buy-in or support later on). As such it might be considered to be more social than generation. Indeed past research has shown that positive feedback / validation (and the implementation / acceptance oriented form of feedback referred to as “Legitimacy”) was frequently sought and obtained from a recipient’s strongest ties or their most intimate relations (Cross et al. 2001; Cross & Sproull, 2004):

“Validation shows how seeking information from others affects not only knowledge creation, but also its effective deployment. The ability to get an answer (even a correct one) is only the first step in actionable knowledge. The next step almost always requires one to convince people (whether a client, boss, teammate, or oneself) of one's thinking. This step is often supported by seeking validation from others.” (Cross & Sproull, 2004, p. 451).

The described process of getting buy-in or acceptance for solutions highlights the social context in which most solutions are implemented. Looking back at the SDT framework this might suggest that when relatedness is highest (e.g., [positive] introjection and identification motivations are high) that recipients will be more engaged when they receive feedback than when they receive generation (as exemplified in figure 26).

[Insert Figure 26 About Here]

Below I include a much more detailed discussion of six (6) forms of motivation positioned in the SDT framework and found in past research to be critical in encouraging knowledge exchange and collaboration.

Extrinsic

Through interviews with several senior executives responsible for knowledge sharing initiatives Bock et al. (2005) found that many organizations have directly linked knowledge sharing behavior to monetary incentives and/or promotions and that these extrinsic rewards had been effective in motivating employees to share their knowledge (Ewing & Keenan, 2001; Hyoungh & Moon, 2002). On the other side of knowledge exchanges, performance goals which are linked to reviews / rewards have been identified as important in influencing recipient's motivation to use new knowledge (Gupta & Govindarajan, 2000; Szulanski, 1996). In the creativity space, although there is almost universal agreement that intrinsic motivation is positively related with creative behavior there is little agreement regarding the effect of extrinsic motivation on creativity (Shalley et al., 2004). Two contradictory perspectives assume that extrinsic rewards either come across as controlling to organizational members thus undermining / reducing other more internally driven forms of motivation (Amabile, 1996) or that extrinsic rewards serve to signal organizational or supervisory support for creative behavior and thus encourage this behavior (Eisenberger, 1992; Eisenberger & Armeli, 1997). Given past evidence, I expect that individuals with high extrinsic motivation will engage in proactive push and pull exchanges more frequency. However, given that

extrinsic rewards are associated with measureable productivity outcomes and less so with learning or creativity, I expect extrinsically motivated individuals to prefer knowledge that helps them complete the problem-solving process and not knowledge that makes the process more complex or take longer.

- **Hypothesis 2-2a:** Individuals with high extrinsic motivation will engage in more frequent proactive knowledge searching (pull) as well as proactive knowledge sharing (push).
- **Hypothesis 2-3a:** Recipients with high extrinsic motivation will be less engaged when they receive divergence enhancing knowledge (i.e., problems or generation) and more engaged when they receive convergent enhancing knowledge (generation or feedback).

Fear of Loss of Unique Value

Obviously, for a successful knowledge exchange to occur it is critical that a knowledge transferor is motivated to cooperate with a knowledge searcher (Szulanski, 1996, 2000). However, knowledge is a valuable commodity that is often not shared without significant forethought. Versions of the saying “knowledge is power” appear in many old languages / cultures and this view is still quite implicit in many modern knowledge-centric organizations. As people share their unique valuable knowledge they may worry they lose some of their human capital in the organization and thus become more redundant with other members of the organization (e.g. Probst et al., 2000; Tiwana, 2002) or that their job is less secure (Lelic, 2001; Riege, 2005). Indeed from this

perspective the only person that does not benefit from the exchange is the one who has the most to lose—the source (Thibaut & Kelley 1959; Thorn & Connolly 1987).

Information system research often looks at the knowledge commons (e.g., knowledge repositories) as a classic public good dilemma (Bock et al., 2005; Barry & Hardin, 1982; Marwell & Oliver, 1993; Connolly & Thorn, 1990; Connolly, Thorn, & Heminger, 1992; d'Aspremont, et al., 1998; Farrell, 2001; Fulk et al., 2004): “it seems irrational that individuals voluntarily contribute their time, effort, and knowledge toward the collective benefit, when they can easily free-ride on the efforts of others” (Wasko & Faraj, 2005, p. 38). Because these are largely extrinsic factors, I consider this a form of negative extrinsic motivation and place it on the externally motivated side of the intrinsic-extrinsic continuum.

Past research on knowledge search-transfer and knowledge sharing-via-repositories has consistently shown that the fear of loss of unique value is one of the most significant knowledge sharing demotivators. Scientists have described the “enormous personal impact of sharing knowledge unwisely: they could be *swallowed up, cut out of the chain*, and risked *losing credit, visibility, first authorship*, and a place on the patent.” (Andrews & Delhay, 2000, p. 803). Thus scientists develop, what is sometimes referred to as, a *healthy selfishness* in order to protect their commercially valuable knowledge (Andrews & Delhay, 2000). Indeed knowledge hoarding is the de facto norm in many organizations where individuals perceive their knowledge or idea stock to be limited, where patents are salient and associated with large financial or

other rewards, and where there is an insufficient appreciation of the value of collaboration as a source of new knowledge and ideas¹⁵.

Given this past evidence and the fact that proactive knowledge sharing (knowledge push) is more optional and “selfless” than knowledge searching, fear of loss of unique value should have the largest negative effect on the frequency of this type of knowledge exchange behavior. In addition, given that individuals with high fear of loss of unique value believe that knowledge is a rivalrous or subtractable good (Sandler, 1986) and that sources are losing their human capital by sharing knowledge, they may see knowledge as more valuable and thus be more engaged whenever they are receiving knowledge (whether unsolicited or solicited). However, it is not clear that this would be the case since engagement in interpersonal exchanges implies collaboration and require some degree of give and take that these individuals may not be open to participate in. Thus I have no explicit hypotheses about how fear of loss of unique value will affect recipient’s receptivity to unsolicited knowledge.

- **Hypothesis 2-2b:** Individuals with high fear of loss of unique value will engage in less frequent proactive knowledge sharing (push).

¹⁵ This public good dilemma perspective may be more appropriate when contribution to knowledge repositories is the focus of research. These systems place a barrier between sources and recipients (this barrier exists both in terms of the actual technological intermediary as well as temporally given the typical asynchronous nature of the repository model) and eliminate much of the value of collaboration and dialogue for sources. Social computing / social networking systems and interpersonal interactions increase the bi-directional exchange of knowledge and thus may be a very different context which presents a different value proposition for sources (Bordia et al., 2006).

- **Hypothesis 2-3b:** No Hypotheses (unclear if recipient with high fear of loss of unique value perceive all knowledge as more valuable or else are not willing to engage in give and take necessary to exchange knowledge)

Introjection (Social Motives)

Moving along the continuum, another motivation that is also considered to be largely extrinsic is introjection. “Introjection describes a type of internal regulation that is still quite controlling because people perform such actions with the feeling of pressure in order to avoid guilt or anxiety or to attain ego-enhancements or pride” (Deci & Ryan, 2000, p. 72). Social exchange theory (SET - Blau, 1964) suggests that individuals engage in social interactions based on an expectation that this will lead to some form of social rewards (i.e. approval, status, or respect) or preclude social sanctions (i.e., being excluded or ostracized). Social environments frequently develop subjective norms about what behaviors should and should not be performed (Bandura, 1982) and when individuals are largely motivated (controlled) by these social norms they are considered to have high introjected regulation / motivation.

Positive Social Motives

Past research has highlighted social capital, social status, and expert status gains as all being relevant to encouraging knowledge transfer/sharing. Particularly relevant with regards to social capital is the concept of reciprocity. SET looks at the social norms regarding the exchange of favors (Hall, 2003; Huang, 2008) including both reciprocal exchange (direct reciprocity) and generalized exchange (generalized reciprocity) (Flynn,

2005; Putnam, 1993). In basic terms, the effort a person expends on behalf of the team or in helping other members of the team is based in part on a belief that this will be reciprocated in the future by other members (Blau, 1964; Gouldner, 1960). The simplest view of reciprocity is called direct reciprocity and refers to the expectation that if a person helps another, they can expect that same person to “return the favor” in the future. On the other hand, generalized reciprocity refers to the fact that members frequently assist a group member because they believe that another member of the group would help them if the tables were turned (e.g., if a norm of helping predominates then everyone expects and also gives help as necessary). Much of the knowledge search-transfer literature focuses on face-to-face interactions where “people typically know one another and interact over time, creating expectations of obligation and reciprocity that are enforceable through social sanctions” (Wasko & Faraj, 2005, p. 37). However, when knowledge exchange is expected beyond so-called strong ties, for example in contributing to organization-wide knowledge repositories or when exchanging knowledge across organizational boundaries with other organization members, generalized reciprocity becomes more relevant.

In addition to building a bank of social capital in the form of reciprocity relationships, other research has highlighted reputation and status as critical factors for promoting knowledge transfer/sharing. In knowledge-based organizations status is frequently associated with what people know and/or how they contribute to organizational problem solving. Past research has found that organizational members were more likely to share knowledge interpersonally (e.g., Morris & Emspon, 1988), via

repositories (e.g., Bordia et al., 2006), and in communities of practice (e.g., Ardichvili et al., 2003) if they felt that this helped to establish or maintain “their professional reputation” (Wasko & Faraj, 2005, p. 35). Expert status is afforded to individuals based on a number of cues that help others assess the amount of relevant knowledge that an individual possesses (Bunderson, 2003; Wittenbaum 2000, 1998). One of the most straightforward ways for individuals to achieve expert status in organizations is to share unique knowledge or collaborate in ways that demonstrates their expertise in specific domains (see ‘specific status cues’ as described in Status Characteristics Theory – Humphreys & Berger, 1981; Hembroff & Myers, 1984). Unlike human capital and expert status, the concepts of social capital and social status are not so easily separable. Social status is typically defined as the extent to which an individual or group is admired or held in high esteem by others (e.g., Ridgeway & Walker, 1995; Magee & Galinsky, 2008) and past studies have shown that an individual’s attained status is related to the status of groups or individuals that they interact with (e.g., Marsden & Hurlbert, 1988; Lin et al., 1978). This might suggest that social status, in the context of knowledge exchange, is about gaining access to higher prestige, exclusive groups and or gaining a greater amount of prestige in one’s own social groups. However, the interplay of social capital and social status is quite complicated with some studies arguing that social status is a form of social capital (e.g., Nahapiet & Ghoshal, 1998), others showing that social capital leads to status attainment (e.g., Lin, 1999), and finally others suggesting that access to higher status groups creates unequal access to social capital (e.g., Lin, 2000).

Since high levels of positive social motives suggest a constant give and take between sources and recipients over time, I believe individuals with high levels of positive social motives will engage in both proactive push and pull forms of knowledge exchange more frequently. Furthermore, since these individuals are motivated to be collaborative and build stronger relationships with their peers, I expect they will be more open to receive all types of unsolicited knowledge. Finally, since individuals motivated by positive introjection display a relatively high level of relatedness and are externally regulated to engage in socially acceptable / desired behaviors (e.g., desire acceptance from peers and recognition from upper management), I would expect these individuals to be more engaged particularly when they receive feedback.

- **Hypothesis 2-2c:** Individuals with high positive social motives will engage in more frequent proactive knowledge searching (pull) as well as proactive knowledge sharing (push).
- **Hypothesis 2-3c:** Recipients with high positive social motives will be more engaged when they receive unsolicited knowledge of all types.
- **Hypothesis 2-3d:** Recipients with high positive social motives will be more engaged when receiving feedback (both solicited and unsolicited).

Negative Social Motives

Evaluation apprehension (Cottrell, 1968) is described in both the knowledge sharing and creativity literature as the fear of having ones knowledge or ideas critiqued by others (e.g., Bordia, et al., 2006; Paulus & Dzindolet, 1993; Stroebe & Diehl, 1994) in

particular other experts (Amabile, 1983). “Not only does an individual choosing to share knowledge stand to lose his/her unique value within the organization, but any knowledge that is subsequently judged to be unsound or irrelevant can damage his/her reputation” (Brock et al., 2005, p.89). A similar form of evaluation apprehension has been highlighted as a major reason that creative brainstorming groups tend to generate less radical ideas: “despite brainstorming instructions, the fear of negative evaluations from other group members prevents subjects who are working in groups from presenting their more original ideas” (Diehl & Stroebe, 1987, p. 498). This has been frequently described as a form of social inhibition: “individuals will be most likely to censor their responses if they fear that certain answers might reveal socially undesirable or even embarrassing aspects of themselves (e.g., lack of knowledge, ideological biases)” (Diehl & Stroebe, 1987, p. 502). Thus evaluation apprehension goes far beyond the worry that the knowledge exchanged might be found to be inaccurate—since all knowledge is novel / innovative when transferred to a new context (see section 1 for my arguments along these lines) there is always a chance that a source's knowledge or ideas may seem “crazy” since they are novel or different, may unknowingly attack some unspoken assumption, might “rock the boat” by challenging the status quo, or might be socially unacceptable for some reason or to some subgroup in the organization. This is the negative side of the introjection coin. Whereas behaviors that are consistent with the norms of the group can be generously rewarded with additional social capital, social status, and expert reputation, those that are inconsistent can frequently be even more aggressively penalized. Individuals that go against group norms can be ostracized (lose

social status) thus reducing their chances for access to help later (lose social capital) or sidelining them / removing their access to attractive projects (lose expert reputation).

Given that source initiated knowledge push is a more autonomous and elective behavior wherein recipients' needs may be more implicit with less obvious cues provided by recipients, I expect individuals with greater negative social motivation to be less likely to provide knowledge proactively via push exchanges. In addition, it is unclear whether they will be more engaged or less engaged when presented with unsolicited knowledge. On the one hand if unsolicited / unsought knowledge is considered inappropriate or bizarre then individuals influenced by negative social motives might reject this knowledge and thus be disengaged during the exchange. On the other hand they may be worried about doing something inappropriate or in an incorrect way and thus seek to understand the unsolicited / unsought knowledge provided by others. Thus I have no explicit hypotheses regarding negative social motives and unsolicited / unsought knowledge.

- **Hypothesis 2-2d:** Individuals with high negative social motives will engage in less frequent proactive knowledge sharing (push).
- **Hypothesis 2-3e:** No Hypotheses (unclear if recipient with high negative social motives perceive unsolicited / unsought knowledge as inappropriate or as a salvation that could prevent their rejection or them being criticized in the future)

Identification

When individuals feel a psychological linkage to the organization this has been shown to be related to a range of pro-social behaviors and positive job-relevant outcomes. This psychological connection to the organization has been conceptualized in a number of ways over the past 40+ years. Earlier research focused on employee's affective or emotional attachment to the organization. Kanter (1968) described this concept under the term 'cohesion commitment' which was defined as 'the attachment of an individual's fund of affectivity and emotion to the group' (p. 507). Ashforth and Mael (1989) focused on employee perceptions of belonging or oneness with the organization by re-conceptualized organizational identification through the lens of social identity theory (SIT - Tajfel, 1974; 1978) and self-categorization theory (SCT - Turner et al., 1987). According to SIT / SCT, people tend to classify themselves and others into social categories based on factors such as organizational membership or demographic data (Tajfel & Turner, 1986). Organization identification depends on whether group membership reflects positively on the individual as well as on the extent to which an individual perceives other group members to be similar to them and to share their fate (Mael & Ashforth, 1992; Hogg & Abrams, 1988; Turner et al., 1987). When identification is high this can lead an individual to self-categorize or define themselves in part based on their organization membership (van Knippenberg & Sleebos, 2006). This identification leads individuals to engage in more pro-social behavior as collective interest is experienced as self-interest (Ashforth & Mael, 1989; Dutton et al., 1994; van Knippenberg & Ellemers, 2003). These contributions become more internally motivated

as the boundaries between the individual and other organizational members become less salient.

“A more autonomous, or self-determined, form of extrinsic motivation is regulation through *identification*. Here, the person has identified with the personal importance of a behavior and has thus accepted its regulation as his or her own... the most autonomous form of extrinsic motivation is *integrated regulation*. Integration occurs when identified regulations have been fully assimilated to the self. This occurs through self-examination and bringing new regulations into congruence with one’s other values and needs. The more one internalizes the reasons for an action and assimilates them to the self, the more one’s extrinsically motivated actions become self-determined. Integrated forms of motivation share many qualities with intrinsic motivation, being both autonomous and unconflicted.” (Ryan & Deci, 2000, p. 72-73)

Given that individuals who identify strongly with the organization will be more concerned with overall organizational outcomes that go beyond their own narrow responsibilities, I expect that they will proactively share knowledge more frequently. In addition, given that individuals who identify strongly with the organization are also likely to feel a stronger affinity to their peers, I propose that they will be more open to unsolicited knowledge (both divergence enhancing and convergence enhancing). In particular, since individuals with high identification have the highest levels of relatedness they should be more attuned to multiple stakeholders throughout the organization. Thus, I expect that these individuals will be particularly open to solicited and unsolicited feedback.

- **Hypothesis 2-2e:** Individuals with high identification will engage in more frequent proactive knowledge searching (pull) as well as proactive knowledge sharing (push).
- **Hypothesis 2-3f:** Individuals with high identification will be more engaged when receiving unsolicited knowledge (all forms).
- **Hypothesis 2-3g:** High identification individuals will be more engaged when receiving feedback (both solicited and unsolicited).

Intrinsic

Intrinsic motivation is defined as the degree to which employees are “motivated primarily by the interest, satisfaction, and challenge of the work itself” (Amabile, 1998, p. 79). Intrinsic motivation was first recognized more than 50 years ago in animal behavior studies where it was observed that many organisms engaged in playful or curiosity driven behaviors even in the absence of other rewards or reinforcement (White, 1959; Ryan & Deci, 2000). Past research has shown that intrinsic / autonomous motivation leads to more positive knowledge exchange and collaboration behaviors than extrinsic / controlled motivation (Gagne & Deci, 2005), such as better performance on complex and creative tasks (Amabile, 1982; Amabile, Goldfarb, & Brackfield, 1990; Grolnick & Ryan, 1987; McGraw & McCullers, 1979), active information seeking (Koestner & Losier, 2002), and goal attainment (Sheldon & Elliot, 1998). Given that intrinsic motivation is fully internally driven it is innate to the person in question. Thus it is not considered to be “caused” by any external factors but rather can be facilitated or hindered by situational or task related factors (Ryan & Deci, 2000). Intrinsic motivation

for knowledge sharing / exchange has been conceptualized in a number of ways that frequently overlaps with other forms of motivation otherwise differentiated in this SDT framework. For example, several researchers have considered “enjoyment of helping others” as intrinsic motivation (e.g., Constant et al., 1996; Wasko & Faraj, 2005). However, a conceptualization of intrinsic motivation that relies so substantially on social motives risks overlapping with the introjection concepts as described above. Deci & Ryan’s (2000) discussion of intrinsic motivation highlights non-social aspects of intrinsic motivation more relevant to my context: “Perhaps no single phenomenon reflects the positive potential of human nature as much as intrinsic motivation, the inherent tendency to seek out novelty and challenges, to extend and exercise one's capacities, to explore, and to learn” (p. 70). A well established theoretical construct called “need for cognition” (NFC - Cohen et al., 1955) is much closer to this description and possibly more relevant in predicting collaboration, knowledge exchange, and the provision of or acceptance of unsolicited knowledge. NFC is described as “the tendency for an individual to engage in and enjoy thinking” (Cacioppo & Petty, 1982).

Thus, linking back to the human / social capital and expertise / social status perspectives, intrinsic motivation seems to be most clearly connected to an individual’s innate desires to develop new human capital. I expect that people that “love to think” will intrinsically enjoy being engaged in the problem-solving process and want to consider all the options so that they get to the best answers to questions, not the fastest or the most convenient closure. These individuals are likely to initiate more knowledge exchanges (both as searchers and sharers) and, given the more discretionary

nature of knowledge sharing, this effect is likely to be stronger for sharing. In addition, highly intrinsically motivated individuals should also be more open to receiving unsolicited and solicited knowledge that allows them to develop a deeper and more comprehensive understanding of problems or to develop more alternatives for consideration (i.e., divergent knowledge).

- **Hypothesis 2-2f:** High intrinsically motivated individuals will engage in more frequent proactive knowledge searching (pull) as well as proactive knowledge sharing (push), however, this effect will be substantially stronger for proactive knowledge sharing (push).
- **Hypothesis 2-2g:** The effect of intrinsic motivation on knowledge exchange initiation frequency will be substantially stronger for proactive knowledge sharing (push) than it is for proactive knowledge searching (pull).
- **Hypothesis 2-3h:** High intrinsically motivated individuals will be more engaged when receiving divergence enhancing knowledge (both unsolicited and solicited; both problem knowledge & generation knowledge).

RELATIONSHIPS IN KNOWLEDGE EXCHANGES

It has been argued that a “dyadic model of knowledge seeking should include characteristics of the knowledge seeker, the knowledge source, and the relationship between the seeker and the source” (Cross & Sproull, 2004, p. 452). The previous section highlighted individual differences in the form of motivational states. This section

highlights relationships between sources and recipients and their role in knowledge exchange interactions.

The concept of strong vs. weak ties and the related network theoretical perspectives have taken precedence as a way to conceptualize relationships in studies of knowledge exchange and, more recently, creativity. "Most intuitive notions of the 'strength' of an interpersonal tie should be satisfied by the following definition: the strength of a tie is a (probably linear) combination of the amount of time, the emotional intensity, the intimacy (mutual confiding), and the reciprocal services which characterize the tie." (Granovetter, 1973, p. 1361). However, examining the precursors and effects of tie strength is not so simple—various relationships are critical to understand and these can have both positive and negative impacts on collaboration and knowledge exchange. On the one hand, when people are strongly connected to one another this allows the development of awareness and shared understanding (as described in the introduction) as well as reciprocity or other social motives that encourage engagement among exchange participants (as described above under introjection motivations). However, the positive effect of strong ties is only half of the story—strong relationships also typically involve redundant knowledge (Granovetter, 1973) and can increase the prevalence of groupthink (Janis, 1972; Hart, 1998; McCauley, 1989). John Stuart Mills (1987) summarizes the importance of non-redundant knowledge: "it is hardly possible to overrate the value... of placing human beings in contact with persons dissimilar to themselves, and with modes of thought and action unlike those with which they are familiar... Such communication has always been, and is peculiarly in the present age,

one of the primary sources of progress.” (p.581). Kijkuit & Van den Ende (2007) make a similar argument in their summary of how network theory has been applied to creativity: “The current applications of network structure to creativity focus on idea generation and argue that ‘good’ ideas are the result of having non-redundant, heterogeneous contacts that enable a person to generate ideas by combining diverse information (Burt 2004; Perry-Smith, 2006; Perry-Smith & Shalley, 2003)” (p. 866). However, flipping the coin back over, there is a limit to the benefit of heterogeneity since individuals require a certain amount of shared understanding in order to effectively comprehend and learn the knowledge communicated by others (Kurtzberg & Amabile, 2001; Mumford & Gustafson, 1988). One conception that seeks to disentangle these relational effects differentiates the structural aspects of network position (access to non-redundant knowledge or contacts) from the interpersonal aspects of these ties (trust, reciprocity, motivation, engagement) (Easley & Kleinberg, 2010) while other researchers have focused on identifying multiplex relationships that combine non-redundant knowledge with the positive effects of strong ties – see for example: “The Strength of Weak Ties You Can Trust: The Mediating Role of Trust in Effective Knowledge Transfer” (Levin & Cross, 2004).

Organizational Barriers in Knowledge Exchanges

There are several relevant types of relational ‘distances’ or barriers to relationships that exist in organizations (particularly in medium to large companies) and affect the development of strong / close relationships or ties. These include: physical / geographic, cultural, formal organizational, functional, formal hierarchical rank, and

expertise differences. Some of the earliest studies of the effects of physical distance on collaboration within organizations were also some of the most compelling. For example, Allen (1977) discovered the so-called 'Allen Curve' that displays the exponential drop in frequency of communication between engineers that worked at greater distances from one another—effects are stark between 5 and 50 meters. Building on this research stream, even the difference between stairs, escalators, and elevators has been examined given their impact on perceived vertical distances as a barrier to collaboration (Allen & Furfeld, 1975). These early studies have been backed up with a number of other studies both at hyper-local within office settings as well as globally across large geographic distances (e.g., Moenaert & Caeldries, 1996; Van den Bulte & Moenaert, 1998; Peponis et al., 2007; Almeida, 1996; Wineman et al., 2009; Hansen, 2002). Physical distance increases the time, effort, and expense involved in communicating or getting together (Cummings & Teng, 2003) while making it especially difficult to exchange complex or tacit knowledge (Hansen, 1999).

In addition to physical or geographic distance, formal organizational barriers add another potential barrier between organizational actors. The free flow of information declines rapidly once an organization grows to the point that it spans multiple locations and/or incorporates a more complex formal organizational structure (Chase, 2004; Riege, 2005). Different workgroups, departments, and divisions have different priorities, objectives, rewards, and supervisors that create nested or overlapping sets of identities as well as corresponding barriers to knowledge exchange (e.g., Rosenkopf and Nerkar's, 2001; Chase, 2004; Riege, 2005; Szulanski, 1996; Tsai,

2001). Both physical and formal organizational distances are further compounded by cultural and functional differences. Multinationals can have locations across the globe in countries with their own national or regional culture while formal organizational structures frequently draw lines between functional groups such as sales, marketing, finance, accounting, and research & development. Within these groups, strong norms and unique perspectives develop which can facilitate collaboration within the group but can further hinder cross-group collaboration and knowledge exchange. This has been discussed in several different literatures and with many different names, for example: thought worlds (Dougherty, 1992) or professional guilds (Mudambi & Swift, 2009).

Another type of barrier is related to formal hierarchical rank in the organization. As organizations grow and the work they engage in becomes more complex they tend to increase the formalization of their hierarchies through the development of job titles, reporting structures, and organizational charts (Magee & Galinsky, 2008). However, this hierarchy can create yet another barrier in the organization (e.g., Nonaka, 1994; Goh, 2002). It is frequently very difficult for information to flow upwards in the hierarchy (e.g., Michailova and Husted, 2003) since vastly different influence strategies are usually needed to encourage the upwards transmission of knowledge (Kipnis & Schmidt, 1988; Kipnis, Schmidt & Wilkinson, 1980; Schilit & Locke, 1982; Howell & Higgins, 1990; Yukl et al., 1995). Conversely, challenges exist in knowledge transfer from superiors to subordinates: “The most useful information is rarely that which flows down the formal chain of command” (Powell, 1990, p. 304). Higher rank individuals are most likely to have many demands on their time and thus may be less engaged in an exchange. Past

evidence has suggested that higher rank individuals are likely to become less involved in knowledge work (Cross & Sproull, 2004) and that this may be partly the result of an adaptive filtering process preventing information/cognitive overload (Wagner & Sternberg, 1987; Andrews & Delhay, 2000).

There is very little literature that connects relationships to knowledge exchange within the problem-solving process or that links it to unsolicited knowledge. Findings in past research were suggestive that more trust or closer ties are required for validation, followed by problem reformulation, followed by solution (answer) finding. (Cross et al., 2001; Cross & Sproull, 2004). This research has suggested that allowing another person to influence knowledge via problem reformulation or validation gives that person some control over a project or problem-solving process' trajectory (i.e. these are instances when unsolicited / unsought knowledge can push people's problem solving process in undesirable directions). In addition, research on advice giving frequently looks at forms of unsolicited / unsought advice. However, this unsolicited / unsought knowledge is typically transferred from higher status individuals to lower status individuals (Nemanick, 2000; McAller, 2003; Pittinsky & Poon, 2005) often more specifically from parents to children (Greene & Grimsley, 1990; Barber, 1994; Tucker et al., 2001; McDowell, Parke, & Wang, 2003) or from doctors to patients (e.g., Russell et al., 1979; Frank et al., 1991; Ha & Longnecker, 2010).

[Source Expertise in Knowledge Exchanges](#)

Although interesting hypotheses could be explored for any of the above relational constructs within my problem-solving process perspective for knowledge

exchanges, I decided to focus on sources relative expertise in comparison to the recipient as my main area for exploration in this section of the dissertation¹⁶. This was done because expertise is one of the single most important factors in knowledge exchange, collaboration, and creativity. By their very definition, experts are more likely to possess accurate or useful knowledge (O'Reilly, 1982). Thus when a recipient exhibits low engagement in exchanges involving higher expertise sources or perceives the knowledge exchanged by these sources to be less useful this is less likely to be due to the actual lack of value of this knowledge (and more likely related to cognitive or other barriers on the part of recipients). Given the potential value of knowledge possessed by higher expertise sources, reducing any barriers that block the flow of knowledge from these experts to others in the organization is critical. Exchanges involving higher expertise sources provide a perfect context in which to test the difference between initiation and various forms of unsolicited / unsought knowledge.

In the knowledge search-transfer literature, search is typically assumed to be directed towards sources that have more expertise (Cross & Sproull, 2004) and similarly, those with the most expertise are encouraged to share in knowledge sharing-via-repositories literature (Hinds & Pfeffer, 2003). Indeed research has shown that groups in which members know each others' expertise perform better (Thomas-Hunt et al., 2003)

¹⁶ Source expertise can be considered a characteristic of sources, a status signal about a source but constructed by those around him / her, or in this case as a dyadic or relational characteristic inherent in the relative expertise of the source in comparison to the recipient. The relational construction of expertise is consistent with past studies that have looked at expertise diversity as a distance between individuals (CITE) as well as research that looks at advice taking / discounting which typically highlights the relative expertise of sources vs. recipients (CITE).

implicitly because they leverage this expertise to a greater extent. In addition, Amabile's componential model of creativity emphasizes the interplay of 3 main factors: motivation, expertise, and creative thinking skills as determining an individual's creative potential. Finally, research on innovation has highlighted lifelong expertise as being a critical pre-condition for truly groundbreaking innovations (Kauffman & Baer, 2004). Despite these positives, past research has also shown that expertness diversity can hurt the potential for collaboration and complicate knowledge exchanges (Van der Vegt et al., 2006) and that recipients need to have sufficient absorptive capacity or shared perspectives in order to learn knowledge from expert sources (e.g., Nahapiet & Ghoshal, 1998; Argyres, 1999; Cohen & Levinthal, 1990; Zahra & George, 2002).

Building on my prior efficiency argument and findings (i.e., recipients will prefer source-initiated exchanges that involve solicited / sought knowledge), I believe that push exchanges initiated by higher-expertise sources should be particularly useful. In ordinary daily organizational life it should be ideal if an expert proactively approaches a recipient offering them the knowledge the recipient was already seeking.

- **Hypothesis 2-4a:** Push exchanges will be perceived to be more useful when initiated by higher-expertise sources.

On the other hand, the barriers to unsolicited / unsought exchanges described in part one of this dissertation are extremely strong psychological factors. Thus I propose that unsolicited / unsought exchanges will be perceived to be less useful than solicited / sought exchanges regardless of whether the source is higher expertise or not. However, past research has found that when a source is recognized as an expert this makes it less

likely that advice and knowledge will be challenged or resisted by sources (Szulanski, 1999). This might suggest that the reduced usefulness of unsolicited / unsought exchanges may be partly mitigated by source expertise (even if you were not looking for knowledge regarding a particular problem or issue it is difficult to write-off or ignore knowledge shared by an expert).

- **Hypothesis 2-4b:** Unsolicited / unsought exchanges will always be perceived as less useful than solicited / sought exchanges but this effect will be less strong when sources have higher-expertise.

Qualitative research has found that scientists indicated it was possible to be intimidated by experts or specialists in the field and thus be hesitant to reach out to them during knowledge search (Andrews & Delhaye, 2000). This may be especially true regarding the search for new problem knowledge since past evidence has suggested this form of knowledge leaves recipients feeling particularly vulnerable (Cross & Sproull, 2004)—giving an exchange partner access to help formulate a problem has a tremendous effect on the complexity of the requisite problem-solving process. In addition, the earliest phase of problem solving involves scoping and delving into ill-defined problem spaces and is thus often characterized by open-ended exploratory search. This early stage exploratory search can come across as premature to some sources and it may seem that searchers have not sufficiently “done their homework” prior to the exchange. This has been confirmed in my discussions with several companies who indicated, for example, that individuals would not waste the time of experts / fellows until they had spent sufficient time exploring the problem and

formulating tentative but well-developed solutions for feedback or had identified specific, tightly-defined challenges that required the intervention of experts. This might suggest that searchers may hesitate to seek out experts for problem knowledge, instead relying on them primarily for solutions.

- **Hypothesis 2-4c:** Recipients will be more likely to seek out highly expert sources for solutions instead of problem knowledge.

Past research has shown that expert status can increase sources confidence (Trafimow and Sniezek 1994) as well as their knowledge sharing behavior (Constant et al., 1996; Wang & Noe, 2010). Indeed experts share more unshared (i.e., non-redundant) knowledge (Larson et al., 1996; Thomas-Hunt et al., 2003). This past research might also suggest that experts would be more likely to share unsolicited / unsought knowledge from different parts of the problem-solving process. A source that possesses more expertise may understand a recipient's problem better than the recipient themselves (and these experts are also likely to recognize this fact). Thus they may be more likely to provide disagreeing feedback and/or unsolicited / unsought problem knowledge.

- **Hypothesis 2-4d:** Higher-expertise sources will be more likely to provide disagreeing feedback.
- **Hypothesis 2-4e:** Higher expertise sources will be more likely to share unsolicited problem knowledge.

Finally, as mentioned above, research on shared understanding, representations, interpretations, and systems of meaning at an interpersonal level (Nahapiet & Ghoshal, 1998; Tsai & Ghoshal, 1998; Bolino, Turnley, & Bloodgood, 2002; Argyres, 1999) and absorptive capacity at the organizational level (Cohen & Levinthal, 1990) have shown that knowledge recipients must have a certain baseline level of knowledge or expertise in order to assimilate or learn what sources share / transfer. Thus expertise is also suggested to be important for searchers (Day & Lord, 1992; Cross & Sproull, 2004). However, in exchanges involving lower-expertise recipients and higher-expertise sources the base level of knowledge or absorptive capacity may not exist for recipients. Thus they may not appreciate the knowledge provided by sources, particularly when this knowledge is unsolicited / unsought and would have negative implications—such as pushing them backwards in the problem-solving process.

- **Hypothesis 2-4f:** Recipients will be less engaged when they receive unsolicited problem knowledge even when this knowledge is conveyed by higher expertise sources.
- **Hypothesis 2-4g:** Recipients will find unsolicited problem knowledge to be less useful even when this knowledge is conveyed by higher expertise courses.

SECTION 2: METHODS

SAMPLE & PROCEDURE

The survey format and procedure as well as the sample are the same as described in Study 1.

ITEMS & SCALES

Dependent Variables

Proactive Knowledge Sharing (Push) Frequency. Instructions for this section started with: “Please think carefully about the past several months and consider how you interacted to exchange knowledge or ideas with other people at [Org.] for the purpose of discussing work related topics, projects, or problems.” This was followed by specific items prefaced with: “How frequently did you interact in each way described with other people within [Org.]?”. Frequency of knowledge sharing was then measured by the item: “I went to other people to share/give/offer my knowledge or ideas to them” with a response scale ranging from 1. “Never”, 2. “Less than once a month”, 3. “Around once a month”, 4. “Around once a week”, 5. “Around once a day”, and 6. “Several times a day”.

Proactive Knowledge Searching (Pull) Frequency. As above, specific items were prefaced with: “How frequently did you interact in each way described with other people within [Org.]?” and frequency of knowledge searching was measured by the item: “I went to other people looking for their knowledge or ideas” with a response scale ranging from 1. “Never”, 2. “Less than once a month”, 3. “Around once a month”, 4. “Around once a week”, 5. “Around once a day”, and 6. “Several times a day”.

Exchange Usefulness. Computed as described in Study 1 (Cronbach’s $\alpha = 0.88$).

Mediators / Dependent Variables

Recipient Engagement. Computed as described in Study 1 (Cronbach’s $\alpha = 0.87$).

Knowledge Sought Problem-to-Solution. Computed as described in Study 1.

Knowledge Sought Generation-to-Feedback. Computed as described in Study 1.

Knowledge Provided Problem-to-Solution. Computed as described in Study 1.

Knowledge Provided Generation-to-Feedback. Computed as described in Study 1.

Independent Variables

Intrinsic Motivation. Items were drawn from the need for cognition scale developed by Petty & Cacioppo, (1986) in order to measure subjects' intrinsic motivation to solve problems: "Thinking about myself in general ..." which was followed by four items: "One of my main sources of satisfaction comes from working through complicated problems", "I really enjoy thinking about difficult questions", "I prefer complex to simple problems", and "I like tasks that challenge my thinking abilities". table 15 shows the results from a principle components exploratory factor analysis with a direct oblimin rotation. Items in this scale loaded onto one factor (Factor 3) with Cronbach's $\alpha = 0.80$.

Identification Motivation. Items used to measure identification motivation were drawn from Mael & Ashforth's (1989) scale of organizational identification (2 items) and Allen & Meyer's (1990) affective commitment scale (2 items). "Thinking about myself in general..." which was followed by four items: "When someone criticizes [Org], it feels like a personal insult", "When I talk about [Org], I usually say 'we' rather than 'they'", "I feel a strong sense of belonging at [Org]", and "I feel 'emotionally attached' to [Org]". table 15 shows the results from a principle components exploratory factor analysis with

a direct oblimin rotation. Items in this scale loaded onto one factor (Factor 4) with Cronbach's $\alpha = .83$.

Positive Social Motives. Items to measure social motives were developed based on several existing scales (e.g., Bordia et al., 2006; Kankanhalli, 2005; Bock et al., 2005; Wasko & Faraj, 2005) and items relevant to social capital, social status, and expert status were included, adapted, or created as necessary. Instructions started with "When I share my knowledge or ideas with other people in [Org], I will..." which was followed by: "Enhance and build relationships with my coworkers", "Strengthen existing relations or create new relations with my peers", "Gain respect as my competence is recognized by others", "Be seen as a more knowledgeable expert by others", "Raise my standing in [Org] as my ideas are widely adopted", and "Increase my prestige in [Org] as my ideas have broader impact". Table 15 shows the results from a principle components exploratory factor analysis with a direct oblimin rotation. Items in this scale loaded onto one factor (Factor 6) with Cronbach's $\alpha = .89$.

Negative Social Motives. Items to measure negative social motives were developed based on past theorizing in various relevant papers as well as existing scales of evaluation apprehension (e.g., Bordia et al., 2006; Shalley 1995; Hall 2001). Existing items were contrasted with the items included for positive social motives and adapted or created as necessary. The final scale started with the instructions "When I share my knowledge or ideas with other people in [Org], I take a chance that I may..." were followed by six items to measure negative social motives: "Weaken my relations with my coworkers if I propose radical or bizarre ideas", "Alienate my coworkers if I mention

really different or strange ideas”, “Be thought of as less knowledgeable if I show that I don’t know something”, “Open myself up to be critiqued if I make a mistake”, “Lower my standing in [Org] if what I say challenges the status quo”, and “Hurt my prestige in [Org] if my statements threaten the powers that be”. Table 15 shows the results from a principle components exploratory factor analysis with a direct oblimin rotation. Items in this scale loaded onto one factor (Factor 2) with Cronbach’s $\alpha = .88$.

Extrinsic Rewards. Several similar existing scales that measure extrinsic motivation (e.g., Maurer & Tarulli 1994; Bock et al., 2005; Siemsen 2007; Kankanhalli et al., 2005) were reviewed in developing a scale for this study. The final format started with the instructions: “When I share my knowledge or ideas with other people in [Org], I will...” which was followed by two items: “Receive compensation or other incentives from [Org]” and “Gain bonuses or other monetary rewards from [Org]”. Table 15 shows the results from a principle components exploratory factor analysis with a direct oblimin rotation. Items in this scale loaded onto one factor (Factor 5) with Cronbach’s $\alpha = .90$.

Loss of Unique Value. Items to measure fear of loss of unique value were developed based on past theorizing in various relevant papers as well as existing scales of evaluation apprehension (e.g., Kankanhalli et al., 2005). The final scale started with the instructions: “When I share my knowledge or ideas with other people in [Org], I take a chance that I may...” which was followed by three items “Reduce my unique value since other people will know what I know”, “Become more replaceable since others would possess my knowledge”, and “Jeopardize my job security since my knowledge becomes less valuable”. Table 15 shows the results from a principle components

exploratory factor analysis with a direct oblimin rotation. Items in this scale loaded onto one factor (Factor 7) with Cronbach's $\alpha = .88$.

Greater Expertise Source. Computed as described in Study 1.

Controls

Company Dummy Variables. Computed as described in Study 1.

Functional Area Dummy Variables. Dummy variables were created to represent the functional background of subjects. The following functional area dummy variables were created: "Customer Service", "Marketing / Sales", "Research & Development", "Administration / Support", and "Production Operations". Research and development was the most commonly occurring functional group (almost 50% of the sample) and thus was chosen as the comparison / control group.

Age. Was measured as a categorical variable: 1) 24 and under – 2) 25 to 29 – 3) 30 to 34 – 3) 35 to 39 – 4) 40 to 44 – 5) 45 to 49 – 6) 50 to 54 – 7) 55 to 59 – 8) 60 to 64 – 9) 65 and over. Age was logged for analyses.

Education. Was measured as a categorical variable: Education: 1) Less than High School – 2) High School – 3) Some college – 4) two-year college – 5) four year college – 6) Masters – 7) Doctoral Degree – 8) Professional Degree (JD, MD).

Years at Job (Logged). Was measured in years and months, converted into years, and logged for analyses.

Years at Company (Logged). Was measured in years and months, converted into years, and logged for analyses.

Years in Industry (Logged). Was measured in years and months, converted into years, and logged for analyses.

Climate for Collaboration & Creativity. Organizational climate / culture that supports creativity and collaboration is important for encouraging knowledge sharing (De Long & Fahey, 2000; Kanter, 1988) and has been differentiated from individual factors like motivation in past studies of knowledge sharing (e.g., Riege, 2005; Bock et al., 2005). Items designed to measure collaborative vs. judgmental culture were drawn from several existing scales of support for knowledge sharing (e.g., Maurer & Tarulli, 1994; Bock et al., 2005), knowledge sharing norms (e.g., Faraj & Sproull 2000; Kankanhalli et al., 2005), and climate for innovation and creativity (e.g., Siegel & Kaemmerer, 1978; Scott & Bruce, 1994) while additional items were added based on discussions with representatives from companies that were participating in the study. “In [Org]...” was followed by nine items to measure collaborative climate: “Radically new ideas are appreciated and many are allowed further development”, “Creativity is strongly encouraged”, “Employee risk taking is supported, even if this risk taking leads to failure”, “Upper management believes knowledge sharing is a key responsibility of all employees”, “People are encouraged to spend ‘work time’ on learning new things”, “People are open to consider a variety of different perspectives”, “People have significant autonomy in determining how they do their job”, “Flexibility and responsiveness to change is a top priority”, and “People give credit for others’ knowledge or ideas where it is due”. Table 15 shows the results from a principle

components exploratory factor analysis with a direct oblimin rotation. Items in this scale loaded onto one factor (Factor 1) with Cronbach's $\alpha = .86$.

Judgmental Climate. "In [Org]..." was followed by three items: "People are very critical when others make mistakes", "People harshly judge those that show they don't know something", and "People immediately point out the limitations of other people's ideas or contributions". Table 15 shows the results from a principle components exploratory factor analysis with a direct oblimin rotation. Items in this scale loaded onto one factor (Factor 8) with Cronbach's $\alpha = .72$.

Organization in Flux. In order to control for perception of change or instability within a subjects climate I included a single item: "In [Org]..." which was followed by "We are going through a great deal of flux or change"

Anxious About Future. In order to control for any potential perceived uncertainty and anxiety about the future I included a single item: "In [Org]..." which was followed by "I feel a lot of anxiety when I think about my future role or prospects"

Interaction ID. Computed as described in Study 1.

Interaction Days Ago. Computed as described in Study 1.

Interaction Duration (Logged). Computed as described in Study 1.

Interaction Group Size. Computed as described in Study 1.

Strong Ties. Computed as described in Study 1 (Cronbach's $\alpha = .80$).

Relationship Length (Logged). Computed as described in Study 1.

Physical Proximity. Computed as described in Study 1.

Formal Organizational Proximity. Computed as described in Study 1.

Higher Rank Source. Computed as described in Study 1.

Recipient Sought All (Avg). Computed as described in Study 1 (Cronbach's $\alpha = .63$).

Source Provided All (Avg). Computed as described in Study 1 (Cronbach's $\alpha = .62$).

Feedback Valence. Computed as described in Study 1 (Cronbach's $\alpha = .63$).

Recipient-initiated exchange. Computed as described in Study 1.

Subject Initiated Exchange. Computed as described in Study 1.

Subject Searcher Dummy. Computed as described in Study 1.

ANALYSES

Motivation and Organization Climate

An exploratory factor analysis was conducted on subject motivations and perceived organizational climate since these scales had not been included together in exactly these forms in a survey before. Results are reported in table 15 and show that predicted scales were convergently and divergently valid. The convergent validity of these scales is further confirmed by the high Cronbach alpha reliabilities reported above under each variable's description. Table 16a-e includes correlation results for these any other variables included in this study.

[Insert Table 15 About Here]

[Insert Table 16a-d About Here]

HYPOTHESIS TESTING

In order to examine Hypotheses 2-1a and 2-1b about the levels of engagement across source vs. recipient initiation, I performed a simple T-test comparison of recipient and source engagement for source initiated vs. recipient initiated knowledge exchanges. These results are displayed in table 17. Interestingly, there are no significant differences in engagement for recipient-initiated vs. source-initiated forms of knowledge exchange. Contrary to hypothesis 2-1a, I find no evidence that recipients have significantly higher levels of engagement in recipient-initiated exchanges and contrary to hypothesis 2-1b I find no evidence that sources have significantly higher levels of engagement in source-initiated interactions. This is consistent with the results found in part 1 which suggested that initiation was a poor proxy for knowledge seeking, providing, and unsolicited / unsought knowledge.

Hypothesis 2-1a: Recipients will exhibit higher levels of engagement when they initiated a knowledge exchange (i.e., in recipient-initiated / pull exchanges). **(Not Supported)**

Hypothesis 2-1b: Sources will exhibit higher levels of engagement when they initiated a knowledge exchange (i.e., in source-initiated / push exchanges). **(Not Supported)**

[Insert Table 17 About Here]

Motivations and Proactive Knowledge Searching (Pull) vs. Sharing (Push)

In order to examine hypotheses 2-2a through 2-2g regarding how motivation affects the frequency with which individuals will engage in proactive knowledge searching and sharing behavior I used Structural Equation Modeling (SEM) with bias-

corrected bootstrapping as implemented in AMOS v19. I used SEM path analysis instead of regressions for these analyses because it has the advantages of (1) simultaneously testing two correlated dependent variables (Searching and Sharing Frequency), and (2) the bootstrapping technique more accurately models the actual distribution of the underlying variables and makes no assumptions of normal sample distribution (Judd & Kenny, 1981; Preacher & Hayes, 2008). The purpose of these analyses was to look at the effects of culture and motives on Searching and Sharing Frequency. These are the two proactive roles in my integrated model of knowledge exchange. SEM path models were developed based on some initial premises: more internally driven motivation should be closest to behavior (DVs) with culture / climate and other more externally driven factors potentially affecting the salience of these internally driven factors. Finally, intrinsic motivation was assumed to be independent of other climate or motivational effects. The model was then optimized based on modification indexes and non-significant relationships were dropped so that hypothesis could be examined. Goodness-of-Fit indexes universally suggested the path diagram below was a good representation of the underlying data ($\chi^2 = 21.364$, $p = .093$, $df = 14$; CMIN/DF = 1.526; NFI = .992; CFI = .997; RMSEA = .020 $p_{close} = .999$; Hoetler $n(.05) = 1433$; sample $n=1293$). It should be noted that for models with 400 or more cases χ^2 is almost always significant and thus makes a poor fit index (in this case χ^2 is marginally significant). In this research context the following path model is primarily utilized to appreciate the full effect of climate and motivations on these proactive knowledge exchange behaviors (the actually path model is fairly complex and can be difficult to apprehend in its entirety).

Results partly supported Hypothesis 2-2a. Extrinsic motivation did indeed positively influence knowledge sharing frequency but the effect of extrinsic motivation on knowledge searching frequency was ambiguous and displayed an apparent suppression effect (negative direct effect and positive indirect effect). Looking backward at the causes of extrinsic motivation reveals some interesting relationships: both collaborative and judgmental climate are positively related to extrinsic motivation. Moving forward to understand the indirect effect of extrinsic motivation shows that it is negatively related to negative introjection and positively related to positive introjection (these are the main drivers of the positive indirect effect observed). This seems to be consistent with the mixed findings of past studies regarding extrinsic motivation. For example, rewards systems might encourage people to more openly collaborate and thus proactively share knowledge but at the same time might hinder them from displaying their ignorance by seeking knowledge interpersonally. Results supported hypothesis 2-2b showing that fear of loss of unique value had a significant negative effect on knowledge sharing frequency (and no effect on knowledge searching frequency). Hypothesis 2-2c and 2-2d were also mostly supported since positive social motives had a strong positive effect on knowledge sharing and weaker positive effect on knowledge searching (marginal) while negative social motives had a negative effect (marginal) on knowledge sharing. An unexpected result was that despite the marginal negative effect of negative social motives on knowledge sharing, it had a fairly strong positive effect on knowledge searching behavior. This might be because individuals seek out others perspectives in order to preempt or otherwise avoid rejection and criticism once they

propose a final solution or idea, however, this is strictly conjecture. Also surprisingly, contrary to hypothesis 2-2e, organization identification had little effect on the frequency of initiating knowledge exchanges with only a marginally positive effect on proactive knowledge sharing. This is an unexpectedly small effect and it seems that there may be differences in this effect across companies. In earlier results (not reported here) the effect of organization identification was substantially stronger when only company 1-3 were analyzed. This change in effect might be because the sample in company 4 was collected globally whereas company 1-3 were collected exclusively in US locations. However, interpreting this would require more analysis that is beyond the scope of this paper. Finally, showing that intrinsic motivation is indeed the strongest motivational predictor of both knowledge searching and sharing frequency, I find highly significant positive effects on both of these behaviors (supporting hypothesis 2-2f). However, the coefficient for the effect of intrinsic motivation on sharing is 35% larger than it is for searching (providing some evidence to support 2-2g).

Hypothesis 2-2a: Individuals with high extrinsic motivation will engage in more frequent proactive knowledge searching (pull) as well as proactive knowledge sharing (push).

(Partly Supported)

Hypothesis 2-2b: Individuals with high fear of loss of unique value will engage in less frequent proactive knowledge sharing (push). **(Supported)**

Hypothesis 2-2c: Individuals with high positive social motives will engage in more frequent proactive knowledge searching (pull) as well as proactive knowledge sharing (push). **(Mostly Supported)**

Hypothesis 2-2d: Individuals with high negative social motives will engage in less frequent proactive knowledge sharing (push). **(Supported)**

Hypothesis 2-2e: Individuals with high identification will engage in more frequent proactive knowledge searching (pull) as well as proactive knowledge sharing (push). **(Mostly Not Supported)**

Hypothesis 2-2f: High intrinsically motivated individuals will engage in more frequent proactive knowledge searching (pull) as well as proactive knowledge sharing (push), however, this effect will be substantially stronger for proactive knowledge sharing (push). **(Supported)**

Hypothesis 2-2g: The effect of intrinsic motivation on knowledge exchange initiation frequency will be substantially stronger for proactive knowledge sharing (push) than it is for proactive knowledge searching (pull). **(Supported)**

[Insert Figure 27 About Here]

[Insert Table 18 About Here]

Motivations Moderating Recipient Engagement in Face of Unsolicited Knowledge

The primary tests of hypothesis 2-3a through 2-3h were accomplished via a series of hierarchical linear regressions that examined the two-way and three-way interaction effects of various forms of motivation with unsolicited problem-to-solution and unsolicited generation-to-feedback. Step 1 includes controls for company and functional dummies, individual differences (including other motivational states beyond that being focused on), exchange / interaction differences, relationship controls, for average seeking and providing and disagreeing vs. agreeing feedback, as well as a

control for recipient- vs. source-initiated exchange. Step 2 adds centered (Tabachnick & Fidell, 2001) main effects for seeking and providing of problems-to-solutions and generation-to-feedback and target motivation for the specific analysis. Step 3 adds two-way interaction effects for unsolicited knowledge and well as motivation by seeking and providing. Finally, step 4 adds both three way interaction effects for motivation by unsolicited problems-to-solutions and generation-to-feedback.

Extrinsic Motivation

As shown in figure 28a-d and table 19 model 4 results partly supported hypothesis 2-3a. Extrinsically motivated recipients are more engaged when presented with feedback knowledge than with generation knowledge. This significant three way interaction effect is actually driven mostly by the simultaneous decrease in engagement in the face of solicited generation (consistent with hypothesis) as well as an increase in engagement for unsolicited feedback (consistent with hypothesis) and for unsolicited generation (unexpected). In addition, there seems to be an important shift for problem-to-solution knowledge where solicited and unsolicited problems are met with less engagement while unsolicited solutions are met with more engagement, however, these results are not significant. I am not sure why the result is insignificant given the relatively large shift shown between figure 28a and figure 28b (I would expect a significant 3-way interaction with problems-to-solutions so there must be significant variation that is obscured by these mean-based interaction graphs).

Hypothesis 2-3a: Recipients with high extrinsic motivation will be less engaged when they receive divergence enhancing knowledge (i.e., problems or generation) and more

engaged when they receive convergent enhancing knowledge (generation or feedback).

(Partly Supported)

[Insert Figure 28 About Here]

[Insert Table 19 About Here]

Lose Unique Value

Nothing was hypothesized and two- and three-way interactions were not significant (results not reported).

Positive Social Motives

As shown in figure 29a-d and table 20 model 3 & 4 results strongly supported hypothesis 2-3c. Recipients motivated by positive social factors have higher engagement when presented with unsolicited problem knowledge, solutions, generation, and feedback. The negative coefficients on the three way interactions suggest that when positive social motivation is high and unsolicited knowledge is high engagement will be higher (unsolicited knowledge is negative since it reflects a low * high or high * low interaction for seeking by providing). In addition results seemed to support hypothesis 2-3d. Recipients motivated by positive introjection found both solicited and unsolicited feedback to be more useful than recipients with low positive introjection. The overall high levels of engagement across multiple knowledge types for high socially motivated individuals may be reflective of their generally collaborative attitude and thus their openness to all forms of unsolicited knowledge.

Hypothesis 2-3c: Recipients with high positive social motives will be more engaged when they receive unsolicited knowledge of all types. **(Supported)**

Hypothesis 2-3d: Recipients with high positive social motives will be more engaged when receiving feedback (both solicited and unsolicited). **(Supported)**

[Insert Figure 29 About Here]

[Insert Table 20 About Here]

Negative Social Motives

Nothing was hypothesized and two- and three-way interactions were not significant (results not reported).

Identification

As shown in figure 30a-d and table 21 model 4 results partly supported hypothesis 2-3f. Both unsolicited problems and unsolicited solutions were met with higher recipient engagement. Unfortunately, despite apparent strong support in figure 30c-d for hypothesis 2-3g, these results were not statistically significant. Although high identification recipients seem to be much more engaged when receiving feedback than low identification recipients, I cannot interpret this result due to the insignificant regression results. Finally, there seems to be a general preference for problems over solutions for higher identification recipients (similar to the pattern for intrinsically motivated recipients below). This might be consistent with my discussion that high identification people are more internally driven and want to find answers to deeper issues (not just surface level quick-fixes).

Hypothesis 2-3f: Individuals with high identification will be more engaged when receiving unsolicited knowledge (all forms). **(Partly Supported)**

Hypothesis 2-3g: High identification individuals will be more engaged when receiving feedback (both solicited and unsolicited). **(Not Supported)**

[Insert Figure 30 About Here]

[Insert Table 21 About Here]

Intrinsic Motivation

As shown in figure 31a-d and table 22 model 3 & 4 results strongly supported hypothesis 2-3h. Intrinsically motivated recipients have higher engagement when presented with problem knowledge (both solicited & unsolicited) as well as generation knowledge (solicited very large change, unsolicited smaller change). Collectively this was consistent with the hypothesized arguments that highly intrinsically motivated individuals are more motivated to understand deeper issues relevant to the problem and explore all solution options regardless of how this might affect their progress towards completing the problem-solving process.

Hypothesis 2-3h: High intrinsically motivated individuals will be more engaged when receiving divergence enhancing knowledge (both unsolicited and solicited; both problem knowledge & generation knowledge). **(Supported)**

[Insert Figure 31 About Here]

[Insert Table 22 About Here]

Aggregated Motivation Results

Table 32 summarizes the results from above regarding how various forms of motivation affect the engagement of recipients when faced with convergent vs. divergent solicited and unsolicited forms of knowledge. Large changes are in bold, small changes are in light grey and I have attempted to contrast divergence enhancing knowledge on the left with convergence enhancing knowledge on the right. Internally driven motivations are towards the top while externally driven motivation is near the bottom. There is an apparent shift from receptivity to divergence on the intrinsic motivation side of the scale to receptivity to convergence on the extrinsic side of the scale. Figure 33a-b further explores this general trend by comparing high intrinsic to high extrinsic motivation and show an obvious shift in slopes for problems-to-solutions. Finally, the table below also shows a general increase in receptivity (higher levels of recipient engagement) for positive social motives (one motive associated with higher levels of relatedness). This is displayed in figure 33c-d that compares high identification to high intrinsic motivation for generation-to-feedback knowledge (although high identification results were not significant the pattern displays the effect I am describing).

[Insert Figure 32 About Here]

[Insert Figure 33 About Here]

Source Expertise and Unsolicited Knowledge

The following section includes explicit tests of hypotheses 2-4a to 2-4g while also providing some exploration of other interesting and relevant variables. In most cases these analysis are structured to examine relational variables (e.g., sources relative expertise) and thus utilize all first reasonable interactions. In cases where the dependent variable was the tendency for recipients to seek problems-to-solutions / generation-to-feedback or the tendency for sources to provide problems-to-solutions / generation-to-feedback, results were analyzed from either recipient's or source's perspective. This allowed a broader range of motivations and other individual factors to be explored as discussed in the introduction above.

Source Expertise and Pull vs. Push

The primary test of hypothesis 2-4a was accomplished via a series of hierarchical linear regressions that examined the two-way interaction effect of initiation by source expertise to predict exchange usefulness. Step 1 includes controls for company and functional dummies, exchange / interaction differences, relationship controls, average seeking, average providing, and disagreeing vs. agreeing feedback as well as a control for recipient-initiated exchange. Step 2 adds centered main effects for initiation and source expertise. Step 3 adds the two-way interaction effect for initiation by source expertise. Finally, step 4 added controls for whether the subject (survey respondent) initiated the exchange as well as the interaction of recipient and subject initiation (i.e.,

subject in proactive recipient / searcher role) as a robustness check to make sure results were consistent after controlling for self vs. perceived other observations.

As shown in figure 34 and table 23 model 3-4 results supported my hypothesis by showing that source-initiated exchanges were perceived to be particularly useful when initiated by higher expertise sources (as compared to recipient-initiated exchanges). Indeed, the opposite was the case for lower expertise sources—source-initiated exchanges were less useful than recipient-initiated exchanges.

Hypothesis 2-4a: Push exchanges will be perceived to be more useful when initiated by higher-expertise sources. **(Supported)**

[Insert Figure 34 About Here]

[Insert Table 23 About Here]

Source Expertise and Unsolicited Exchanges

The primary test of hypothesis 2-4b was accomplished via a series of hierarchical linear regressions that examined the two-way and three-way interaction effects of specialized expertise with overall unsolicited knowledge. Step 1 includes controls for company and functional dummies, exchange / interaction differences, relationship controls, average seeking, average providing, and disagreeing vs. agreeing feedback as well as a control for recipient-initiated exchange. Step 2 adds centered main effects for overall seeking, overall providing, and source expertise. Step 3 adds two-way interaction effects for unsolicited exchange, and well as source expertise by overall seeking and providing. Step 4 adds three way interaction effects for source expertise by unsolicited exchange. Finally, step 5 added controls for subject initiation as described above.

Results shown in figure 35 and table 24 model 3 provide support for this hypothesis. Unsolicited exchanges were always less useful than solicited exchanges (for a given level of source expertise). However, this difference was less significant for higher expertise sources than it was for lower expertise sources—unsolicited exchanges were penalized much more for lower-expertise sources.

Hypothesis 2-4b: Unsolicited knowledge will always be perceived as less useful than solicited knowledge but this effect will be less strong when sources have higher-expertise. **(Supported)**

[Insert Figure 35 About Here]

[Insert Table 24 About Here]

Source Expertise and Knowledge Seeking

The primary test of hypothesis 2-4c was accomplished via a series of hierarchical linear regressions that examined what factors predicted seeking of problems vs. solutions. In order to assess a comprehensive set of recipient motives this analysis was done from a recipient's perspective (sample of first reasonable recipient interactions). Step 1 includes controls for company and functional dummies, individual differences, and exchange / interaction differences as well as a control for recipient-initiated exchange. Step 2 examines the effect of culture / climate and recipient's motivational states. Step 3 examines relationship variables. Finally, step 4 adds recipient engagement and recipient sought all (based on average across all seeking items) in order to confirm that prior results are not driven by amount of knowledge sought but rather are due to the shifts across the problem-solving process phases.

Results shown in table 25 show that very little predicts the type of knowledge typically sought (problems to solutions). Neither recipient's motivational states nor the relationship between sources and recipients were reasonable predictors of problem-to-solution knowledge seeking (either before or after controlling for recipient engagement, total seeking, and initiation). No evidence for Hypothesis 2-4c was found—recipients were no more likely to seek problem or solution knowledge from higher expertise sources. Similarly (although not related to a hypothesis), higher-expertise sources were no more likely to be sought out for generation vs. feedback knowledge. Unfortunately, looking beyond source expertise to other individual and relationship factors that predict seeking of problems-to-solutions or generation-to-feedback is difficult. Total adjusted R^2 in table 25a is negative, suggesting that none of the variables are reasonable predictors of the DV (or that the model is over-specified which is unlikely given the large sample size). Similarly poor overall prediction was found for seeking generation-to-feedback as a dependent variable (table 25b: total adjusted R^2 around 2% with no particular model providing significant improvement to overall model fit).

Hypothesis 2-4c: Recipients will be more likely to seek out highly expert sources for solutions instead of problem knowledge. **(Not Supported)**

[Insert Table 25a-b About Here]

Source Expertise and Knowledge Providing

The primary test of hypothesis 2-4d was accomplished via a series of hierarchical linear regressions that examined what factors predicted sources providing disagreeing feedback. In order to assess a comprehensive set of source motives this analysis was

done from a source's perspective (sample of first reasonable source interactions). Step 1 includes controls for company and functional dummies, individual differences, and exchange / interaction differences as well as a control for recipient-initiated exchange. Step 2 examines the effect of culture / climate and recipients motivational states. Step 3 examines relationship variables. Finally, step 4 adds recipient sought all and providing all (based on average across all seeking / providing items) in order to confirm that prior results are not driven by amount of knowledge provided but rather are due to the negative vs. positive feedback provided.

Results shown in table 26 model 3-5 provide support for this hypothesis by showing that higher expertise sources are more likely to provide disagreeing feedback. Analysis also revealed other interesting results. For example, model 2 showed that individuals that were motivated by negative social motives were more likely to provide disagreeing feedback while model 3 showed that strong ties were more likely to provide agreeing feedback (validation). Given that individuals with high negative social motives believe they are more likely to be penalized when knowledge they share is crazy, inaccurate, inappropriate, or unwanted, they may also be more willing to disagree by providing negative feedback. In these situations, sources are conforming to social expectations which tend to emphasize judging others' knowledge or ideas harshly. As I have mentioned previously, disagreeing feedback is not necessarily a bad thing in organizations, indeed too much agreement is as likely to be a suboptimal since it likely reflects groupthink (Janis, 1972) as might be suggested by the tendency for strong ties to provide validating / agreeing feedback.

Hypothesis 2-4d: Higher-expertise sources will be more likely to provide disagreeing feedback. **(Supported)**

[Insert Table 26 About Here]

The primary test of hypothesis 2-4e was accomplished via a series of hierarchical linear regressions that examined what factors predicted providing of problems vs. solutions after controlling for seeking of problems vs. solutions (table 27a). The rationale for this approach was that if recipient's seeking of problems-to-solutions was a perfect predictor of source's providing problems-to-solutions then other variables would not be significant predictors of providing. In order to assess a comprehensive set of source motives these analyses were done from a source's perspective (sample of first reasonable source interactions). Step 1 includes controls for seeking problems-to-solutions, company and functional dummies, individual differences, and exchange / interaction differences as well as a control for recipient-initiated exchange. Step 2 examines the effect of culture / climate and recipients motivational states. Step 3 examines relationship variables. Step 4 adds recipient sought all and providing all (based on average across all seeking / providing items) as well as providing negative-to-positive feedback in order to confirm that prior results are not driven by amount of knowledge sought but rather are due to the type of knowledge provided across the problem-solving process phases.

Results shown in table 27a model 3-5 provide support for this hypothesis by showing that higher expertise sources are more likely to provide problem knowledge even after controlling for the problem-to-solution knowledge sought by recipients. It

seems that higher expertise sources are indeed more likely to provide unsolicited problem knowledge (i.e., they are more likely to notice and exchange knowledge regarding problem reformulations—different assumptions, boundary conditions, etc...) . Additional results (table 27b) show that higher expertise sources are no more likely to share generation or feedback knowledge. Thus the only form of unsolicited knowledge that higher expertise sources are more likely to share is problem knowledge. In addition to the hypothesized effect of source expertise, there were a few other results that were also interesting. Table 27a shows that identification motivation (model 2, marginal) and organizational distance (model 3) was a significant predictor of providing problem knowledge. This might indicate that people motivated by identification are more likely to worry about deeper issues than surface problems. The result for organizational distance would be consistent with past arguments about the non-redundant knowledge and diverse perspectives possessed by individuals in different parts of the organization. This diversity might lead to unsolicited / unsought problem knowledge in much the same way that source expertise does. In addition, table 27b shows that the number of years a person has been in their job increases their tendency to provide generation instead of feedback knowledge and the degree to which a source perceives the organization to be in flux is related to their tendency to provide feedback instead of generation. Model 2 shows that if an individual has a high fear of loss of unique value then they tend to provide more feedback instead of generation. This might suggest that individuals with a strong fear of loss of unique value may be more likely to provide feedback knowledge in order to avoid sharing unique knowledge.

Hypothesis 2-4e: Higher expertise sources will be more likely to share unsolicited problem knowledge. **(Supported)**

[Insert Table 27a-b About Here]

Source Expertise, Unsolicited Problem-solving knowledge, and Recipient Engagement

Hypothesis 2-4f and 2-4g were tested via a series of hierarchical linear regressions that examined the two-way and three-way interaction effects of source expertise with unsolicited problem-to-solution knowledge. Step 1 included controls for company, exchange / interaction differences, relationship controls, average seeking, average providing, and disagreeing vs. agreeing feedback as well as a control for recipient-initiated exchange. Step 2 adds centered main effects for seeking and providing of problems-to-solutions and generation-to-feedback and source expertise. Step 3 adds two-way interaction effects for unsolicited knowledge, and well as source expertise by seeking and providing. Step 4 adds both three way interaction effects for source expertise by unsolicited problems-to-solutions and generation-to-feedback. Finally, step 5 added controls for whether the subject (survey respondent) initiated the exchange as well as the interaction of recipient and subject initiation (i.e., subject in proactive recipient / searcher role) as a robustness check to make sure results were consistent after controlling for self vs. perceived other observations.

Results shown in table 28a model 3-5 and figure 36a-d do not support for hypothesis 2-4f. Despite an apparent substantial drop in recipient engagement when presented with unsolicited problem knowledge this result is not statistically significant. On the other hand significant 3-way interaction effects for generation-to-feedback seem

to be driven by slight increases in recipient engagement when higher expertise sources share unsolicited generation and feedback as well as a substantial decrease in source engagement when experts share solicited generation. It is unclear why solicited generation is met with lower recipient engagement when shared by higher expertise sources. This might be a problem of a lack of understanding or higher expectations regarding generation knowledge shared by experts (everyone seems to want a silver bullet and expert sources tend to recognize the complexity of issues and realize that silver bullets do not exist). Results shown in table 29b model 3-5 and figure 37a-d provide support for hypothesis 2-4g. Interestingly, recipients find all forms of solicited and unsolicited knowledge to be more useful when shared by higher expertise sources except for solicited generation and unsolicited problem knowledge. Thus the only form of unsolicited knowledge higher expertise sources are more likely to share is the same type that recipients don't find more useful and is the type that is met with dramatically lower recipient engagement.

Hypothesis 2-4f: Recipients will be less engaged when they receive unsolicited problem knowledge even when this knowledge is conveyed by higher expertise sources. **(Not Supported)**

Hypothesis 2-4g: Recipients will find unsolicited problem knowledge to be less useful even when this knowledge is conveyed by higher expertise courses. **(Supported)**

[Insert Figure 36 About Here]

[Insert Figure 37 About Here]

[Insert Table 28a-b About Here]

SECTION 2: DISCUSSION

As highlighted in the introduction, this section of the dissertation is focused on understanding how motivation interacts with initiation and unsolicited / unsought knowledge while also highlighting a specific ‘story’ regarding higher expertise sources and unsolicited / unsought knowledge intended to show the implications of the perspectives put forth in this paper. Consistent with section 1 of this dissertation it seems that initiation is a poor proxy for engagement of sources and recipients. However, the motivations that encourage individuals to search for knowledge (i.e., to trigger recipient-initiated exchanges) and to share knowledge (i.e., to trigger source-initiated exchanges) are quite different. Intrinsic motivation is the only consistently positive predictor of both types of exchange—and it seems to be more important for knowledge sharing. Both positive and negative social motives are positively related to searching behavior, while extrinsic motivation, identification, and fear of loss of unique value (negatively) are more important predictors of knowledge sharing behavior. This might suggest that even though engagement levels do not differ across recipient- and source-initiated exchanges, different types of individuals may be involved in these types of exchanges. It is difficult for me to assess this given the random assignment research designed used to sample exchanges but this is a worthy areas for additional research.

Following this I assessed how recipients’ motivational states moderated their engagement when presented with unsolicited knowledge from different parts of the problem solving process. This section suggested that there are important epistemic and social motives that seem to affect the way individuals prefer to solve problems and

exchange knowledge in organizations. Intrinsically motivated and high identification individuals were most engaged when receiving divergence enhancing problem-to-solution knowledge, while extrinsically motivated individuals seemed to be most engaged when receiving convergence enhancing knowledge (i.e., feedback). Individuals with high relatedness seemed to be more receptive to all forms of unsolicited knowledge and were particularly engaged when receiving feedback. My theory and hypotheses in this section highlights something I have come to believe as I have worked through this research paper (this may be less than explicit in my discussion since results are hard to interpret holistically). I believe that there may be a trade-off between intrinsic motivation, as it relates to a love of solving complex problems (i.e., epistemic goals), and identification, other social motives, or indeed intrinsic motivation if it is measured as love of helping people (i.e., social goals). Despite an almost universal pro-intrinsic motivation perspective in past research, intrinsic motivation seems likely to also be quite selfish. In some of my earliest data exploration I observed what seemed to be a negative correlation between intrinsic motivation and identification (in company 1's data). Although this result did not remain after additional data was added (intrinsic motivation is strongly positively related to identification and positive social motives in the final dataset), this along with conversations I have been having with numerous companies triggered my thinking about scientists motivations and goals (including my own). First in discussions with numerous companies about R&D personnel motivation it seems that organization identification is at a historic low—employees and organizations show little loyalty to one another. Scientists are likely to change companies in order to

work on more interesting projects—seeming to show that their intrinsic motivation outweighs any identification or social motives they may have. Obviously it is ideal if we can find intrinsically motivated scientists that are also socially motivated and have strong identification. However, how realistic is this? Given current open innovation, Fortune 500 downsizing, and evolving industry ecosystems, one future scenario that was proposed for the Industrial Research Institute (<http://iriweb.org>) 2038 futures project was: “what if all R&D employees become freelancers?” I used to give the example of Albert Einstein to show the importance of having high levels of both intrinsic motivation and organization identification. If Einstein had been exclusively intrinsically motivated he might have developed the nuclear bomb for Germany—his identification with the values of the United States vs. Germany at the time led him to describe the potential for this weapon to then president Roosevelt. However, this is obviously an extreme case of both an innovation with the potential to change the course of history as well as an organization (Nazi Germany) with values that were extremely inconsistent with Einstein’s (to put it almost ridiculously mildly). How frequently is this tradeoff a problem for scientists? How frequently are scientists driven by both epistemic intrinsic and social / identification motivations? When do organizations want employees to buck the social system and primarily focus on epistemic goals regardless of how this disrupts things? These are still open questions but the acknowledgement of unsolicited / unsought knowledge within the problem solving process seems to shed some light and provide the potential for more exploration of these phenomena in the future.

The exploration of a ‘story’ around higher-expertise sources was intended to highlight the implications for this perspective. By showing that expertise moderates initiation in a very different way than it moderates unsolicited / unsought exchanges I have provided more evidence of the orthogonality of these constructs. By highlighting the fact that recipients are no more likely to engage experts in earlier stages of the problem solving process, that experts are more likely to provide unsolicited problem knowledge, and that recipients are not receptive to this knowledge (find it less useful than other forms of knowledge shared by experts), I believe I have highlighted an important barrier for knowledge exchange and innovation in organizations. Given how important problem formulation is to generating creative and high-impact solutions to problems, any barriers to experts providing this type of knowledge is critical to understand. I believe this story helps demonstrate the importance of analyzing knowledge exchanges within a problem solving context and may have highlighted some normative practitioner takeaways—if organizations support some form of earlier problem-solving stage engagement with top experts this facilitates greater knowledge diffusion from experts across the organization and is likely to generate better solutions to organizational problems.

SECTION 3: KNOWLEDGE CHARACTERISTICS

This final section of the dissertation is intended to highlight the implications of the above findings by examining how knowledge characteristics are tied to the problem solving process and unsolicited / unsought exchanges or knowledge. By connecting

knowledge characteristics to the newly theorized concepts introduced in this paper I hope to answer any potential “so what” questions. For example, if problem knowledge is more tacit (as I propose and find below) then the barrier highlighted above for the exchange of problem knowledge from higher-expertise sources is effectively a barrier to experts’ tacit knowledge—arguably one of the most important forms of knowledge that organizations try to facilitate the flow of. In addition, if unsolicited / unsought knowledge is related to knowledge more novel to recipients then I would be revealing an important way that knowledge exchange is connected via the problem-solving process, and implicitly the resolution of unknown-unknowns, to organizational creativity and innovation.

SECTION 3: THEORY / LITERATURE REVIEW

KNOWLEDGE CHARACTERISTICS

There are numerous dimensions or characteristics of knowledge that distinguish various forms of this all-important organizational asset (Garcia & Calantone, 2002; Green et al., 1995). For example: Zander and Kogut (1995) used five dimensions: codifiability, teachability, complexity, system dependence, product observability; Rogers (1983) used five dimensions of innovation (relative advantage, communicability, observability, complexity, compatibility); Winter (1987) used four dimensions of firm knowledge (tacit/articulable, observable/not observable in use, complex/simple, dependent/independent of a system); Contractor & Ra (2002) use four knowledge attributes (codification, newness, complexity, teachability); Antonelli (1999)

distinguishes four types of knowledge and processes in a 2x2 matrix with the dimensions tacit/codified and internal/external; Ancori et al. (2000) also used four types in a 2x2 matrix with tacit/codified and individual/social. All of these frameworks include tacitness and/or complexity as characteristics of knowledge and, indeed, the concept of tacitness has come to predominate research focused on explaining knowledge based competitive advantage (Grant, 1996; Winter, 1987; Teece & Pisano, 1997; Baird & Henderson, 2001) as well as organizational learning and innovation (Senker, 1995; Nonaka & Takeuchi, 1995). Furthermore, as highlighted throughout this paper, in both creativity and knowledge exchange research, non-redundant (i.e., novel or unfamiliar to recipients) knowledge has been highlighted as critical to successful knowledge exchanges and serves as an important bridge between knowledge transfer / recombination research and creativity or innovation (e.g., Fleming & Sorenson, 2004; Weitzman, 1996; Burt 2004). Although there are other knowledge characteristics that are also important, in this section of the dissertation I focus on complexity, tacitness, and novelty to distinguish different types of knowledge.

Complexity & Tacitness

Fundamentally tacit or complex knowledge is assumed to resist transfer and diffusion, while codified or simple knowledge flows easily and universally (Sorensen et al., 2006; Hansen, 1999). “Many current trends in organizational design can be interpreted as attempts to access and integrate the tacit knowledge of organizational members while recognizing the barriers to the transfer of such knowledge” (Grant, 1996, p.118). Tacitness is a term that is typically used to describe the degree to which

knowledge can be articulated and is contrasted with explicit knowledge which is more easily codified or explained (Zander & Kogut, 1995; Nonaka, 1994; Polanyi, 1966; von Hippel et al., 1994; Szulanski, 1996; Reagans & McEvily, 2003). The intersection of complexity and tacitness constructs has been described in numerous ways by authors with the terms sometimes being used synonymously to describe the richer or deeper knowledge that is most important in organizations (e.g., McEvily & Chakravarthy, 2002; Bhagat et al., 2002; Daft & Lengel, 1986). In other cases tacitness and complexity are described as subdimensions of one another. For example, knowledge complexity is described by Hansen (1999) as having two dimensions: its interdependence and its level of codification / codifiability (i.e., tacitness). In Hansen's paper interdependence is described with regards to how embedded vs. modular and separable a piece of knowledge is in relation to the specific context it is being abstracted or removed from (Simon, 1962; Kauffman, 1993; Zander & Kogut, 1995; Sorensen et al., 2007; Teece et al., 1997) and this is a common definition of knowledge interdependence or complexity when it is looked at orthogonally to tacitness (e.g., Simonin, 1999). Ultimately, the degree to which a piece of knowledge is embedded in its context (interdependence), is made up of multiple interconnected parts (complexity), or is embedded in an individual (tacitness) makes it more difficult to exchange this knowledge but also consequently makes that knowledge more valuable to organizations. It is the very fact that tacit or complex knowledge is difficult to transfer that makes it less likely to spill-over beyond the boundaries of the organization and it is its connection to other knowledge, technology, or contexts in the organization that gives it value.

Despite a tremendous amount of research that has emphasized the importance of tacit knowledge over the last 50 years, most organizations have not successfully incorporated this into their knowledge management strategy (Fahey & Prusak, 1998). I believe that this is based on a number of issues with the conceptualization of tacit knowledge that has become popular among practitioners as well as academics. These problems may make tacit knowledge unapproachable, may focus organizations on a narrow subset of the important knowledge, or may create an excessive focus on codification.¹⁷

The first problem with much of the discussion about tacit knowledge is that examples of tacit knowledge often focus on technical skills that include a component of physical or muscle memory (e.g., riding a bike or kneading dough). Although technical skills are one part of Polanyi's original conception of tacit knowledge (Nonaka, 1991; Polanyi, 1967), these examples are very specific and largely inappropriate for understanding today's knowledge workers—a very small percentage of knowledge work in modern organizations actually includes a significant component of physical / muscle memory. An example that is more generalizable to knowledge-workers since it focuses on the cognitive aspect of Polanyi's concept of tacit knowledge might be a doctor or

¹⁷ These arguments may seem to go beyond what is necessary for my exploration of how the problem solving process and unsolicited / unsought knowledge relate to knowledge characteristics like tacitness. However, explicitly conveying my perspective on what tacit knowledge is may be relevant or clear up confusion for readers that have very different conception for what I argue is an oft misunderstood concept. From my perspective transferring tacit knowledge is about changing recipients' assumptions and other implicitly held beliefs or perspectives—it is not about getting recipients to practice technical skills, helping them understand 'know-how', or about codifying a greater portion of sources' expertise.

nurse. These diagnosticians have to holistically assess situations or patients and make snap judgments based on numerous components of knowledge and long term experience (much of which is accessed unconsciously by them during moments of extreme pressure). Although they do have a number of technical skills that are also relevant (e.g., the ability to give an injection or draw blood without causing pain or creating a bruise) a great deal of what they do is cognitively tacit—they have huge knowledge sets based on extensive study and experience that help them diagnose and treat patients. Focusing too much on physical / muscle memory dependent skills makes tacit knowledge seem overly mysterious and takes it out of the domain of what can be realistically transferred or exchanged interpersonally. On the other hand, recognizing the cognitive dimension of tacit knowledge makes it more tractable—as well as potentially transferrable between individuals, albeit with difficulty (e.g., doctors and nurses are trained via extensive theory-based learning as well as practical experience / practice working with other more expert individuals).

A second related problem stems from the common differentiation of “know-what”, “know-how”, or “know-why” (e.g., Kogut & Zander, 1992; Cohen & Sproull, 1996; Moingeon & Edmondson, 1996) since these perspectives often assume that know-how equates to tacit knowledge. I propose that frameworks which rely too heavily on a ‘know-how equals tacit knowledge’ assumption are quite limiting. It should be easy for readers to think of simple processes with corresponding written step-by-step instructions that are obviously non-tacit know-how and, conversely, to imagine immensely complex know-what that would obviously fit into the conception of tacit

knowledge we have been describing. The know-how equals tacit assumption has come from the recognition that there are many things that people do that become rote—like the diagnostician immediately knowing what to do if a patient suddenly goes into heart failure—and thus are (or become) tacit. However, this perspective can lead to an overly narrow focus on know-how and might make organizations believe they have ‘solved the tacit knowledge challenge’ so long as they have some programs focused on codifying routines and other forms of know-how. Recognizing the core embeddedness of tacit knowledge in individuals and contexts is much more valuable than presuming that all know-how is tacit (and that only know-how is tacit).

The final problem is an almost universal use of the iceberg analogy to help appreciate tacit knowledge (e.g., Nonaka 1991, 1994; Nonaka & Takeuchi, 1995). This analogy suggests that tacit knowledge often resides below the surface of a person’s awareness—only a small amount of a person’s knowledge (the figurative tip of the iceberg) is above the surface, visible, explicit, and codified (the rest is below the surface and is non-codified for various reasons—inability, inattention, or undesirability). This tends to focus organizations and individuals on getting a greater portion of the iceberg above the surface by spending more time and effort codifying or otherwise recording that knowledge. An alternative analogy which focuses more on the cognitive dimension of tacit knowledge is that of a “stagelight”. In his original arguments establishing the tacit knowledge construct Polanyi (1966) argued: “suppose that tacit thought forms an indispensable part of all knowledge, then the ideal of eliminating all personal elements of knowledge, would, in effect, aim at the destruction of all knowledge” (p. 20). Thus

knowledge only exists in its interpretation within an individual's cognitive schema and perspectives—it does not truly exist outside of individuals. The “stagelight” metaphor is based on the idea that each audience member sees the stage in a different way, they each focus on different aspects of the scene playing out in front of them. This perspective of tacit knowledge assumes that knowledge is tacit because it is embedded, to some extent inextricably, in individuals' mental models, schemas, perspectives, and past experiences – we each learn a piece of knowledge in our own way and put our own spin on it. By recognizing that tacitness is not something to overcome via codification we can shift our attention to much more important, albeit more involved, matters like facilitating the exchange or transfer of this type of knowledge: “Tacit knowledge cannot be ‘captured’, ‘translated’, or ‘converted’ but only displayed, manifested, in what we do. New knowledge comes about not when the tacit becomes explicit, but when our skilled performance—our praxis—is punctuated in new ways through social interaction.” (Tsoukas, 2003, p.410). Thus sources can attempt to help recipients see their situation, context, or problem differently on the basis of the source's tacit understanding and differing perspectives (Mcdermott, 1999). From this angle, codification is not a goal but codifiability / articulability may be a proxy for the tacitness of knowledge that measures how difficult it is to convey knowledge in spoken or written forms.

Novelty

I have already spent a fair amount of time / space in this paper introducing the perspective on novelty I am putting forth (see for example sections: “Source-Initiated Knowledge Exchanges” and “Relationships in Knowledge Exchanges” for reminders). At

the most basic level, I have argued that knowledge and ideas are not fundamentally different from one another and that non-redundant (i.e., novel) knowledge and ideas are core to successful knowledge exchanges, transfers, or recombinations. The remaining argument that the novelty of knowledge can be considered on a continuum is a logical extension of this view and is consistent with research that has argued the importance of breaking with dichotomous constructs of newness (e.g., Green et al., 1995). Given that novelty is inherently a relative construct it needs to be compared to something or someone. One of the most common perspectives of novelty or relative 'newness' is that of familiarity (e.g., Danneels & Kleinschmidt, 2001) which describes the relative similarity vs. difference of new knowledge in comparison to other knowledge recipients have been exposed to in the past or that they currently possess. This is consistent with innovation literature that looks at the incremental-radical continuum as well as the perspective of non-redundant knowledge in the knowledge exchange literature.

KNOWLEDGE CHARACTERISTICS & EXCHANGES

Knowledge Characteristics & Initiation

As I highlighted in the introduction it seems that literature that looks at source-initiated forms of knowledge exchange avoid the term knowledge preferring instead terms like ideas or advice. This might suggest that knowledge is somehow different in source-initiated exchanges. It is unclear exactly how these differences will manifest

themselves if indeed any differences exist. However, this is discussed more below under unsolicited / unsought knowledge and exchanges.

- **Hypothesis 3-1:** Knowledge will exhibit different characteristics (novelty, tacitness, complexity) depending on whether it is shared or transferred in source-initiated vs. recipient-initiated exchanges.

Knowledge Characteristics & The Problem-Solving Process

Although tacit knowledge and tacit assumptions come into play at all phases of the problem solving process, nowhere are they more important than in problem formulation. “Problem formulation, as a process taking place over a period of time, involves first sensing the existence of a problem, then identifying contributing factors and, finally, reaching a definition of the problem” (Lyles & Mitroff, 1980, p.104). People’s assumptions are made concrete or explicit in their problem formulations: their apprehension of opportunities or knowledge gaps, their supposition of boundary conditions, their intuitive beliefs about underlying causes and relevant issues to be considered—all these assumptions both guide and constrain individuals’ further problem-solving processes:

“According to Puccio, et al., (2007), sensing gaps was about purposefully becoming aware of intuition, your hunches and your ‘gut feelings’ and choosing to act on them. In essence, this refers to our innate ability to recognize that something ‘is missing’ or ‘not adding up’ without being able to explain how this conclusion was reached. The capacity to identify gaps is reinforced by experience, i.e. experts are more able to perform this function, and this suggests that unconscious processing of

tacit knowledge is an essential element.” (Francisco & Burnett, 2008, p.243)

A quote I commonly use when teaching creativity helps highlight the degree to which tacit assumptions contained in problem formulation affect the rest of the process: “a well-packed question carries its answer on its back as a snail carries its shell” (Stephens, 1923 p. 64). The implicit assumptions contained in a problem’s formulation shape the solutions that are possible—problems and solutions are two, inseparable sides of the same coin. Indeed, it turns out to be exceptionally difficult for people to change these assumptions, to change their minds about these tacitly held beliefs (Kiesler, 1971; Mitroff, 1974, Lyles & Mitroff, 1980). All of this leads me to believe that problem knowledge is especially tacit (and thus very difficult to transfer but at the same time especially important in organizations).

- **Hypothesis 3-2:** Problem knowledge will be more tacit than solution knowledge.

Knowledge Characteristics & Unsolicited / Unsought Knowledge

In the introduction I presented the concept of unknown-unknowns. Although there are many frameworks of ignorance one of the most relevant to this discussion was proposed by Kerwin (1993). Kerwin proposed a 2x2 with meta-level (known vs. unknown) against primary-level (knowns vs. unknowns) thus creating 4 types of ignorances / knowledge: known-knowns, known-unknowns, unknown-knowns, and unknown-unknowns. The unknown meta-ignorance column of the 2x2 describes cases where a person does not know what they know or do not know. In this column, unknown-knowns are used to describe a person’s tacit knowledge (i.e., “we know more

than we can tell” - Polanyi). Unknown-unknowns on the other hand describe people’s blind spots—their tacit assumptions about what they know, what they need to know, and what they don’t need to know. These are examples of ignorance that are extremely difficult to resolve and are usually only recognized in hindsight (Bammer & Smithson, 2008) or via the insights of others (Argyris, 1977). Thus challenging unknown-unknowns via knowledge exchange will likely involve a fair amount of source’s tacit knowledge as it seeks to change recipient’s tacit assumptions. Building on my arguments that unsolicited / unsought knowledge may be more likely to resolve unknown-unknowns this would suggest that unsolicited / unsought knowledge is also more likely to be tacit and that unsolicited / unsought exchanges are more likely to be tacit.

- **Hypothesis 3-3a:** Unsolicited / unsought exchanges will be more tacit than solicited / sought exchanges.
- **Hypothesis 3-3b:** Unsolicited / unsought problem-solving knowledge will be more tacit than solicited / sought knowledge.

The resolution of unknown-unknowns inherently requires the recognition of a heretofore unidentified knowledge gap that is novel for recipients. On the other hand exchanges that involve the resolution of known-unknowns involve a previously recognized and likely familiar knowledge gap. Carrying the argument further, it is unclear whether or not this means that unknown-unknowns involve knowledge that is inherently more novel than known-unknowns. The arguments made previously under convergence-divergence may suggest that each problem, opportunity, or knowledge gap allows for a subset of novel solutions and thus might suggest that a novel

knowledge gap / problem may open up the exploration of an even more novel solution space. Thus unsolicited / unsought exchanges and unsolicited / unsought knowledge may inherently involve knowledge that is more novel to recipients.

- **Hypothesis 3-3c:** Unsolicited / unsought exchanges will include more novel knowledge than solicited / sought exchanges.
- **Hypothesis 3-3d:** Unsolicited / unsought problem-solving knowledge will be more novel than solicited / sought knowledge.

Knowledge Characteristics Interaction With Unsolicited / Unsought Knowledge

As discussed above under the topics of relationships, tie strength, and shared-understanding it is one thing for a person to be exposed to knowledge during an exchange, another for them to be motivated to engage in the exchange, and quite another for them to possess the capacity to understand and learn the knowledge they are exposed to. In addition, I have shown that unsolicited / unsought exchanges and unsolicited / unsought knowledge seem to trigger recipients' resistance to sources' provided knowledge. Combining these two factors together is likely to make recipients resistance even stronger. Recipients can more easily discard knowledge that is tacit, difficult to demonstrate, or seemingly ambiguous to those who don't understand it. Tacit knowledge is more likely to directly attack their implicitly held beliefs requiring potentially unpleasant change and adaptation if accepted. On the other hand, when unsolicited / unsought knowledge can be easily codified / articulated it might be much clearer that this knowledge provides value and the knowledge may be easier to act on.

Finally, it may be more difficult for initially resistant recipients to argue with or reject well articulated, codifiable knowledge.

- **Hypothesis 3-4a:** Unsolicited / unsought exchanges will be perceived to be less useful when the exchange involves more tacit knowledge.
- **Hypothesis 3-4b:** Unsolicited / unsought problem-solving knowledge will be perceived to be less useful when it is tacit.

Implicit in the discussions made thus far in this paper is the assumption that unsolicited / unsought knowledge is more likely to resolve unknown-unknowns (and thus potentially to be more novel). However, in many instances when sources provide unsolicited / unsought knowledge it might be redundant with knowledge already processed or considered and rejected by recipients. For example, a commonly researched scenario regarding physicians' unsolicited / unsought knowledge involves advice for patients to stop smoking. In today's health-conscious society, it is nearly impossible for individuals to not realize the negative health consequences of smoking (at least in the United States). Thus unsolicited / unsought knowledge supporting the advice to quit smoking is likely not novel—if a patient continues to smoke they do so after having decided to ignore available knowledge regarding the negative consequences of smoking. Similarly in organizations a great deal of unsolicited / unsought knowledge may have already been considered and consequently rejected by recipients for one reason or another. On the other hand a great deal of unsolicited / unsought knowledge may already be possessed by a recipient—they may already have incorporated that knowledge into their knowledge set and thus may not have had a

need for the knowledge provided by recipients. This redundant or familiar knowledge would fall under the heading of known-knowns while considered and rejected knowledge would fall under heading of 'irrelevancies' in the taxonomies of knowledge and ignorance (Bammer & Smithson, 2008). If some amount of unsolicited / unsought knowledge is redundant or familiar then this knowledge should be of relatively low value. Thus I believe that only when unsolicited / unsought knowledge is novel will it actually be useful.

- **Hypothesis 3-4c:** Unsolicited / unsought exchanges will be perceived to be more useful when the exchange involves more novel knowledge.
- **Hypothesis 3-4d:** Unsolicited / unsought problem-solving knowledge will be perceived to be more useful when it is novel.

SECTION 3: METHODS

SAMPLE & PROCEDURE

The survey format and procedure as well as the sample are the same as described in Study 1.

ITEMS & SCALES

Dependent Variables

Exchange Usefulness. Computed as described in Study 1 (Cronbach's $\alpha = 0.88$).

Recipient Engagement. Computed as described in Study 1 (Cronbach's $\alpha = 0.87$).

Mediators / Dependent Variables

Tacit Exchange. Items to measure tacit knowledge were developed based on past theorizing in various relevant papers as well as existing scales of tacit knowledge (e.g., Hansen, 1999; Hansen et al., 2005; Reagans & McEvily, 2003). The final scale started with the instructions: “The information, knowledge, or ideas that I shared/provided (or tried to share/provide) during the interaction...” which was followed by three items “Was (or could have been) easily articulated”, “Was (or could have been) explained without too much effort”, and “Was (or could have been) conveyed in writing with little difficulty” which was combined with items that started with the instructions: “The information, knowledge, or ideas that [NAME] shared/provided (or tried to share/provide) during the interaction...” which was followed by “Was (or could have been) easily articulated”, “Was (or could have been) explained without too much effort”, and “Was (or could have been) conveyed in writing with little difficulty”. Table 29 shows the results from a principle components exploratory factor analysis with a direct oblimin rotation. Since items designed to measure tacitness of source’s knowledge and recipient’s knowledge loaded together, this scale seemingly described a ‘Tacit Exchange’. Items in this scale loaded onto one factor (Factor 1) with Cronbach’s $\alpha = .88$.

Complex Exchange. Items to measure complex knowledge were developed based on past theorizing in various relevant papers as well as adapted versions of existing scales of interdependent / dependent knowledge (e.g., Hansen, 1999). The final scale started with the instructions: “The information, knowledge, or ideas that I

shared/provided (or tried to share/provide) during the interaction...” which was followed by two items: “Had many interrelated / interdependent components or steps” and “Was very complex / complicated”. This was combined with items that started with the instructions: “The information, knowledge, or ideas that [NAME] shared/provided (or tried to share/provide) during the interaction...” followed by “Had many interrelated / interdependent components or steps” and “Was very complex / complicated”. Table 29 shows the results from a principle components exploratory factor analysis with a direct oblimin rotation. Since items designed to measure complexity of source’s knowledge and recipient’s knowledge loaded together, this scale seemingly described a ‘Complex Exchange’. Items in this scale loaded onto one factor (Factor 3) with Cronbach’s $\alpha = .82$.

Novelty to Recipient. Items to measure novel knowledge were developed based on past theorizing in various relevant papers as well as existing scales of innovation novelty / familiarity (e.g., Danneels & Kleinschmidt, 2001). The final scale started with the instructions: “The information, knowledge, or ideas that I shared/provided (or tried to share/provide) during the interaction...” which was followed by two items: “Was much different than what [NAME] had experience with in the past” and “Was quite novel to [NAME]”. Table 29 shows the results from a principle components exploratory factor analysis with a direct oblimin rotation. Items in this scale loaded onto one factor (Factor 2) with Cronbach’s $\alpha = .82$.

Independent Variables

Knowledge Sought Problem-to-Solution. Computed as described in Study 1.

Knowledge Sought Generation-to-Feedback. Computed as described in Study 1.

Knowledge Provided Problem-to-Solution. Computed as described in Study 1.

Knowledge Provided Generation-to-Feedback. Computed as described in Study 1.

Controls

Company Dummy Variables. Computed as described in Study 1.

Functional Area Dummy Variables. Computed as described in Study 2.

Age. Computed as described in Study 2.

Education. Computed as described in Study 2.

Years at Job (Logged). Computed as described in Study 2.

Years at Company (Logged). Computed as described in Study 2.

Years in Industry (Logged). Computed as described in Study 2.

Climate for Collaboration & Creativity. Computed as described in Study 2.

(Cronbach's $\alpha = .86$).

Judgmental Climate. Computed as described in Study 2. (Cronbach's $\alpha = .72$).

Intrinsic Motivation. Computed as described in Study 2. (Cronbach's $\alpha = 0.80$).

Identification Motivation. Computed as described in Study 2. (Cronbach's $\alpha = .83$).

Positive Social Motives. Computed as described in Study 2. (Cronbach's $\alpha = .89$).

Negative Social Motives. Computed as described in Study 2. (Cronbach's $\alpha = .88$).

Extrinsic Rewards. Computed as described in Study 2. (Cronbach's $\alpha = .90$).

Loss of Unique Value. Computed as described in Study 2. (Cronbach's $\alpha = .88$).

Greater Expertise Source. Computed as described in Study 1.

Organization in Flux. Computed as described in Study 2.

Anxious About Future. Computed as described in Study 2.

Interaction ID. Computed as described in Study 1.

Interaction Days Ago. Computed as described in Study 1.

Interaction Duration (Logged). Computed as described in Study 1.

Interaction Group Size. Computed as described in Study 1.

Strong Ties. Computed as described in Study 1 (Cronbach's $\alpha = .80$).

Relationship Length (Logged). Computed as described in Study 1.

Physical Proximity. Computed as described in Study 1.

Formal Organizational Proximity. Computed as described in Study 1.

Higher Rank Source. Computed as described in Study 1.

Recipient Sought All (Avg). Computed as described in Study 1 (Cronbach's $\alpha = .63$).

Source Provided All (Avg). Computed as described in Study 1 (Cronbach's $\alpha = .62$).

Feedback Valence. Computed as described in Study 1 (Cronbach's $\alpha = .63$).

Subject Initiated Exchange. Computed as described in Study 1.

Recipient-initiated exchange. Computed as described in Study 1.

Subject Searcher Dummy. Computed as described in Study 1.

Subject Sharer Dummy. Computed as described in Study 1.

Novelty to Source. Items to measure novel knowledge were developed based on past theorizing in various relevant papers as well as existing scales of innovation novelty

/ familiarity (e.g., Danneels & Kleinschmidt, 2001). The final scale started with the instructions: “The information, knowledge, or ideas that I shared/provided (or tried to share/provide) during the interaction...” which was followed by two items: “Was much different than what I had experience with in the past” and “Was quite novel to me”.

Table 29 shows the results from a principle components exploratory factor analysis with a direct oblimin rotation. Items in this scale loaded onto one factor (Factor 4) with Cronbach’s $\alpha = .81$.

ANALYSES

Exploratory factor analysis was conducted for all items designed to measure knowledge characteristics (e.g., source tacit knowledge, recipient tacit knowledge, source complex knowledge, recipient complex knowledge, source knowledge novel to recipient, recipient knowledge novel to source) since these scales had not been included together in exactly these forms in a survey before. These results are reported in table 29 and the convergent validity of these scales was further confirmed by the high Cronbach alpha reliabilities reported above under each variable’s description. Items designed to measure tacit knowledge of sources and recipients loaded together to create a tacit exchange scale while complex knowledge of sources and recipients loaded together to create a complex exchange scale. The novelty of sources knowledge to recipients is clearly consistent with my prior discussion regarding novelty. In addition as a control I measured the degree to which recipient’s knowledge was novel to sources. To some extent this could be considered to be the novelty of the problem to sources, however, I do not distinguish the type of knowledge in the problem solving process so I simply refer

to this as 'Recipient Knowledge Novel to Source' and use it as a control in most of my analyses.

[Insert Table 29 About Here]

HYPOTHESIS TESTING

Knowledge Characteristics & Initiation

To test Hypotheses 3-1 about knowledge characteristics across source vs. recipient initiation, I did a simple T-test comparison of tacit exchange, complex exchange, source knowledge novelty to recipient, and recipient knowledge novelty to source for source initiated vs. recipient initiated knowledge exchanges. These results are displayed in table 30. Although there are no mean differences across recipient- and source-initiated exchanges there is significantly more variance in the tacitness of recipient-initiated exchange. Despite this significant variance difference, results generally contradict hypothesis 3-1; I find no evidence that knowledge exhibits different characteristics between recipient and source initiation. Obviously this study measures a limited set of knowledge characteristics, however, the lack of differences found due to source- vs. recipient-initiation in part 1 and part 2 of this dissertation when combined with these results suggests that initiation is likely a poor predictor of knowledge characteristics.

Hypothesis 3-1: Knowledge will exhibit different characteristics (novelty, tacitness, complexity) depending on whether it is shared or transferred in source-initiated vs. recipient-initiated exchanges. **[Not Supported]**

[Insert Table 30 About Here]

Knowledge Characteristics & Unsolicited / Unsought Knowledge

To test Hypotheses 3-3a I conducted a series of hierarchical regression analyses that looked at whether or not unsolicited / unsought exchanges were more tacit. As I have argued tacitness is relative and likely perceived differently by recipients vs. sources (for one party in the exchange knowledge could be quite commonplace or obvious while for the other it could be extremely difficult to articulate or understand). Thus this analysis was done from a recipient's perspective (sample of first reasonable recipient interactions) so that we could understand their perception of tacitness. Step 1 including controls for company, recipient characteristics, exchange characteristics, relationship characteristics, and a dummy variable for recipient-initiated exchange. Step 2 added centered main effects for overall providing and seeking and Step 3 included the unsolicited exchange interaction term. Step 4 and Step 5 are included as robustness tests. Step 4 added a control for negative feedback while Step 5 added controls for other knowledge characteristics (source knowledge novelty to recipients, recipient knowledge novel to sources, and complexity).

Results in table 31 model 5 show some evidence for hypothesis 3-3a after controlling for other knowledge characteristics of the exchange. Figure 38 is based on table 31 model 5 and suggests that when seeking is low (as is the case in unsolicited / unsought exchanges) exchanges involve a greater degree of tacitness. Although interaction effects are not significant, the marginally significant main effect of recipient overall seeking on tacitness provides some weak support for the hypothesis.

Hypothesis 3-3a: Unsolicited / unsought exchanges will be more tacit than solicited / sought exchanges. **[Weakly Supported]**

[Insert Figure 38 About Here]

[Insert Table 31 About Here]

To test Hypotheses 3-2 and 3-3b I conducted a series of hierarchical regression analyses that looked at how the problem-solving process and unsolicited knowledge in the process corresponded to exchange tacitness. Analysis was again done from a recipient's perspective (sample of first reasonable recipient interactions). Step 1 including controls for company, recipient characteristics, exchange characteristics, relationship characteristics, and a dummy variable for recipient-initiated exchange. Step 2 added centered main effects for problem-to-solution (test of hypothesis 3-2) and generation-to-feedback seeking and providing and Step 3 included unsolicited knowledge interaction terms (test of hypothesis 3-3b). Step 4 and step 5 are included as robustness tests as described previously.

Results in table 32 model 2 and figure 39 showed that seeking problem knowledge is associated with more tacit exchanges confirming hypothesis 3-2. Results in model 3-5 did not support hypothesis 3-3b. There was no evidence that unsolicited knowledge was more tacit. Other interesting results included the fact that the amount of time a person has been at their job reduces the apparent tacitness of the exchange, the degree to which the organization is going through flux / change increases the tacitness of exchanges, longer exchanges are more tacit, and complex knowledge is positively related to tacitness. Finally, seeking generation was also marginally associated

with greater exchange tacitness (possibly suggesting that divergence is associated with tacitness more generally).

Hypothesis 3-2: Problem knowledge will be more tacit than solution knowledge.

[Supported]

Hypothesis 3-3b: Unsolicited / unsought problem-solving knowledge will be more tacit than solicited / sought knowledge. **[Not Supported]**

[Insert Figure 39 About Here]

[Insert Table 32 About Here]

To test Hypotheses 3-3c I conducted a series of hierarchical regression analyses that looked at how unsolicited exchanges corresponded to the novelty of source's knowledge to recipients. Analysis was again done from a recipient's perspective (sample of first reasonable recipient interactions). Step 1 including controls for company, recipient characteristics, exchange characteristics, relationship characteristics, and a dummy variable for recipient-initiated exchange. Step 2 added centered main effects for overall providing and overall seeking and Step 3 included the unsolicited / unsought exchange interaction term. Step 4 and step 5 are included as robustness tests as described previously.

Contrary to my hypothesis, results in table 33 model 2 and 3 shows that recipient seeking is associated with increased recipient novelty. Figure 40 shows this result graphically and highlights that when seeking is high (as is the case in solicited / sought exchanges) exchanges involve knowledge with a greater degree of novelty for recipients. Although 3-way interaction effects are not significant, the significant main

effect of recipient seeking on novelty is the opposite of what I proposed. One explanation for this result is that unsolicited / unsought exchanges may frequently involve redundant (i.e., familiar or non-novel) knowledge as I have discussed above.

Hypothesis 3-3c: Unsolicited / unsought exchanges will include more novel knowledge than solicited / sought exchanges. **[Not Supported]**

[Insert Figure 40 About Here]

[Insert Table 33 About Here]

To test Hypotheses 3-3d I conducted a series of hierarchical regression analyses that looked at how unsolicited knowledge in the problem-solving process corresponded to the degree to which knowledge was novel to recipients. Analysis was again done from a recipient's perspective (sample of first reasonable recipient interactions). Step 1 including controls for company, recipient characteristics, exchange characteristics, relationship characteristics, and a dummy variable for recipient-initiated exchange. Step 2 added centered main effects for problem-to-solution and generation-to-feedback seeking and providing and Step 3 included unsolicited problem-solving knowledge interaction terms. Step 4 and step 5 are included as robustness tests as described previously.

Consistent with the findings regarding Hypothesis 3-3c but inconsistent with my hypothesis results in table 34 model 4-5 (graphed in figure 41a and 41b) show that unsolicited generation is actually less novel to recipients than solicited generation. Although any explanations are purely conjecture, this would again be consistent with the idea that unsolicited / unsought knowledge is frequently redundant or familiar.

Hypothesis 3-3d: Unsolicited / unsought problem-solving knowledge will be more novel than solicited / sought knowledge. **[Not Supported]**

[Insert Figure 41a-b About Here]

[Insert Table 34 About Here]

Knowledge Characteristics Interaction with Unsolicited / Unsought Knowledge

To test Hypotheses 3-4a I conducted a series of hierarchical regression analyses that looked at how unsolicited / unsought exchanges interacted with exchange tacitness to affect the perceived usefulness of exchanges. Analyses were again done from a recipient's perspective (sample of first reasonable recipient interactions). Step 1 included controls for company, recipient characteristics, exchange characteristics, relationship characteristics, and a dummy variable for recipient-initiated exchange. Step 2 added centered main effects for overall seeking and overall providing as well as for exchange tacitness, Step 3 added two-way interaction terms for unsolicited exchange and exchange tacitness with overall seeking and overall providing, Step 4 added three-way interactions for unsolicited exchange with exchange tacitness. Step 5 and Step 6 are included as robustness tests as described previously.

Results in table 35 model 4 are exhibited in figure 42a-b. Marginally significant results suggested that explicit knowledge was preferred when seeking was low (i.e., in unsolicited / unsought exchanges) while tacit knowledge was preferred when seeking was high (i.e., in solicited / sought exchanges). Although 3-way interaction effects are not significant, the marginal significant main effect of recipient seeking with tacitness

provides support for Hypothesis 3-4a but also goes further to highlight the apparent perceived value of tacit knowledge in particular in solicited / sought exchanges.

Hypothesis 3-4a: Unsolicited / unsought exchanges will be perceived to be less useful when the exchange involves more tacit knowledge. **[Supported]**

[Insert Figure 42a-b About Here]

[Insert Table 35 About Here]

To test Hypotheses 3-4b I conducted a series of hierarchical regression analyses that looked at how unsolicited / unsought knowledge in the problem-solving process interacted with exchange tacitness to affect the perceived usefulness of exchanges. Analyses were again done from a recipient's perspective (sample of first reasonable recipient interactions). Step 1 including controls for company, recipient characteristics, exchange characteristics, relationship characteristics, and a dummy variable for recipient-initiated exchange. Step 2 added centered main effects for seeking and providing for problem-to-solution and generation-to-feedback as well as for exchange tacitness, Step 3 added two-way interaction terms for unsolicited knowledge (both problem-to-solution and generation-to-feedback) and exchange tacitness with seeking and providing, Step 4 added three-way interactions for unsolicited problem-to-solution and generation-to-feedback with exchange tacitness. Step 5 and Step 6 are included as robustness tests as described previously.

Results in table 36 model 4-5 provided partial support for Hypothesis 3-4b by showing that unsolicited generation-to-feedback knowledge is less useful when it is tacit. Graphical results in figure 43a and 43b display the substantial drop in usefulness

for both generation and feedback that is unsolicited / unsought. Apparently tacitness does indeed complicate or further enhance barriers to the exchange of unsolicited / unsought knowledge.

Hypothesis 3-4b: Unsolicited / unsought problem-solving knowledge will be perceived to be less useful when it is tacit. **[Partly Supported – Generation-to-Feedback**

Unsolicited Knowledge]

[Insert Figure 43a-b About Here]

[Insert Table 36 About Here]

To test Hypotheses 3-4c I conducted a series of hierarchical regression analyses that looked at how unsolicited / unsought exchanges interacted with recipient novelty to affect the perceived usefulness of exchanges. Analyses were again done from a recipient's perspective (sample of first reasonable recipient interactions). Step 1 included controls for company, recipient characteristics, exchange characteristics, relationship characteristics, and a dummy variable for recipient-initiated exchange. Step 2 added centered main effects for overall seeking and overall providing as well as for recipient novelty, Step 3 added two-way interaction terms for unsolicited exchange and recipient novelty with overall seeking and overall providing, Step 4 added three-way interactions for unsolicited exchange with recipient novelty. Step 5 and Step 6 are included as robustness tests as described previously.

Results displayed in table 37 model 3-6 and displayed in figure 44a and 44b provide strong support for hypothesis 3-4c and show that recipients found unsolicited /

unsought exchanges to be more useful when these exchanges involved knowledge that was novel to them.

Hypothesis 3-4c: Unsolicited / unsought exchanges will be perceived to be more useful when the exchange involves more novel knowledge. **[Supported]**

[Insert Figure 44a-b About Here]

[Insert Table 37 About Here]

To test Hypotheses 3-4d I conducted a series of hierarchical regression analyses that looked at how unsolicited / unsought knowledge in the problem-solving process interacted with recipient novelty to affect the perceived usefulness of exchanges. Analyses were again done from a recipient's perspective (sample of first reasonable recipient interactions). Step 1 including controls for company, recipient characteristics, exchange characteristics, relationship characteristics, and a dummy variable for recipient-initiated exchange. Step 2 added centered main effects for seeking and providing for problem-to-solution and generation-to-feedback as well as for recipient novelty, Step 3 added two-way interaction terms for unsolicited knowledge (both problem-to-solution and generation-to-feedback) and recipient novelty with seeking and providing, Step 4 added three-way interactions for unsolicited problem-to-solution and generation-to-feedback with recipient novelty. Step 5 and Step 6 are included as robustness tests as described previously.

Results displayed in table 38 model 3-6 and displayed in figure 45a-b provide partial support (i.e., generation-to-feedback) for hypothesis 3-4d. Recipients found unsolicited / unsought feedback and generation to be more useful when it was novel. In

addition, solicited generation was perceived to be more useful when it was novel but, somewhat surprisingly, solicited feedback was less useful when it was novel.

Hypothesis 3-4d: Unsolicited / unsought problem-solving knowledge will be perceived to be more useful when it is novel. **[Partly Supported – Generation-to-Feedback**

Unsolicited Knowledge]

[Insert Figure 45a-b About Here]

[Insert Table 38 About Here]

SECTION 3: DISCUSSION

This final section of the dissertation revealed some interesting results. First the problem side of the problem-to-solution continuum seems to be associated with more tacit knowledge (and indeed the generation side of the generation-to-feedback continuum is also marginally more tacit possibly suggesting that all divergent knowledge is somewhat more tacit). When interpreted in combination with the previous results regarding higher expertise sources, this suggests that experts' tacit knowledge is blocked in part due to people's tendency not to seek problem knowledge from experts, experts tendency to provide unsolicited problem knowledge, and recipients' low level of receptivity to unsolicited problem knowledge.

Results also showed that knowledge characteristics were not predicted by initiation. Obviously this study measures a limited set of knowledge characteristics, however, the lack of differences found due to source vs. recipient initiation in part 1 and part 2 of this dissertation when combined with these results suggests that initiation is also likely a poor predictor of knowledge characteristics. There was weak evidence that

unsolicited / unsought exchanges were more tacit however, this was not supported for the unsolicited / unsought knowledge in the problem-solving process. In addition, contradicting my propositions, unsolicited / unsought exchanges and unsolicited / unsought knowledge in the problem-solving process seemed to be more familiar / less novel.

As I discussed above, sources must perceive recipients' knowledge gaps / needs in order to offer unsolicited / unsought knowledge or initiate unsolicited / unsought exchanges. Unfortunately, despite the potential value of these exchanges to resolve valuable unknown-unknowns there is also likely a substantial amount of 'noise' and possibly less 'signal' in these exchanges (i.e., they are likely somewhat less accurate than solicited / sought instances where recipients have explicitly defined their need). A great deal of unsolicited / unsought knowledge may already be possessed by a recipient (i.e., they may have already incorporated the knowledge into their knowledge set) or may have already been considered and consequently rejected by recipients for one reason or another. This suggests that it is especially important to look at how unsolicited / unsought exchanges and knowledge are perceived when it is novel vs. familiar.

Next results revealed interesting interaction effects between tacitness and unsolicited / unsought exchanges or knowledge. Unsolicited / unsought exchanges and knowledge are both less useful when tacit. It seems that either the difficulty of transferring tacit knowledge or the depth with which tacit assumptions are inextricably embedded in recipients combines with the natural resistance people seem to exhibit to unsolicited / unsought knowledge to create even larger barriers to its transfer.

Finally, results provided strong support for the hypothesis that unsolicited / unsought knowledge is preferred when it is novel or unfamiliar to recipients. When combined with the previous results that showed that unsolicited / unsought knowledge is typically less novel, this is a very important finding that helps highlight the decreased signal to noise inherent in trying to resolve unknown-unknowns. A great deal more research needs to be done to look at knowledge exchanges and the resolution of unknown-unknowns but this provides a start.

The paper contributes in several ways to a variety of research streams. First it breaks down the apparent barrier between past literatures that looks at recipient-initiated exchanges: knowledge search-transfer (e.g., Hansen, 1999) and source-initiated exchanges: advice giving-taking (e.g., Swol & Sniezek, 2005) or innovation championing-adopting (e.g., Howell & Higgins, 1990). In addition, it refutes several of the apparent assumptions in these literatures by showing that initiation is a poor proxy for problem recognition or solicited / sought vs. unsolicited / unsought knowledge as well as a poor predictor of recipient and/or source engagement. Second, it contributes to the knowledge exchange / transfer literature by building on a groundbreaking but sparse stream of research (e.g., Cross & Sproull, 2004) that shows that solutions are not the only, or even the primary, form of knowledge exchanged in organizations. It furthers the arguments made in this research stream by integrating creative problem solving (e.g., Isaksen, Dorval, Treffinger, 1994) and knowledge search-transfer to contextualize knowledge-exchanges within an overall problem-solving process. Finally, this dissertation provides several practitioner takeaways and actionable advice.

DISSERTATION DISCUSSIONS / CONCLUSIONS

Ultimately this dissertation hopes to contribute to research at the intersection of organizational learning (OL) and innovation. My foundational perspective that “a well functioning learning organization should be able to effectively and efficiently resolve both known-unknowns as well as unknown-unknowns and it does this in large part by organizing for and motivating various types of knowledge flows throughout the networks of its members.” highlights my belief that learning (i.e., the resolving of ignorance) is ultimately what drives change and innovation in organizations. By approaching OL from an emergent, bottom-up perspective that focuses on knowledge-exchange interactions, I attempt to understand when, how, and why knowledge exchanges may resolve either known-unknowns or unknown-unknowns and how the overall system of exchanges can be designed to do this effectively and efficiently. Finally, given the particular difficulty and barriers to resolving unknown-unknowns as well as the status-quo-altering, assumption-busting nature of doing so, my efforts are particularly focused on identifying knowledge exchanges that potentially resolve unknown-unknowns.

In my quest to identify knowledge exchanges with the potential to resolve unknown-unknowns I look first to the literature which seems to suggest that source-initiated ‘push’ exchanges are more likely to resolve unknown-unknowns (e.g., as sources champion innovations or otherwise offer unsolicited / unsought ideas or advice). However, contrary to past literatures’ assumptions, my results show that recipients were no more likely to have recognized their knowledge need or gap, be open

to knowledge, or be actively searching for knowledge in recipient-initiated exchanges. This result when combined with the similar levels of source and recipient effort / engagement, similar extent to which sources provide knowledge, and similar characteristics of knowledge exchanged across source- and recipient-initiated exchanges, seems to suggest that initiation is not particularly relevant for differentiating the type of knowledge exchange (or more precisely whether an exchange may resolve unknown-unknowns).

In order to further explore the types of exchanges that may potentially resolve unknown-unknowns, I introduce the concept(s) of unsolicited / unsought exchanges (i.e., cases where recipients were not seeking any knowledge prior to an exchange) and, furthermore, suggest that the recipient's problem-solving process is relevant for contextualizing knowledge exchanges and thus understanding unsolicited / unsought knowledge (i.e., knowledge that comes from different phases of the problem-solving process than that which was sought). Results showed that recipients are less engaged and perceive exchanges to be less useful when they are unsolicited / unsought. Furthermore, recipients are less engaged and perceive exchanges to be less useful when they involve certain types of unsolicited knowledge (i.e., problems or solutions). This apparent barrier is similar to that which we would expect when an exchange corresponded to unknown-unknowns. However, this requires further exploration since it is also possible that unsolicited / unsought knowledge is legitimately less useful and thus deserving of less effort and engagement on the part of recipients.

Additional results looking at initiation as a moderator suggested that the perceived usefulness of unsolicited / unsought knowledge is subjective (thus possibly suggesting that unsolicited / unsought knowledge may have underappreciated value for some organizational members). These results seem to suggest that although initiation does not create a truly different form of knowledge exchange it does create a specific social psychological context that can affect recipients' receptivity to some types of unsolicited / unsought knowledge (i.e., recipients are more open to unsolicited / unsought knowledge when they initiated the exchange). Additional support for the argument that the value of unsolicited / unsought knowledge is subjective is found in the motivational analyses in section 2. These results show that recipients with different motivational states are likely to be more receptive to certain forms of unsolicited / unsought knowledge. For example, recipients with high intrinsic or positive introjection motives are equally as engaged when presented with either solicited / sought or unsolicited / unsought problem knowledge. Somewhat stronger evidence that unsolicited / unsought knowledge may have real value was found in the results that showed higher-performing recipients were more engaged when receiving unsolicited / unsought problem or solution knowledge and found this knowledge to be more useful than their lower performing counterparts. Although alternative explanations exist (and thus further exploration / confirmation is required), it seems likely that there may be performance benefits to being more open to unsolicited / unsought knowledge. Collectively this highlights the fact that although unsolicited / unsought knowledge is generally perceived to be less useful and is ordinarily met with lower levels of recipient

engagement, it is unclear whether this is productive or unproductive on the part of recipients. There are some indications that it might be more productive for recipients to be more receptive to unsolicited / unsought knowledge but more work needs to be done to assess this.

Finally, results in section 3 shed further light on the relationship between unsolicited / unsought knowledge and unknown-unknowns. The fact that unsolicited / unsought generation knowledge is actually less novel than solicited / sought generation knowledge is extremely interesting and runs counter to the assumption that unsolicited / unsought knowledge is related to the resolution of unknown-unknowns. This seems to suggest that a great deal of unsolicited / unsought knowledge would actually be redundant with knowledge already possessed by recipients. If a source encounters some knowledge that he/she believes is useful to a colleague because it is highly relevant to their work it is very likely that the colleague already encountered that same knowledge previously. In this case unsolicited / unsought knowledge would correspond to known-knowns and would be indicative of noise or inefficiencies in the overall knowledge exchange system. However, it is equally as plausible that unsolicited / unsought knowledge may relate to knowledge a prospective recipient was already exposed to but which they discarded or decided to ignore. In this case although the knowledge is familiar it may indeed propose to resolve an error, incorrect assumption, or other type of known- or unknown-unknown. Finishing out this discussion the additional results that show that unsolicited / unsought knowledge is more useful when it is novel suggest a surprising openness to truly resolving unknown-unknowns in the organizations sampled.

Again more needs to be done to assess this result in conjunction with the primary results that unsolicited / unsought knowledge is generally less useful as well as the result that unsolicited / unsought knowledge that is tacit is perceived to be less useful.

In addition to the primary goal of uncovering exchanges that are likely to resolve unknown-unknowns this dissertation also puts forth the argument that different exchanges may do this more efficiently than others. Even if source-initiated knowledge exchanges are no more likely to resolve unknown-unknowns they still play a very important role in creating an efficient overall knowledge exchange system. It is unrealistic for searchers to approach all potential transferors when seeking knowledge so they must be able to broadcast a knowledge need / gap and then count on their colleagues to provide knowledge when and if it becomes available. Although this research did not directly reveal any efficiency benefits, it did show that solicited generation knowledge exchanged during source-initiated exchanges is perceived by recipients to be especially useful. However, this is another area that requires further examination. Results in section 2 found that intrinsic motivation was the most significant predictor of proactive source knowledge sharing and this was followed by extrinsic motivation. Unexpectedly, social motives were less significant overall, possibly contradicting the idea that proactive knowledge sharing is always a form of prosocial behavior. I discussed this and other potential future directions for motivation research in the conclusion of section 2.

In order to explore unsolicited / unsought knowledge across both recipient- and source-initiated knowledge exchanges, I introduced the problem-solving process as a

way to provide a broader context in which to consider knowledge exchanges. This represents a very important contribution in its own right that highlights how traditional innovation championing- adoption style exchanges (i.e., unsolicited / unsought exchanges) can be considered in the same framework as traditional knowledge search-transfer (e.g., solicited / sought exchanges). The exploration and results throughout this paper suggest that this perspective is valuable and that the problem-solving process can help us understand where recipients are cognitively when they are involved in a knowledge-exchange interaction. In particular the problem-solving process framework helps highlight ways in which both recipient- and source-initiated exchanges can frequently include unsolicited / unsought knowledge. It also has very important implications for examining how people solve problems and seek out knowledge as well as how knowledge exchanged affects recipients' move from ambiguity / flexibility to closure / constraint. However, the way that people solve problems is quite complex and more work needs to be done to look at unsolicited / unsought knowledge within the problem-solving process. For example, although unsolicited / unsought knowledge that shifts people along the problem-to-solution axis of the problem-solving process seems to be universally rejected or blocked, unsolicited / unsought knowledge that shifts people along the generation-to-feedback axis is only perceived to be less useful in some specific cases (e.g., in source-initiated exchanges).

The 'story' regarding higher-expertise sources explored in section 2 suggests some important practitioner takeaways and shows the value of many of the different arguments / perspectives put forth throughout this paper. First, by showing that

expertise interacts with initiation in a very different way than it does unsolicited / unsought exchanges I provide more evidence of the orthogonality of these constructs. However, the real take away is in the fact that recipients are no more likely to engage experts in earlier stages of the problem-solving process, that experts are more likely to provide unsolicited problem knowledge, that recipients are not receptive to this unsolicited problem knowledge (find it less useful than other forms of knowledge shared by experts), and that problem knowledge is more tacit than solution knowledge. This set of results highlights a very important barrier to the transfer of tacit knowledge from higher-expertise sources that is consistent with conversations I have had with R&D managers in a number of companies (both those in this sample and others). Although problem knowledge is exceptionally important to generating creative / innovative solutions to problems, recipients are unlikely to engage others, in particular higher-expertise others, as they formulate problems. It is difficult and a little threatening to approach sources with ill-defined problems or opportunity spaces. This is a chronic problem in creativity training—people simply don't spend sufficient time on problem formulation—that is compounded in this situation by the fact that people don't like to be pushed "backwards" in the problem-solving process. Experts have something important to add to discussions about problem formulations but this knowledge is not being received and optimally leveraged in organizations.

FUTURE RESEARCH

In many ways this dissertation represents a purposeful and significant departure from existing theory, research design, and practice in the area knowledge search-

transfer and innovation championing-adoption. As such it reveals at least as many unanswered questions as it resolves and opens up many more potential paths for future follow-up research.

First, the largely insignificant effects of source vs. recipient initiation might support the premise put forth in section 1 that many exchanges are mutually or coincidentally initiated in modern organizations. Research could further explore this by looking at how and why an exchange occurred, how it was triggered, and how source and recipient became aware of the opportunity for a knowledge exchange. Closely related to this, research could explore the extent to which an exchange was truly unsolicited / unsought by differentiating recipients awareness of the knowledge need, their openness to knowledge relevant to the need, and their active search efforts prior to the exchange. These factors are combined in this research design but if they were differentiated this might highlight the impact of recipients' problem recognition separate from their active and/or passive search for knowledge.

Another topic that was touched on but not explored completely was the efficiency aspect of knowledge exchanges / organizational learning. It might be necessary to use simulations or modeling based on the data in this research and follow-up research in order to assess these types of systemic effect. For example, in this research I measured the effect of various aspects of organizational climate and motives on the frequency with which people engage in proactive sharing as well as searching, I measured how these same factors affect recipients' receptivity to unsolicited / unsought knowledge, I measured recipients' tendency to seek certain types of knowledge, and

sources' tendency to provide unsolicited / unsought knowledge from different parts of the problem-solving process. If these parameters were put into a computer simulation it could reveal interesting results highlighting the impacts of various organizational design and climate factors on organizational learning and innovation. Transactive memory systems (TMS) offer one of the most holistic or systemic perspectives of knowledge exchange. However, these systems tend to exclusively focus on how knowledge can be stored and accessed most efficiently. For example, although the information allocation aspect of TMS highlights cases where knowledge is proactively shared with others throughout the organization, this is really a case of transferring knowledge to other more relevant sources not potential recipients. TMS does not really take into account instances where knowledge can be shared with those that leverage that knowledge and thus seems insufficient to model the systemic effects of proactive knowledge sharing.

The problem-solving process and its corresponding ambiguity / flexibility and closure / constraint continuums also has the potential to make significant contributions to research on Need for Closure (NFC - Kruglanski & Webster, 1996) and the Paradox of Choice (PoC - Schwartz, 2002). These research streams have typically relied on experimental evidence so the exploration of knowledge exchanges within the problem-solving process in real-world organizational settings can significantly enhance the generalizability of findings. In addition there is a subtle difference between these two research streams, with each making normative assumptions but in different directions. NFC tends to assume that people avoid ambiguity and require closure (and suggests that this is not always optimal behavior since people may make decisions too quickly). On

the other hand the PoC assumes that people are frequently fearful of invalidity or making mistakes and thus prefer complete information (and highlights that this is not always optimal behavior since people may require too much information to make decisions). Part of the difference comes from NFC's argument that people tend to "freeze" and thus may refuse to recognize a new problem, knowledge need, or gap. Conversely, PoC assumes that satisficers make rapid decisions because they can easily start the process over and thus continuously improve or adapt. Further expanding on the problem-solving process perspective I have proposed here can help resolve this disagreement by studying individuals that fear ambiguity, desire closure, desire full information, and fear invalidity and examining how these individuals behave in knowledge exchanges.

This perspective can also help us better understand the resistance of recipients when faced with traditional innovation champions. Unsolicited / unsought exchanges effectively require prospective recipients to move from a place of closure to a point of uncertainty and ambiguity by acknowledging the existence of a problem or knowledge gap where none was recognized previously. This is the most significant move to the left in the problem-solving process since it effectively moves all the way from a validated solution (complete closure) to problem formulation (highest ambiguity). In addition to accepting the existence of the problem, a successful unsolicited / unsought exchange requires that recipients accept the proposed solution to this newly formulated problem. This effectively requires that they skip the search for other alternatives, or that they otherwise move rapidly past all divergent problem-solving paths, to accept the solution

put forth by the knowledge source as the single best solution to the proposed problem. Thus resistance on the part of recipients to unsolicited / unsought exchanges may be based on their intolerance for ambiguity as well as their fear of invalidity. This is truly a “double whammy” since individuals that are highly intolerant of ambiguity and have high need for closure may be very resistant to acknowledge a new problem, while information maximizers and those low in need for closure may be very resistant to being forced to choose a solution without fully considering all their options. Again, more work needs to be done to assess these propositions but the problem-solving process as a framework for knowledge exchanges allows these types of analyses to be completed.

Another promising avenue for future research is carrying forward the problem-solving process through acceptance finding. This could help identify source-initiated exchanges that are not fully altruistic and instead highlight true innovation championing / diffusion examples. This would also incorporate the “legitimacy” knowledge type highlighted in Cross and Sproull (2004). Finally, future research can look at exchanges that involve multiple types of knowledge in conjunction. For example an unsolicited / unsought exchange may explicitly formulate the relevant problem or can simply assume its existence by proposing a solution. It might be that exchanges are more successful when sources make an effort to highlight and collaboratively formulate the problem instead of jumping directly to the solution. On the other hand, providing disagreeing feedback may be valuable when an alternative solution is proposed (and may be less useful when it is not accompanied by alternative solution formulation).

The final area that deserves more research is the connection between unsolicited / unsought knowledge and unknown-unknowns. As I highlighted above, unsought / unsolicited knowledge seems to offer the greatest potential for resolving unknown-unknowns. However, the “signal to noise” ratio is still unclear—it is unclear how much unsolicited / unsought knowledge does indeed resolve unknown-unknowns vs. how much corresponds to known-unknowns, known-unknowns, or even unknown-knowns. This ultimately comes down to a question of why the exchange or knowledge is unsolicited. For example, an unrecognized need / gap can correspond to unknown-unknowns, while a need / gap that was identified but previously rejected as unworthy of pursuit because of lack of available solutions might be a known-unknown. On the other hand exchanges that involve known-knowns—knowledge that is already possessed by recipients and thus redundant—highlight instances of unsolicited / unsought knowledge that are “noise” and that reduce the efficiency of the whole OL system. However, it seems natural that unsolicited / unsought knowledge would sometimes miss the mark (this is the nature of unsolicited / unsought knowledge) but questions remain what signal to noise ratio is acceptable or what is the best we can expect. Indeed even in the case of accurately recognized unknown-unknowns there must be an optimal amount of ignorance that can be addressed at one time by an individual or organization. We all have literally thousands if not millions of ignorances that we are unaware of possessing and a highly effective unsolicited / unsought knowledge-exchange climate might identify too many of these for us to handle at once. Alternatively, it might be preferable for

these all to turn into known-unknowns so that they can be prioritized and addressed in turn.

This brings up a final area that I have identified for future research: the intersection of learning and innovation. I have presented a view of the world that sees learning and innovation to be two sides of the same coin, however, this is a departure from much of the literature, which sees these as largely-separate domains. Although I have highlighted the potential for examining the systematic resolution of ignorances as a worthy focus for OL research, I have still not directly answered the question on how resolving unknown-unknowns may drive innovation in organizations. At a micro level this is partly about understanding how learning is involved in the process of innovation adoption. At a systemic level this is about understanding how learning, resolving ignorance, and shifting perspectives is critical to organizational change and innovation. This is a topic that is salient to R&D and innovation-focused companies. Indeed a recent project I am working on looks at how and why companies are integrating their knowledge management and innovation strategy offices. This is a final area that I believe could benefit from additional research—if we can better understand the complex interplay of learning and innovation, we can potentially enhance both in organizations.

TABLES

Table 1: Primary Survey Response Rate

Company ID	Sampled	Respondents (Usable)	Response Rate	Percent of Sample
1	332	214	64%	17%
2	198	129	65%	10%
3	324	283	87%	22%
4	1,899	667	35%	52%
Total	2,753	1,293	47%	100%

Table 2: Exchange Survey Response Rate

Company ID	Sampled	Respondents (Usable)	Response Rate	Usable Interactions		Percent of Sample
1	332	197	59%	A	196	27%
				B	N/A	
2	198	56	28%	A	55	14%
				B	49	
3	324	135 ¹⁸	42%	A	134	37%
				B	133	
4	1,899	155	8%	A	155	21%
				B	N/A	
Total	2,753	543	20%	722		100%

¹⁸ For company 3, although there are only 134 useable interaction A's and 133 useable interaction B's there are 135 total respondents that provided these interactions. This suggests that at least 1 subject provided complete/valid data for interaction B but incomplete/invalid data for interaction A while at least 2 subjects provided reasonable data for interaction A but not for B.

Table 3: Exchange Survey Sub-Sample Sizes

	Company 1	Company 2	Company 3	Company 4	Total Sample
All Exchanges	196	104	267	155	722
Reasonable Exchanges (Based on recall lag and duration)	190	97	258	142	687
First Reasonable Exchange (One exchange per subject)	190	53	135	142	520
First Reasonable Recipient Exchange (Subject is Recipient)	78	40	105	62	285
First Reasonable Source Exchange (Subject is Source)	80	47	111	80	318
First Reasonable Pull Exchange (Recipient-Initiated Exchange)	85	44	116	80	325
First Reasonable Push Exchange (Source-Initiated Exchange)	73	30	94	62	259
First Reasonable Searcher Exchange (Subject is Proactive-Recipient)	39	25	68	40	172
First Reasonable Transferor Exchange (Subject is Reactive-Source)	46	36	81	40	203
First Reasonable Sharer Exchange (Subject is Proactive-Source)	34	18	54	40	146
First Reasonable Acceptor Exchange (Subject is Reactive-Recipient)	39	18	55	22	134

Table 4: Correlations Seeking & Providing Maximum & Average

		Mean	S.D.	1.	2.	3.
1.	Recipient Sought All Avg	4.94	1.02			
2.	Recipient Sought All Max	5.86	0.94	0.680 ***		
3.	Source Provided All Avg	5.15	0.94	0.592 ***	0.356 ***	
4.	Source Provided All Max	5.91	0.85	0.373 ***	0.512 ***	0.640 ***

Notes: † $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$

Table 5: Knowledge Seeking in Problem Solving Process MDS Stress

	Seeking			Providing		
	1 Dim	2 Dim	3 Dim	1 Dim	2 Dim	3 Dim
Stress-I	0.13992	0.01112	0.00433	0.18674	0.00974	0.00752
Stress-II	0.30782	0.04746	0.14823	0.44936	0.04497	0.20589
S-Stress	0.07535	0.00053	0.00008	0.13372	0.00032	0.00023

Table 6: Counts of Observations in PSxGF Quadrants or Along Axis

	Recipient Sought (Obs Count)	Source Provided (Obs Count)
Problem Generation Quadrant	80	75
Problem Feedback Quadrant	78	68
Solution Generation Quadrant	51	35
Solution Feedback Quadrant	57	51
Problem or Solution Generation	21	20
Problem or Generation Feedback	39	40
Problem Generation or Feedback	34	27
Solution Generation or Feedback	17	16
All Non 0,0 First Reasonable Exchanges	377	332
All First Reasonable Exchanges	475	476

Table 7: Exchange Engagement & Outcomes Factor Analysis

Rotated Component Matrix(a)				
		Factor		
		1	2	3
Recipient Engagement	I was wholeheartedly involved in the interaction	0.95	-0.01	0.04
	I was truly engaged in the interaction	0.93	-0.02	0.01
	I was really enthusiastic about the interaction	0.75	0.06	-0.09
Exchange Usefulness	was (or will be) extremely helpful for me	-0.03	0.95	-0.01
	was (or will be) exceptionally useful to me	0.04	0.93	0.01
Source Engagement	NAME was truly engaged in the interaction	-0.07	0.03	-0.94
	NAME was wholeheartedly involved in the interaction	-0.02	-0.01	-0.93
	NAME was really enthusiastic about the interaction	0.15	0.00	-0.78
	Eigenvalues:	4.297	1.229	1.043
% of Variance Explained:		54%	15%	13%
Cumulative % of Variance Explained:		54%	69%	82%

Notes: I arbitrarily chose an example where subject was the recipient for these examples of item full text

Table 8: Dependent Variables & Mediators for Perceived Self vs. Perceived Other

	Subject Recipient Dummy		Subject Source Dummy	
	n = 219		n = 268	
	Mean	StdDev	Mean	StdDev
Engagement Recipient	5.80	.77 *	5.72	.95 *
Engagement Source	5.72	.95	5.82	.81
Usefulness Recipient	5.26	1.10	5.17	1.02

Table 9: Knowledge Seeking/Providing Source-Initiated vs. Recipient-Initiated

	Source-Initiated Exchange		Recipient-Initiated Exchange	
	n = 204		n = 273	
	Mean	StdDev	Mean	StdDev
Recipient Sought New Problem	5.0	1.5 **	4.8	1.6 **
Recipient Sought Problem Feedback	5.2	1.4	5.1	1.4
Recipient Sought New Solution	4.9	1.4	4.9	1.4
Recipient Sought Solution Feedback	4.9	1.4	4.8	1.5
Recipient Sought All Max	5.8	1.0	5.9	.9
Recipient Sought All Avg	5.0	1.0	4.9	1.0
Recipient Sought Problem to Solution Knowledge	-.4	2.2	-.2	2.3
Recipient Sought Generation to Feedback Knowledge	.2	2.8	.2	3.1
Source Provided New Problem	5.2 †	1.3 †	5.0 †	1.5 †
Source Provided Problem Feedback	5.4	1.2	5.3	1.3
Source Provided New Solution	5.1	1.4	5.0	1.4
Source Provided Solution Feedback	5.2	1.3	5.0	1.4
Source Provided All Max	6.0	.7 **	5.9	.9 **
Source Provided All Avg	5.2 †	.9 †	5.1 †	1.0 †
Source Provided Problem to Solution Knowledge	-.3	2.2	-.3	2.1
Source Provided Generation to Feedback Knowledge	.3	2.7	.4	2.7
Unsolicited (SeekXProv Max)	.3	1.4	.5	1.9
Unsolicited (SeekXProv Avg)	.5	1.3	.6	1.5
Unsolicited (SeekXProv PS)	1.6	8.0	2.2	8.2
Unsolicited (SeekXProv GF)	3.4	13.1 *	5.3	16.2 *

Table 10: Unsolicited Exchange Regression Results**Table 10a: Recipient Engagement****Dependent Variable: Recipient Engagement**

Variables	Model 1		Model 2		Model 3		Model 4		Model 5	
	B	S.E.	B	S.E.	B	S.E.	B	S.E.	B	S.E.
(Constant)	4.88 ***	0.59	4.87 ***	0.60	5.28 ***	0.56	5.09 ***	0.56	5.36 ***	0.58
Company 2 Dummy	0.10	0.15	0.10	0.15	-0.06	0.14	-0.12	0.14	-0.12	0.14
Company 3 Dummy	0.01	0.11	0.01	0.11	-0.08	0.10	-0.12	0.10	-0.12	0.10
Company 4 Dummy	-0.15	0.11	-0.15	0.11	-0.20 *	0.10	-0.20 *	0.10	-0.19 †	0.10
IntID	0.18	0.47	0.18	0.47	0.22	0.44	0.28	0.44	0.20	0.44
Interaction Days Ago	0.01	0.00	0.01	0.00	0.01 †	0.00	0.01 †	0.00	0.01 †	0.00
Interaction Duration Log	-0.02	0.05	-0.02	0.05	-0.05	0.04	-0.04	0.04	-0.04	0.04
Interaction Group Size	-0.06	0.09	-0.06	0.09	-0.10	0.09	-0.11	0.09	-0.11	0.09
Strong Ties	0.13 **	0.04	0.13 **	0.04	0.12 **	0.04	0.12 **	0.04	0.12 **	0.04
Relationship Length (logged years)	-0.04	0.04	-0.04	0.04	-0.05	0.03	-0.04	0.03	-0.04	0.03
Higher Rank Source	0.03	0.03	0.03	0.03	0.01	0.03	0.01	0.03	0.01	0.03
Greater Expertise Source	-0.03	0.03	-0.03	0.03	-0.05 †	0.03	-0.04	0.03	-0.05 †	0.03
Formal Organizational Distance	0.07 *	0.04	0.07 †	0.04	0.06 †	0.03	0.06 †	0.03	0.06 †	0.03
Physical Distance	0.03	0.02	0.03	0.02	0.03	0.02	0.03	0.02	0.03	0.02
Recipient-Initiated Exchange			0.03	0.08	0.05	0.08	0.05	0.08	-0.09	0.11
Recipient Sought All Max (cent)					0.22 ***	0.05	0.25 ***	0.05	0.24 ***	0.05
Source Provided All Max (cent)					0.17 **	0.05	0.24 ***	0.06	0.26 ***	0.06
Unsolicited (SeekXProv Max)							0.10 ***	0.03	0.10 ***	0.03
Subject-Initiated Exchange									-0.22 †	0.12
Subject Searcher Dummy									0.26	0.17

R Square	0.04		0.04		0.16		0.18		0.19	
Adjusted R Square	0.01		0.01		0.13		0.15		0.15	
R Square Change	0.04		0.00		0.12 ***		0.03 ***		0.01	
F Change	1.38		0.15		30.90 ***		14.12 ***		1.67	

Table 10b: Exchange Usefulness**Dependent Variable: Exchange Usefulness (to Recipient)**

Variables	Model 1		Model 2		Model 3		Model 4		Model 5	
	B	S.E.	B	S.E.	B	S.E.	B	S.E.	B	S.E.
(Constant)	3.12 ***	0.70	3.08 ***	0.70	3.42 ***	0.67	3.19 ***	0.66	3.41 ***	0.69
Company 2 Dummy	0.56 **	0.17	0.55 **	0.17	0.33 *	0.17	0.26	0.17	0.26	0.17
Company 3 Dummy	0.36 **	0.13	0.36 **	0.13	0.27 *	0.12	0.22 †	0.12	0.22 †	0.12
Company 4 Dummy	0.12	0.13	0.12	0.13	0.09	0.12	0.09	0.12	0.10	0.12
IntID	0.20	0.55	0.20	0.55	0.22	0.53	0.28	0.52	0.22	0.52
Interaction Days Ago	0.00	0.01	0.00	0.01	0.00	0.01	0.00	0.01	0.00	0.01
Interaction Duration Log	0.14 *	0.05	0.14 *	0.05	0.11 *	0.05	0.12 *	0.05	0.12 *	0.05
Interaction Group Size	0.01	0.11	0.01	0.11	-0.01	0.10	-0.01	0.10	-0.01	0.10
Strong Ties	0.12 *	0.05	0.12 *	0.05	0.12 **	0.05	0.13 **	0.05	0.12 **	0.05
Relationship Length (logged years)	0.01	0.04	0.00	0.04	0.00	0.04	0.00	0.04	0.01	0.04
Higher Rank Source	-0.06	0.04	-0.06	0.04	-0.08 *	0.04	-0.07 *	0.04	-0.08 *	0.04
Greater Expertise Source	0.14 ***	0.03	0.14 ***	0.03	0.11 ***	0.03	0.12 ***	0.03	0.12 ***	0.03
Formal Organizational Distance	0.03	0.04	0.03	0.04	0.02	0.04	0.02	0.04	0.02	0.04
Physical Distance	0.03	0.03	0.04	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Recipient-Initiated Exchange			0.08	0.10	0.13	0.09	0.12	0.09	0.02	0.13
Recipient Sought All Max (cent)					0.05	0.06	0.08	0.06	0.08	0.06
Source Provided All Max (cent)					0.36 ***	0.06	0.44 ***	0.07	0.45 ***	0.07
Unsolicited (SeekXProv Max)							0.11 ***	0.03	0.12 ***	0.03
Subject-Initiated Exchange									-0.18	0.14
Subject Searcher Dummy									0.19	0.20
R Square	0.10		0.10		0.19		0.21		0.22	
Adjusted R Square	0.07		0.07		0.16		0.18		0.18	
R Square Change	0.10 ***		0.00		0.09 ***		0.02 ***		0.00	
F Change	3.74 ***		0.66		24.28 ***		14.14 ***		0.83	

Sample Size: n = 463

Significance Levels: † $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$

Table 11: Unsolicited Exchange by Initiation Regression Results**Table 11a: Recipient Engagement****Dependent Variable: Recipient Engagement**

Variables	Model 1		Model 2		Model 3		Model 4		Model 5	
	B	S.E.	B	S.E.	B	S.E.	B	S.E.	B	S.E.
(Constant)	4.88 ***	0.59	5.31 ***	0.56	5.23 ***	0.56	5.24 ***	0.56	5.38 ***	0.57
Company 2 Dummy	0.10	0.15	-0.06	0.14	-0.12	0.14	-0.12	0.14	-0.12	0.14
Company 3 Dummy	0.01	0.11	-0.08	0.10	-0.10	0.10	-0.10	0.10	-0.10	0.10
Company 4 Dummy	-0.15	0.11	-0.20 *	0.10	-0.19 †	0.10	-0.19 †	0.10	-0.18 †	0.10
IntID	0.18	0.47	0.22	0.44	0.26	0.43	0.25	0.43	0.20	0.44
Interaction Days Ago	0.01	0.00	0.01 †	0.00	0.01 †	0.00	0.01 †	0.00	0.01 †	0.00
Interaction Duration Log	-0.02	0.05	-0.05	0.04	-0.04	0.04	-0.04	0.04	-0.04	0.04
Interaction Group Size	-0.06	0.09	-0.10	0.09	-0.13	0.09	-0.13	0.09	-0.12	0.09
Strong Ties	0.13 **	0.04	0.12 **	0.04	0.11 **	0.04	0.11 **	0.04	0.11 **	0.04
Relationship Length (logged years)	-0.04	0.04	-0.05	0.03	-0.04	0.03	-0.04	0.03	-0.03	0.03
Higher Rank Source	0.03	0.03	0.01	0.03	0.01	0.03	0.01	0.03	0.01	0.03
Greater Expertise Source	-0.03	0.03	-0.05 †	0.03	-0.05 †	0.03	-0.05 †	0.03	-0.06 *	0.03
Formal Organizational Distance	0.07 *	0.04	0.06 †	0.03	0.06 †	0.03	0.06 †	0.03	0.06 †	0.03
Physical Distance	0.03	0.02	0.03	0.02	0.03	0.02	0.03	0.02	0.03	0.02
Recipient Sought All Max (cent)			0.22 ***	0.05	0.25 ***	0.05	0.25 ***	0.05	0.25 ***	0.05
Source Provided All Max (cent)			0.17 **	0.05	0.22 ***	0.06	0.21 ***	0.06	0.23 ***	0.06
Recipient-Initiated Exchange (cent)			0.05	0.08	0.04	0.08	0.02	0.08	-0.09	0.11
Unsolicited (SeekXProv Max)					0.10 ***	0.03	0.09 **	0.03	0.09 ***	0.03
InterPullXLookMax					-0.04	0.09	-0.03	0.10	-0.03	0.10
InterPullXProvMax					0.23 *	0.11	0.27 *	0.12	0.24 *	0.12
InterPullXLookXProvMax							0.05	0.06	0.04	0.06
Subject-Initiated Exchange									-0.17	0.12
Subject Searcher Dummy									0.22	0.17
R Square	0.04		0.16		0.19		0.19		0.20	
Adjusted R Square	0.01		0.13		0.16		0.15		0.16	
R Square Change	0.04		0.12 ***		0.03 ***		0.00		0.00	
F Change	1.38		20.66 ***		6.38 ***		0.69		1.03	

Sample Size: n = 463

Significance Levels: † $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$

Table 11b: Exchange Usefulness**Dependent Variable: Exchange Usefulness (to Recipient)**

Variables	Model 1		Model 2		Model 3		Model 4		Model 5	
	Beta	S.E.	Beta	S.E.	Beta	S.E.	Beta	S.E.	Beta	S.E.
(Constant)	0.00 ***	0.70	0.00 ***	0.67	0.00 ***	0.66	0.00 ***	0.66	0.00 ***	0.67
Company 2 Dummy	0.16 **	0.17	0.10 *	0.17	0.06	0.17	0.06	0.17	0.06	0.17
Company 3 Dummy	0.15 **	0.13	0.11 *	0.12	0.09 †	0.12	0.09 †	0.12	0.09 †	0.12
Company 4 Dummy	0.05	0.13	0.04	0.12	0.03	0.12	0.03	0.12	0.03	0.12
IntID	0.02	0.55	0.02	0.53	0.02	0.51	0.02	0.52	0.01	0.52
Interaction Days Ago	-0.02	0.01	0.00	0.01	0.02	0.01	0.02	0.01	0.02	0.01
Interaction Duration Log	0.12 *	0.05	0.09 *	0.05	0.11 *	0.05	0.11 *	0.05	0.11 *	0.05
Interaction Group Size	0.00	0.11	0.00	0.10	-0.01	0.10	-0.01	0.10	-0.01	0.10
Strong Ties	0.13 *	0.05	0.14 **	0.05	0.12 *	0.05	0.12 *	0.05	0.12 *	0.05
Relationship Length (logged years)	0.01	0.04	0.00	0.04	0.01	0.04	0.01	0.04	0.01	0.04
Higher Rank Source	-0.07	0.04	-0.09 *	0.04	-0.09 *	0.04	-0.09 *	0.04	-0.10 *	0.04
Greater Expertise Source	0.20 ***	0.03	0.16 ***	0.03	0.17 ***	0.03	0.17 ***	0.03	0.16 ***	0.03
Formal Organizational Distance	0.04	0.04	0.03	0.04	0.02	0.04	0.02	0.04	0.03	0.04
Physical Distance	0.06	0.03	0.06	0.03	0.06	0.03	0.06	0.03	0.05	0.03
Recipient Sought All Max (cent)			0.05	0.06	0.06	0.06	0.06	0.06	0.06	0.06
Source Provided All Max (cent)			0.28 ***	0.06	0.35 ***	0.07	0.35 ***	0.07	0.36 ***	0.07
Recipient-Initiated Exchange (cent)			0.06	0.09	0.05	0.09	0.06	0.09	0.01	0.13
Unsolicited (SeekXProv Max)					0.17 ***	0.03	0.17 ***	0.03	0.18 ***	0.03
InterPullXLookMax					-0.16 **	0.11	-0.16 **	0.11	-0.16 **	0.11
InterPullXProvMax					0.10 *	0.13	0.09 †	0.14	0.08	0.14
InterPullXLookXProvMax							-0.02	0.07	-0.02	0.07
Subject-Initiated Exchange									-0.08	0.14
Subject Searcher Dummy									0.09	0.20
R Square	0.10		0.19		0.23		0.23		0.23	
Adjusted R Square	0.07		0.16		0.20		0.20		0.19	
R Square Change	0.10 ***		0.09 ***		0.04 ***		0.00		0.00	
F Change	3.74 ***		16.43 ***		8.18 ***		0.10		0.70	

Sample Size: n = 463

Significance Levels: † $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$

Table 12: Unsolicited Problem Solving Knowledge Regression Results**Table 12a: Recipient Engagement****Dependent Variable: Engagement (Recipient)**

Variables	Model 1		Model 2		Model 3		Model 4		Model 5	
	B	S.E.	B	S.E.	B	S.E.	B	S.E.	B	S.E.
(Constant)	4.87 ***	0.61	3.30 ***	0.60	3.37 ***	0.61	3.18 ***	0.60	3.34 ***	0.62
Company 2 Dummy	0.10	0.15	0.06	0.14	0.08	0.14	0.00	0.14	0.00	0.14
Company 3 Dummy	0.01	0.11	0.01	0.11	0.00	0.11	-0.05	0.11	-0.05	0.11
Company 4 Dummy	-0.15	0.11	-0.21 *	0.10	-0.21 *	0.10	-0.22 *	0.10	-0.21 *	0.10
IntID	0.18	0.48	0.17	0.45	0.17	0.45	0.20	0.45	0.15	0.45
Interaction Days Ago	0.01	0.00	0.01	0.00	0.01 †	0.00	0.01 †	0.00	0.01 †	0.00
Interaction Duration Log	-0.02	0.05	-0.06	0.04	-0.06	0.04	-0.06	0.04	-0.05	0.04
Interaction Group Size	-0.06	0.09	-0.07	0.09	-0.06	0.09	-0.06	0.09	-0.06	0.09
Strong Ties	0.13 **	0.04	0.08 *	0.04	0.08 †	0.04	0.08 †	0.04	0.07 †	0.04
Relationship Length (logged years)	-0.04	0.04	-0.05	0.03	-0.05	0.04	-0.04	0.04	-0.04	0.04
Higher Rank Source	0.03	0.03	0.01	0.03	0.01	0.03	0.01	0.03	0.00	0.03
Greater Expertise Source	-0.03	0.03	-0.03	0.03	-0.03	0.03	-0.03	0.03	-0.04	0.03
Formal Organizational Distance	0.07 †	0.04	0.06 †	0.03	0.06 †	0.03	0.06 †	0.03	0.07 †	0.03
Physical Distance	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Recipient-Initiated Exchange	0.03	0.08	0.06	0.08	0.06	0.08	0.06	0.08	-0.03	0.12
Recipient Sought All Avg			0.20 ***	0.05	0.20 ***	0.05	0.22 ***	0.05	0.22 ***	0.05
Source Provided All Avg			0.07	0.05	0.07	0.05	0.10 †	0.05	0.11 *	0.05
Feedback (Neg to Pos)			0.14 ***	0.04	0.13 ***	0.04	0.12 **	0.04	0.12 **	0.04
ProcLookProbSoluCent					-0.01	0.02	-0.01	0.02	-0.01	0.02
ProcLookGenFeedCent					0.00	0.02	0.00	0.02	0.00	0.02
ProcProvProbSoluCent					-0.01	0.02	-0.02	0.02	-0.02	0.02
ProcProvGenFeedCent					0.02	0.02	0.02	0.02	0.02	0.02
Unsolicited (SeekXProv PS)							0.01 **	0.00	0.02 **	0.00
Unsolicited (SeekXProv GF)							0.00	0.00	0.00	0.00
Subject-Initiated Exchange									-0.16	0.12
Subject Searcher Dummy									0.17	0.17
R Square	0.04		0.16		0.17		0.19		0.19	
Adjusted R Square	0.01		0.13		0.13		0.15		0.15	
R Square Change	0.04		0.13 ***		0.01		0.02 **		0.00	
F Change	1.25		21.61 ***		0.99		4.97 **		0.82	

Sample Size: n = 449

Significance Levels: † $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$

Table 12b: Exchange Usefulness**Dependent Variable: Exchange Usefulness (to Recipient)**

Variables	Model 1		Model 2		Model 3		Model 4		Model 5	
	B	S.E.	B	S.E.	B	S.E.	B	S.E.	B	S.E.
(Constant)	3.08 ***	0.71	1.27 †	0.72	1.28 †	0.72	1.02	0.72	1.15	0.74
Company 2 Dummy	0.55 **	0.18	0.48 **	0.17	0.47 **	0.17	0.36 *	0.17	0.36 *	0.17
Company 3 Dummy	0.36 **	0.13	0.36 **	0.13	0.35 **	0.13	0.30 *	0.13	0.30 *	0.13
Company 4 Dummy	0.12	0.13	0.08	0.12	0.07	0.12	0.06	0.12	0.07	0.12
IntID	0.20	0.56	0.20	0.53	0.20	0.54	0.23	0.53	0.19	0.53
Interaction Days Ago	0.00	0.01	0.00	0.01	0.00	0.01	0.00	0.01	0.00	0.01
Interaction Duration Log	0.14 *	0.05	0.08	0.05	0.08	0.05	0.08	0.05	0.08	0.05
Interaction Group Size	0.01	0.11	0.00	0.10	0.00	0.10	0.01	0.10	0.00	0.10
Strong Ties	0.12 *	0.05	0.07	0.05	0.08	0.05	0.08	0.05	0.07	0.05
Relationship Length (logged years)	0.00	0.04	0.00	0.04	0.00	0.04	0.00	0.04	0.00	0.04
Higher Rank Source	-0.06	0.04	-0.08 *	0.04	-0.08 *	0.04	-0.08 *	0.04	-0.09 *	0.04
Greater Expertise Source	0.14 ***	0.03	0.14 ***	0.03	0.14 ***	0.03	0.13 ***	0.03	0.13 ***	0.03
Formal Organizational Distance	0.03	0.04	0.02	0.04	0.02	0.04	0.02	0.04	0.02	0.04
Physical Distance	0.04	0.03	0.03	0.03	0.03	0.03	0.04	0.03	0.04	0.03
Recipient-Initiated Exchange	0.08	0.10	0.13	0.09	0.13	0.09	0.13	0.09	0.06	0.14
Recipient Sought All Avg			0.08	0.06	0.07	0.06	0.09	0.06	0.09	0.06
Source Provided All Avg			0.26 ***	0.06	0.26 ***	0.06	0.29 ***	0.06	0.30 ***	0.06
Feedback (Neg to Pos)			0.13 **	0.04	0.14 **	0.04	0.12 **	0.04	0.12 **	0.04
ProcLookProbSoluCent					0.00	0.02	0.00	0.02	0.00	0.02
ProcLookGenFeedCent					-0.01	0.02	-0.01	0.02	-0.01	0.02
ProcProvProbSoluCent					0.00	0.02	-0.01	0.02	-0.01	0.02
ProcProvGenFeedCent					0.00	0.02	0.01	0.02	0.01	0.02
Unsolicited (SeekXProv PS)							0.02 **	0.01	0.02 **	0.01
Unsolicited (SeekXProv GF)							0.00	0.00	0.00	0.00
Subject-Initiated Exchange									-0.14	0.15
Subject Searcher Dummy									0.13	0.21
R Square	0.10		0.20		0.20		0.22		0.22	
Adjusted R Square	0.07		0.17		0.16		0.18		0.18	
R Square Change	0.10 ***		0.10 ***		0.00		0.02 **		0.00	
F Change	3.41 ***		18.44 ***		0.12		5.48 **		0.46	

Sample Size: n = 449

Significance Levels: † $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$

Table 13: Unsolicited Problem Solving Knowledge by Initiation Regression Results**Dependent Variable: Exchange Usefulness (to Recipient)**

Variables	Model 1		Model 2		Model 3		Model 4		Model 5	
	B	S.E.	B	S.E.	B	S.E.	B	S.E.	B	S.E.
(Constant)	1.36 †	0.71	1.35 †	0.72	1.21 †	0.72	1.20 †	0.71	1.29 †	0.72
Company 2 Dummy	0.50 **	0.17	0.47 **	0.17	0.33 †	0.17	0.35 *	0.17	0.35 *	0.17
Company 3 Dummy	0.36 **	0.13	0.35 **	0.13	0.31 *	0.13	0.27 *	0.13	0.27 *	0.13
Company 4 Dummy	0.08	0.12	0.07	0.12	0.06	0.12	0.07	0.12	0.08	0.12
IntID	0.19	0.53	0.20	0.54	0.18	0.53	0.11	0.52	0.07	0.53
Interaction Days Ago	0.00	0.01	0.00	0.01	0.00	0.01	0.00	0.01	0.00	0.01
Interaction Duration Log	0.08	0.05	0.08	0.05	0.08	0.05	0.08	0.05	0.08	0.05
Interaction Group Size	-0.01	0.10	0.00	0.10	0.01	0.10	0.04	0.10	0.04	0.10
Strong Ties	0.07	0.05	0.08	0.05	0.07	0.05	0.08	0.05	0.07	0.05
Relationship Length (logged years)	0.00	0.04	0.00	0.04	0.00	0.04	0.00	0.04	0.00	0.04
Higher Rank Source	-0.07 *	0.04	-0.08 *	0.04	-0.08 *	0.04	-0.08 *	0.04	-0.08 *	0.04
Greater Expertise Source	0.14 ***	0.03	0.14 ***	0.03	0.13 ***	0.03	0.13 ***	0.03	0.13 ***	0.03
Formal Organizational Distance	0.02	0.04	0.02	0.04	0.02	0.04	0.02	0.04	0.02	0.04
Physical Distance	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Recipient Sought All Avg	0.08	0.06	0.07	0.06	0.10 †	0.06	0.10 †	0.06	0.09	0.06
Source Provided All Avg	0.25 ***	0.06	0.26 ***	0.06	0.29 ***	0.06	0.28 ***	0.06	0.29 ***	0.06
Feedback (Neg to Pos)	0.13 **	0.04	0.14 **	0.04	0.12 **	0.04	0.13 **	0.04	0.13 **	0.04
ProcLookProbSoluCent			0.00	0.02	-0.01	0.02	0.00	0.02	0.00	0.02
ProcLookGenFeedCent			-0.01	0.02	-0.01	0.02	-0.02	0.02	-0.02	0.02
ProcProvProbSoluCent			0.00	0.02	-0.01	0.02	0.00	0.02	0.00	0.02
ProcProvGenFeedCent			0.00	0.02	0.00	0.02	0.00	0.02	0.00	0.02
Recipient-Initiated Exchange (cent)			0.13	0.09	0.14	0.09	0.22 *	0.10	0.15	0.14
Unsolicited (SeekXProv PS)					0.02 **	0.01	0.02 **	0.01	0.02 **	0.01
Unsolicited (SeekXProv GF)					0.00	0.00	0.01 *	0.00	0.01 *	0.00
InterPullXLookPS					-0.02	0.05	-0.02	0.05	-0.01	0.05
InterPullXLookGF					0.07 †	0.04	0.08 *	0.04	0.08 *	0.04
InterPullXProvPS					0.05	0.05	0.04	0.05	0.03	0.05
InterPullXProvGF					-0.06	0.04	-0.04	0.04	-0.03	0.04
InterPullXLookXProvPS							0.01	0.01	0.01	0.01
InterPullXLookXProvGF							-0.03 ***	0.01	-0.03 ***	0.01
Subject-Initiated Exchange									-0.15	0.15
Subject Searcher Dummy									0.13	0.20
R Square	0.20		0.20		0.23		0.26		0.26	
Adjusted R Square	0.17		0.16		0.18		0.21		0.21	
R Square Change	0.20 ***		0.00		0.03 *		0.03 ***		0.00	
F Change	6.67 ***		0.47		2.66 *		8.18 ***		0.60	

Sample Size: n = 449

Significance Levels: † $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$

Table 14: Unsolicited Problem Solving Knowledge by Recip. Performance Regression Results

Table 14a: Recipient Engagement

Dependent Variable: Recipient Engagement

Variables	Model 1		Model 2		Model 3		Model 4	
	B	S.E.	B	S.E.	B	S.E.	B	S.E.
(Constant)	4.15 ***	0.97	3.69 ***	1.03	3.51 **	1.11	3.61 **	1.05
IntID	-0.06	0.20	0.01	0.21	-0.02	0.23	0.00	0.22
Interaction Days Ago	0.02	0.01	0.02	0.01	0.02	0.01	0.02 †	0.01
Interaction Duration Log	0.05	0.08	0.05	0.08	0.04	0.09	0.04	0.09
Interaction Group Size	0.26	0.23	0.19	0.24	0.25	0.27	0.18	0.25
Strong Ties	0.03	0.11	0.05	0.12	0.08	0.13	0.08	0.12
Relationship Length (logged years)	-0.01	0.09	-0.01	0.09	0.02	0.10	0.02	0.10
Higher Rank Source	-0.05	0.09	-0.04	0.10	-0.05	0.10	-0.05	0.10
Greater Expertise Source	-0.10	0.08	-0.07	0.08	-0.08	0.09	-0.06	0.08
Formal Organizational Distance	-0.08	0.09	-0.08	0.09	-0.07	0.09	-0.09	0.09
Physical Distance	0.04	0.07	0.04	0.07	0.04	0.07	0.04	0.07
Recipient Sought All Avg	0.02	0.14	0.08	0.15	0.09	0.16	0.08	0.15
Source Provided All Avg	0.22	0.14	0.16	0.15	0.20	0.16	0.16	0.15
Feedback (Neg to Pos)	0.11	0.11	0.14	0.12	0.10	0.14	0.14	0.13
Recipient-Initiated Exchange	-0.07	0.21	-0.12	0.22	-0.08	0.23	-0.04	0.22
ProcLookProbSoluCent			-0.03	0.05	-0.03	0.06	-0.09	0.06
ProcLookGenFeedCent			0.00	0.05	0.01	0.05	0.01	0.05
ProcProvProbSoluCent			-0.05	0.05	-0.05	0.06	-0.04	0.05
ProcProvGenFeedCent			0.01	0.05	0.01	0.06	0.02	0.05
Recipient Emp Perf (cent)			0.01	0.17	0.04	0.18	0.24	0.20
Unsolicited (SeekXProv PS)					0.00	0.01	-0.01	0.01
Unsolicited (SeekXProv GF)					0.01	0.01	0.01	0.02
RecipEmpPerfXLookPS					-0.07	0.09	-0.06	0.09
RecipEmpPerfXLookGF					0.02	0.08	0.03	0.08
RecipEmpPerfXProvPS					0.04	0.12	0.05	0.11
RecipEmpPerfXProvGF					0.03	0.08	0.00	0.08
RecipEmpPerfXLookXProvPS							-0.05 **	0.02
RecipEmpPerfXLookXProvGF							-0.01	0.02
R Square	0.19		0.23		0.25		0.35	
Adjusted R Square	0.04		0.01		-0.05		0.06	
R Square Change	0.19		0.04		0.02		0.10 *	
F Change	1.25		0.63		0.32		4.77 *	

Sample Size: n = 105

Significance Levels: † $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$

Table 14b: Exchange Usefulness**Dependent Variable: Exchange Usefulness (to Recipient)**

Variables	Model 1		Model 2		Model 3		Model 4	
	B	S.E.	B	S.E.	B	S.E.	B	S.E.
(Constant)	2.78 *	1.28	2.37 †	1.35	2.03	1.43	2.12	1.39
IntID	0.26	0.26	0.27	0.27	0.26	0.29	0.28	0.29
Interaction Days Ago	0.02	0.02	0.01	0.02	0.01	0.02	0.01	0.02
Interaction Duration Log	0.11	0.11	0.07	0.11	0.06	0.11	0.05	0.12
Interaction Group Size	-0.13	0.30	-0.09	0.31	-0.11	0.34	-0.18	0.33
Strong Ties	-0.10	0.15	-0.04	0.15	-0.01	0.17	-0.02	0.16
Relationship Length (logged years)	0.01	0.11	0.00	0.12	0.02	0.13	0.03	0.13
Higher Rank Source	-0.04	0.12	-0.04	0.13	-0.04	0.13	-0.03	0.13
Greater Expertise Source	-0.05	0.10	-0.08	0.10	-0.09	0.11	-0.08	0.11
Formal Organizational Distance	-0.02	0.12	-0.02	0.12	-0.01	0.12	-0.02	0.12
Physical Distance	0.01	0.09	0.04	0.09	0.05	0.09	0.05	0.09
Recipient Sought All Avg	-0.35 †	0.18	-0.28	0.20	-0.27	0.20	-0.27	0.20
Source Provided All Avg	0.63 ***	0.18	0.53 **	0.19	0.61 **	0.20	0.57 **	0.20
Feedback (Neg to Pos)	0.29 †	0.15	0.38 *	0.16	0.30 †	0.18	0.33 †	0.18
Recipient-Initiated Exchange	-0.10	0.28	-0.10	0.28	-0.09	0.30	-0.04	0.29
ProcLookProbSoluCent			-0.08	0.07	-0.07	0.07	-0.13 †	0.08
ProcLookGenFeedCent			0.00	0.06	0.00	0.06	0.00	0.06
ProcProvProbSoluCent			0.06	0.07	0.06	0.07	0.06	0.07
ProcProvGenFeedCent			-0.07	0.07	-0.03	0.07	-0.03	0.07
Recipient Emp Perf (cent)			0.24	0.22	0.26	0.23	0.46 †	0.26
Unsolicited (SeekXProv PS)					0.01	0.01	0.00	0.01
Unsolicited (SeekXProv GF)					0.02	0.02	0.02	0.02
RecipEmpPerfXLookPS					0.01	0.12	0.02	0.12
RecipEmpPerfXLookGF					-0.04	0.10	-0.03	0.10
RecipEmpPerfXProvPS					-0.03	0.15	-0.03	0.15
RecipEmpPerfXProvGF					0.03	0.10	-0.01	0.11
RecipEmpPerfXLookXProvPS							-0.05 *	0.02
RecipEmpPerfXLookXProvGF							-0.01	0.03
R Square	0.31		0.36		0.39		0.44	
Adjusted R Square	0.18		0.18		0.15		0.19	
R Square Change	0.31 **		0.05		0.03		0.05 †	
F Change	2.39 **		1.01		0.55		2.52 †	

Sample Size: n = 105

Significance Levels: † $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$

Table 15: Motivation and Organization Climate Factor Analysis

Rotated Component Matrix(a)									
		Factor							
		1	2	3	4	5	6	7	8
Climate for Collaboration & Creativity	Creativity is strongly encouraged	0.71	-0.06	-0.01	0.03	0.01	0.05	-0.01	-0.02
	Radically new ideas are appreciated and many are allowed further development	0.69	-0.16	-0.03	0.03	-0.03	-0.04	0.05	-0.13
	Employee risk taking is supported, even if this risk taking leads to failure	0.64	-0.03	-0.02	0.02	-0.08	-0.05	-0.07	-0.06
	People are open to consider a variety of different perspectives	0.62	-0.03	0.01	-0.02	0.05	0.10	-0.03	0.03
	Upper management believes knowledge sharing is a key responsibility of all employees	0.58	0.06	0.01	0.02	0.02	0.10	0.00	0.04
	People are encouraged to spend 'work time' on learning new things	0.58	-0.05	0.04	-0.02	-0.07	-0.06	-0.01	0.03
	People have significant autonomy in determining how they do their job	0.57	0.09	0.02	0.05	0.01	-0.03	-0.03	0.08
	People give credit for others' knowledge or ideas where it is due	0.51	0.01	0.00	-0.04	0.02	0.19	-0.05	0.01
	Flexibility and responsiveness to change is a top priority	0.48	-0.02	-0.02	0.08	-0.02	0.05	0.05	0.00
	Lower my standing in [Org] if what I say challenges the status quo	-0.14	0.74	-0.02	-0.03	0.01	-0.03	-0.03	-0.02
Negative Social Motives	Hurt my prestige in [Org] if my statements threaten the powers that be	-0.11	0.71	0.01	-0.05	0.00	0.04	-0.04	0.02
	Be thought of as less knowledgeable if I show that I don't know something	0.06	0.66	-0.05	-0.01	0.01	0.00	0.10	-0.10
	Weaken my relations with my coworkers if I propose radical or bizarre ideas	0.03	0.64	0.01	0.02	-0.06	-0.09	0.06	-0.16
	Alienate my coworkers if I mention really different or strange ideas	0.02	0.64	0.04	0.01	-0.11	-0.11	0.07	-0.12
	Open myself up to be critiqued if I make a mistake	-0.01	0.57	-0.01	0.01	0.01	0.04	0.17	-0.06
	I really enjoy thinking about difficult questions	0.05	0.09	0.78	-0.05	0.01	-0.05	0.00	0.02
Intrinsic Motivation	One of my main sources of satisfaction comes from working through complicated problems	0.00	0.03	0.76	0.01	-0.05	0.04	0.00	0.03
	I like tasks that challenge my thinking abilities	-0.01	0.02	0.70	0.04	0.04	0.02	-0.03	0.04
	I prefer complex to simple problems	-0.05	-0.06	0.65	0.04	0.00	0.00	0.03	-0.09
Identification Motivation	I feel 'emotionally attached' to [Org]	-0.02	0.06	-0.01	0.86	0.00	0.01	-0.02	0.02
	I feel a strong sense of belonging at [Org]	0.06	-0.09	-0.03	0.79	0.01	0.06	-0.01	0.00
	When someone criticizes [Org], it feels like a personal insult	0.00	-0.04	0.02	0.69	-0.06	-0.06	0.03	-0.05
	When I talk about [Org], I usually say 'we' rather than 'they'	0.05	0.05	0.08	0.53	0.07	0.08	-0.04	0.10
Extrinsic Rewards	Receive compensation or other incentives from [Org]	0.05	0.01	0.01	-0.01	-0.90	0.01	-0.02	0.05
	Gain bonuses or other monetary rewards from [Org]	0.00	0.00	-0.01	0.01	-0.86	0.01	0.02	0.02
Positive Social Motives	Gain respect as my competence is recognized by others	0.04	-0.04	0.02	-0.01	0.02	0.79	-0.05	-0.03
	Strengthen existing relations or create new relations with my peers	0.00	-0.04	0.04	-0.01	0.04	0.76	0.00	0.07
	Be seen as a more knowledgeable expert by others	0.01	0.09	0.01	0.04	0.02	0.73	-0.01	0.04
	Enhance and build relationships with my coworkers	0.08	-0.04	0.01	0.00	0.01	0.72	0.01	0.05
	Increase my prestige in [Org] as my ideas have broader impact	-0.01	-0.02	-0.01	0.00	-0.16	0.70	0.03	-0.06
	Raise my standing in [Org] as my ideas are widely adopted	0.04	-0.05	-0.01	0.05	-0.20	0.64	0.01	-0.07
	People are very critical when others make mistakes	-0.09	-0.09	-0.03	0.04	0.03	0.01	0.85	0.01
Judgmental Climate	People harshly judge those that show they don't know something	0.00	0.11	-0.03	0.03	-0.04	-0.03	0.60	0.00
	People immediately point out the limitations of other people's ideas or contributions	0.05	0.09	0.08	-0.09	0.00	0.01	0.55	0.00
	Become more replaceable since others would possess my knowledge	0.00	0.03	0.03	-0.03	0.06	0.02	0.00	-0.84
Loss of Unique Value	Reduce my unique value since other people will know what I know	-0.03	0.05	0.00	-0.01	0.03	0.03	0.00	-0.81
	Jeopardize my job security since my knowledge becomes less valuable	0.00	0.15	-0.02	-0.02	-0.04	-0.06	-0.01	-0.75
Eigenvalues:		8.515	3.756	2.540	1.686	1.360	1.178	0.863	0.673
% of Variance Explained:		23%	10%	7%	5%	4%	3%	2%	2%
Cumulative % of Variance Explained:		23%	33%	40%	45%	48%	51%	54%	56%

Table 16a: Section 2 Correlations (Part 1 of 5)

	Mean	S.D.	1.	2.	3.	4.	5.	6.	7.	8.	9.
1. Recipient-Initiated Exchange	0.57	0.50									
2. Subject-Initiated Exchange	0.49	0.50	-0.068 †								
3. Company 1 Dummy	0.27	0.45	-0.031	-0.031							
4. Company 2 Dummy	0.14	0.35	0.033	-0.030	-0.250 ***						
5. Company 3 Dummy	0.37	0.48	0.009	-0.013	-0.468 ***	-0.314 ***					
6. Company 4 Dummy	0.21	0.41	-0.007	0.072 †	-0.319 ***	-0.214 ***	-0.401 ***				
7. Customer Service Dummy	0.09	0.29	0.032	-0.037	-0.146 ***	-0.129 ***	-0.245 ***	0.554 ***			
8. Marketing / Sales Dummy	0.16	0.37	-0.041	-0.006	0.216 ***	-0.158 ***	-0.168 ***	0.100 **	-0.139 ***		
9. Research & Development Dummy	0.49	0.50	-0.045	-0.022	-0.158 ***	0.305 ***	0.211 ***	-0.338 ***	-0.309 ***	-0.431 ***	
10. Administration / Support	0.10	0.30	0.010	0.043	0.142 ***	-0.032	-0.242 ***	0.159 ***	-0.107 **	-0.149 ***	-0.330 ***
11. Production / Operations Dummy	0.16	0.36	0.068 †	0.031	-0.005	-0.131 ***	0.276 ***	-0.207 ***	-0.136 ***	-0.189 ***	-0.420 ***
12. Age	5.86	1.85	0.022	-0.001	0.091 *	-0.085 *	0.090 *	-0.131 ***	-0.059	0.007	0.022
13. Education	5.52	1.21	-0.001	-0.019	-0.023	0.291 ***	-0.161 ***	-0.036	-0.066 †	-0.022	0.128 ***
14. Years at Job	1.11	1.08	0.005	-0.004	0.163 ***	-0.049	0.010	-0.144 ***	-0.041	-0.099 **	0.115 **
15. Years at Company	2.44	1.02	0.029	-0.037	0.103 **	-0.322 ***	0.210 ***	-0.083 *	-0.029	0.066 †	-0.057
16. Years in Industry	2.65	1.09	0.010	-0.001	0.126 ***	-0.148 ***	-0.037	0.034	0.038	0.076 *	0.016
17. Collaborative Culture	4.57	0.98	-0.020	0.026	-0.074 *	-0.149 ***	0.043	0.156 ***	0.075 *	-0.025	-0.076 *
18. Judgmental Culture	3.99	1.19	-0.012	-0.027	0.043	0.088 *	-0.114 **	0.012	0.000	-0.009	0.055
19. Intrinsic Motivation	5.70	0.76	-0.048	-0.033	-0.108 **	0.143 ***	-0.022	0.021	-0.008	-0.016	0.051
20. Identification Motivation	5.15	1.16	-0.065 †	0.014	-0.125 ***	-0.086 *	0.127 ***	0.060	-0.001	0.040	-0.130 ***
21. Social Motives Positive	5.19	0.91	0.015	0.022	-0.012	0.048	-0.006	-0.021	0.008	-0.002	-0.035
22. Social Motives Negative	3.74	1.16	0.004	-0.024	0.043	0.002	0.013	-0.064 †	-0.012	-0.032	0.078 *
23. Extrinsic Motivation	2.79	1.45	-0.034	-0.006	0.126 ***	0.049	-0.176 ***	0.028	0.038	-0.044	-0.004
24. Lose Unique Value	2.67	1.19	0.007	-0.038	0.019	0.007	-0.043	0.023	0.046	-0.091 *	0.104 **
25. Organization in Flux	5.76	1.18	0.018	-0.001	0.224 ***	-0.244 ***	-0.080 *	0.061	0.027	0.118 **	-0.139 ***
26. Subject Anxious About Future	4.15	1.77	-0.019	-0.034	0.124 ***	0.009	-0.204 ***	0.098 **	0.069 †	0.044	0.003
27. IntID	1.25	0.43	0.005	-0.064 †	-0.354 ***	0.207 ***	0.434 ***	-0.304 ***	-0.184 ***	-0.152 ***	0.235 ***
28. Interaction Days Ago	10.79	61.04	0.013	-0.053	-0.057	-0.023	-0.025	0.111 **	0.081 *	-0.039	-0.066 †
29. Interaction Duration Log	3.99	1.16	-0.053	-0.004	-0.143 ***	-0.076 *	0.082 *	0.123 ***	0.030	0.012	-0.059
30. Interaction Group Size	1.28	0.47	-0.082 *	-0.053	-0.030	-0.055	-0.015	0.096 **	0.011	0.033	-0.010
31. Strong Ties	4.63	1.21	0.023	0.000	0.026	-0.015	-0.054	0.048	0.048	-0.025	0.025
32. Relationship Length (logged years)	1.07	1.22	0.038	0.069 †	0.208 ***	-0.053	-0.075 *	-0.093 *	-0.065 †	-0.067 †	0.099 **
33. Higher Rank Source	4.04	1.31	0.082 *	0.015	-0.068 †	-0.026	0.084 *	-0.007	0.000	-0.011	0.057
34. Greater Expertise Source	4.49	1.47	0.060	0.024	-0.113 **	-0.006	0.107 **	-0.005	-0.004	-0.011	0.046
35. Formal Organizational Distance	2.43	1.32	-0.031	-0.017	0.004	-0.122 **	0.068 †	0.023	0.033	0.037	-0.187 ***
36. Physical Distance	3.73	1.92	-0.066 †	0.068 †	0.084 *	-0.136 ***	-0.034	0.066 †	0.004	0.136 ***	-0.183 ***
37. Recipient Sought Prob-to-Solu	-0.27	2.28	0.032	-0.047	0.022	0.042	-0.017	-0.038	-0.022	-0.016	-0.004
38. Recipient Sought Gen-to-Feed	0.25	3.01	0.022	0.025	0.054	-0.063	0.027	-0.032	0.051	0.032	-0.045
39. Source Provided Prob-to-Solu	-0.28	2.20	0.005	0.030	0.044	0.037	-0.054	-0.013	0.010	0.020	-0.014
40. Source Provided Gen-to-Feed	0.30	2.73	0.070 †	0.025	0.036	-0.077 *	0.018	0.008	0.045	0.032	-0.062
41. Recipient Sought All Avg	4.93	1.00	-0.019	0.086 *	-0.051	-0.047	0.028	0.060	0.009	0.013	-0.041
42. Source Provided All Avg	5.13	0.92	-0.076 *	0.059	-0.052	0.017	0.004	0.034	-0.011	0.060	-0.047
43. Feedback (Neg to Pos)	4.92	1.15	0.043	0.030	0.026	-0.023	-0.069 †	0.074 †	0.040	0.086 *	-0.097 *
44. Engagement Recipient	5.78	0.88	0.008	-0.006	-0.021	0.058	0.033	-0.068 †	-0.048	-0.006	0.001
45. Usefulness Recipient	5.26	1.05	0.044	-0.008	-0.161 ***	0.073 †	0.119 **	-0.038	-0.050	-0.050	0.055

Notes: † p < .10; * p < .05; ** p < .01; *** p < .001

Table 16b: Section 2 Correlations (Part 2 of 5)

	10.	11.	12.	13.	14.	15.	16.	17.	18.
11. Production / Operations Dummy	-0.145 ***								
12. Age	0.019	-0.006							
13. Education	-0.022	-0.084 *	-0.114 **						
14. Years at Job	0.013	-0.036	0.305 ***	-0.140 ***					
15. Years at Company	-0.011	0.044	0.594 ***	-0.289 ***	0.334 ***				
16. Years in Industry	0.000	-0.129 ***	0.485 ***	-0.114 **	0.234 ***	0.536 ***			
17. Collaborative Culture	0.030	0.047	0.054	-0.105 **	-0.040	0.057	0.018		
18. Judgmental Culture	0.038	-0.098 **	0.018	-0.019	0.051	0.021	0.050	-0.273 ***	
19. Intrinsic Motivation	-0.048	-0.008	-0.069 †	0.227 ***	-0.149 ***	-0.137 ***	0.019	-0.046	0.077 *
20. Identification Motivation	0.051	0.097 **	0.082 *	-0.107 **	0.006	0.149 ***	0.080 *	0.367 ***	-0.128 ***
21. Social Motives Positive	0.012	0.034	-0.079 *	0.132 ***	-0.132 ***	-0.077 *	0.025	0.476 ***	-0.194 ***
22. Social Motives Negative	-0.028	-0.042	0.029	0.044	0.081 *	0.021	-0.018	-0.439 ***	0.471 ***
23. Extrinsic Motivation	0.090 *	-0.055	0.080 *	-0.034	0.085 *	-0.009	0.099 **	0.314 ***	0.076 *
24. Lose Unique Value	0.001	-0.088 *	-0.003	-0.018	0.079 *	-0.034	-0.058	-0.199 ***	0.202 ***
25. Organization in Flux	0.108 **	-0.041	0.177 ***	-0.083 *	0.045	0.141 ***	0.113 **	0.064 †	0.090 *
26. Subject Anxious About Future	0.049	-0.144 ***	-0.080 *	0.069 †	0.059	-0.055	-0.037	-0.288 ***	0.280 ***
27. IntID	-0.154 ***	0.105 **	0.026	0.035	-0.018	-0.003	-0.071 †	-0.023	-0.029
28. Interaction Days Ago	0.079 *	-0.001	0.018	0.004	-0.040	-0.047	-0.047	0.009	0.002
29. Interaction Duration Log	0.007	0.040	0.011	-0.040	-0.045	0.036	0.045	-0.007	-0.009
30. Interaction Group Size	0.009	-0.036	-0.016	0.037	-0.004	-0.006	0.047	-0.054	-0.006
31. Strong Ties	0.022	-0.066 †	0.020	-0.063 †	0.087 *	0.039	0.038	0.075 *	-0.005
32. Relationship Length (logged years)	0.036	-0.048	0.267 ***	-0.098 **	0.327 ***	0.344 ***	0.236 ***	0.067 †	0.019
33. Higher Rank Source	-0.094 *	0.010	-0.044	0.021	-0.007	-0.015	-0.034	0.051	-0.070 †
34. Greater Expertise Source	-0.006	-0.044	-0.034	0.006	0.008	-0.008	-0.070 †	0.005	-0.074 †
35. Formal Organizational Distance	0.064 †	0.138 ***	0.055	0.030	-0.029	0.097 *	0.023	0.008	0.006
36. Physical Distance	0.058	0.063 †	0.045	0.026	-0.005	0.091 *	0.056	-0.013	-0.018
37. Recipient Sought Prob-to-Solu	0.031	0.014	0.008	-0.011	0.082 *	0.001	-0.024	-0.015	-0.010
38. Recipient Sought Gen-to-Feed	-0.051	0.030	0.032	-0.098 *	0.036	0.016	0.024	-0.015	0.013
39. Source Provided Prob-to-Solu	0.001	-0.010	0.000	-0.019	0.030	0.054	0.033	0.019	0.024
40. Source Provided Gen-to-Feed	-0.037	0.046	0.062	-0.059	-0.003	0.051	0.020	0.017	-0.009
41. Recipient Sought All Avg	0.025	0.016	0.018	-0.036	-0.018	-0.008	0.035	0.184 ***	-0.097 *
42. Source Provided All Avg	-0.008	0.021	-0.061	-0.036	0.002	-0.041	-0.006	0.128 ***	-0.033
43. Feedback (Neg to Pos)	0.003	0.014	0.004	-0.033	-0.009	0.033	0.059	0.134 ***	-0.019
44. Engagement Recipient	-0.028	0.067 †	0.119 **	0.057	-0.056	0.023	0.021	0.156 ***	-0.123 **
45. Usefulness Recipient	-0.026	0.035	0.045	-0.013	-0.035	-0.031	-0.018	0.106 **	-0.067 †

Notes: † p < .10; * p < .05; ** p < .01; *** p < .001

Table 16c: Section 2 Correlations (Part 3 of 5)

	19.	20.	21.	22.	23.	24.	25.	26.	27.
20. Identification Motivation	0.127 ***								
21. Social Motives Positive	0.174 ***	0.343 ***							
22. Social Motives Negative	0.013	-0.313 ***	-0.333 ***						
23. Extrinsic Motivation	0.028	0.211 ***	0.373 ***	-0.179 ***					
24. Lose Unique Value	-0.112 **	-0.227 ***	-0.254 ***	0.463 ***	0.002				
25. Organization in Flux	-0.014	0.017	0.043	0.009	-0.034	-0.034			
26. Subject Anxious About Future	-0.041	-0.240 ***	-0.275 ***	0.408 ***	-0.141 ***	0.380 ***	0.151 ***		
27. IntID	0.050	0.040	0.028	-0.003	-0.076 *	-0.027	-0.133 ***	-0.117 **	
28. Interaction Days Ago	-0.009	0.032	-0.049	-0.008	-0.013	0.027	0.022	0.046	-0.010
29. Interaction Duration Log	0.054	0.061 †	0.029	-0.084 *	0.019	-0.062 †	0.051	-0.043	-0.012
30. Interaction Group Size	0.050	-0.005	0.017	-0.016	-0.041	-0.096 *	0.041	-0.007	0.001
31. Strong Ties	-0.030	0.125 ***	0.035	-0.101 **	0.087 *	-0.052	0.023	-0.039	-0.088 *
32. Relationship Length (logged years)	-0.098 **	0.118 **	0.001	-0.029	0.102 **	0.032	0.033	-0.029	-0.057
33. Higher Rank Source	0.018	0.056	0.037	-0.061	-0.011	-0.054	-0.065 †	-0.049	0.054
34. Greater Expertise Source	0.023	0.033	-0.002	0.044	-0.035	-0.010	-0.087 *	-0.030	0.056
35. Formal Organizational Distance	0.023	0.025	-0.015	0.013	-0.082 *	-0.052	0.002	-0.031	0.044
36. Physical Distance	0.012	-0.027	-0.039	0.020	-0.096 **	-0.048	0.044	0.021	-0.020
37. Recipient Sought Prob-to-Solu	-0.017	-0.047	-0.067 †	0.036	-0.079 *	0.009	0.010	0.044	0.024
38. Recipient Sought Gen-to-Feed	-0.074 †	-0.043	0.055	-0.025	-0.047	-0.067 †	-0.006	-0.119 **	0.054
39. Source Provided Prob-to-Solu	-0.023	-0.043	-0.005	0.022	0.000	0.010	-0.013	0.025	0.032
40. Source Provided Gen-to-Feed	-0.082 *	-0.028	0.007	-0.012	-0.034	0.003	0.103 **	-0.035	-0.009
41. Recipient Sought All Avg	0.094 *	0.154 ***	0.194 ***	-0.165 ***	0.106 **	-0.118 **	0.107 **	-0.072 †	-0.016
42. Source Provided All Avg	0.127 ***	0.176 ***	0.196 ***	-0.136 ***	0.141 ***	-0.081 *	0.043	-0.054	-0.037
43. Feedback (Neg to Pos)	0.053	0.121 **	0.177 ***	-0.149 ***	0.082 *	-0.075 †	0.014	-0.067 †	-0.079 *
44. Engagement Recipient	0.140 ***	0.161 ***	0.249 ***	-0.171 ***	0.032	-0.177 ***	0.061	-0.166 ***	0.066 †
45. Usefulness Recipient	0.150 ***	0.100 **	0.105 **	-0.066 †	0.015	-0.024	-0.040	-0.130 ***	0.078 *

Notes: † p < .10; * p < .05; ** p < .01; *** p < .001

Table 16d: Section 2 Correlations (Part 4 of 5)

	28.	29.	30.	31.	32.	33.	34.	35.	36.
29. Interaction Duration Log	0.176 ***								
30. Interaction Group Size	0.072 †	0.207 ***							
31. Strong Ties	-0.018	-0.046	-0.167 ***						
32. Relationship Length (logged years)	-0.005	-0.011	-0.051	0.345 ***					
33. Higher Rank Source	-0.002	-0.048	-0.029	0.050	-0.013				
34. Greater Expertise Source	-0.002	-0.054	-0.042	-0.024	-0.065 †	0.224 ***			
35. Formal Organizational Distance	-0.042	0.076 *	0.173 ***	-0.395 ***	-0.110 **	-0.018	0.033		
36. Physical Distance	-0.060	0.161 ***	0.212 ***	-0.413 ***	-0.070 †	-0.034	-0.033	0.451 ***	
37. Recipient Sought Prob-to-Solu	0.014	-0.056	0.010	0.008	0.007	0.030	-0.019	-0.047	-0.029
38. Recipient Sought Gen-to-Feed	-0.049	-0.077 *	-0.040	0.079 *	0.050	-0.015	-0.076 †	-0.133 ***	0.014
39. Source Provided Prob-to-Solu	0.012	-0.026	-0.039	0.001	0.056	0.009	-0.037	-0.100 *	-0.013
40. Source Provided Gen-to-Feed	-0.039	-0.084 *	-0.077 *	0.075 †	-0.003	0.010	-0.067 †	-0.084 *	0.059
41. Recipient Sought All Avg	-0.044	0.087 *	0.002	0.098 *	0.062	0.084 *	0.002	0.004	-0.022
42. Source Provided All Avg	-0.074 †	0.132 ***	0.002	0.087 *	0.022	0.037	-0.003	0.021	-0.017
43. Feedback (Neg to Pos)	-0.085 *	-0.034	-0.005	0.160 ***	0.056	0.071 †	-0.033	-0.057	-0.006
44. Engagement Recipient	-0.076 *	0.045	-0.005	0.058	-0.022	0.046	-0.029	0.063	0.061
45. Usefulness Recipient	-0.091 *	0.122 **	0.018	0.057	-0.012	0.001	0.191 ***	0.046	0.033

Notes: † p < .10; * p < .05; ** p < .01; *** p < .001

Table 16e: Section 2 Correlations (Part 5 of 5)

	37.	38.	39.	40.	41.	42.	43.	44.
38. Recipient Sought Gen-to-Feed	-0.002							
39. Source Provided Prob-to-Solu	0.437 ***	0.053						
40. Source Provided Gen-to-Feed	-0.016	0.573 ***	0.041					
41. Recipient Sought All Avg	-0.100 **	-0.053	-0.027	0.021				
42. Source Provided All Avg	-0.121 **	0.010	-0.102 **	-0.090 *	0.583 ***			
43. Feedback (Neg to Pos)	0.021	0.154 ***	0.055	0.253 ***	0.161 ***	0.111 **		
44. Engagement Recipient	-0.091 *	0.032	-0.035	0.095 *	0.306 ***	0.226 ***	0.229 ***	
45. Usefulness Recipient	-0.077 *	-0.064 †	-0.046	-0.057	0.228 ***	0.318 ***	0.191 ***	0.398 ***

Notes: † p < .10; * p < .05; ** p < .01; *** p < .001

Table 17: T-Tests for Engagement by Pull vs. Push Exchanges

	Source-Initiated Exchange		Recipient-Initiated Exchange	
	n = 211		n = 276	
	Mean	StdDev	Mean	StdDev
Engagement Recipient	5.74	.9	5.77	.9
Engagement Source	5.80	.9	5.74	.9

Table 18: Structural Equation Path Model Coefficients for Motives on Pull vs. Push Initiation Frequency

		Independent Variables							
		Judgemental Culture	Collaborative Culture	Intrinsic Motivation	Extrinsic Motivation	Fear of Loss of Unique Value	Pos. Social Motives (Acceptance)	Neg. Social Motives (Rejection)	Organizational Identification
Dependent Variables	Extrinsic Motivation	Dir 0.179(**)	Dir 0.574(**)						
	Fear of Loss of Unique Value	Dir 0.237(**)	Dir -0.163(**)	Dir -0.116(*)					
	Pos. Social Motives (Acceptance)	Ind -0.001()	Tot 0.515(**) Dir 0.422(**) Ind 0.092(**)	Tot 0.164(**) Dir 0.152(**) Ind 0.012(**)	Dir 0.132(**)	Dir -0.103(**)			
	Neg. Social Motives (Rejection)	Tot 0.38(**) Dir 0.292(**) Ind 0.088(**)	Tot -0.328(**) Dir -0.231(**) Ind -0.097(**)	Tot 0.02() Dir 0.068(†) Ind -0.048(*)	Dir -0.052(**)	Dir 0.412(**)			
	Organizational Identification	Tot 0.062(†) Dir 0.117(**) Ind -0.055(**)	Tot 0.505(**) Dir 0.316(**) Ind 0.189(**)	Tot 0.315(**) Dir 0.28(**) Ind 0.035(**)	Tot 0.108(**) Dir 0.079(**) Ind 0.029(**)	Tot -0.153(**) Dir -0.082(*) Ind -0.071(**)	Dir 0.171(**)	Dir -0.129(**)	
	Frequency Pull (Searcher)	Ind 0.022(*)	Ind 0.054(*)	Tot 0.175(**) Dir 0.138(**) Ind 0.037(**)	Tot -0.027() Dir -0.051(*) Ind 0.024(**)	Ind 0.012()	Dir 0.214(**)	Dir 0.082(**)	
	Frequency Push (Sharer)	Ind 0.003()	Ind 0.058(*)	Tot 0.234(**) Dir 0.207(**) Ind 0.026(*)	Ind 0.014(*)	Ind -0.014(**)	Tot 0.07(†) Dir 0.062() Ind 0.009(*)	Ind -0.007(†)	Dir 0.052(†)

Table 19: Extrinsic Motivation and Unsolicited Problem-Solving Knowledge on Recipient Engagement Regression Results

Dependent Variable: Recipient Engagement

Variables	Model 1		Model 2		Model 3		Model 4	
	B	S.E.	B	S.E.	B	S.E.	B	S.E.
(Constant)	3.10 ***	0.86	2.98 ***	0.87	2.97 ***	0.86	2.95 ***	0.85
Company 2 Dummy	-0.08	0.20	-0.05	0.20	-0.09	0.21	-0.03	0.20
Company 3 Dummy	-0.17	0.15	-0.19	0.15	-0.25 †	0.15	-0.23	0.15
Company 4 Dummy	-0.14	0.16	-0.17	0.16	-0.17	0.16	-0.19	0.16
Customer Service Dummy	-0.13	0.22	-0.14	0.22	-0.19	0.22	-0.12	0.22
Marketing / Sales Dummy	-0.16	0.16	-0.19	0.16	-0.23	0.16	-0.24	0.15
Administration / Support	-0.25	0.19	-0.24	0.19	-0.27	0.19	-0.25	0.19
Production / Operations Dummy	-0.29 †	0.15	-0.33 *	0.15	-0.33 *	0.15	-0.31 *	0.15
Age	0.10 **	0.04	0.10 **	0.04	0.11 **	0.04	0.09 **	0.04
Education	-0.01	0.05	-0.01	0.05	-0.01	0.05	-0.01	0.05
Years at Job	-0.05	0.05	-0.04	0.05	-0.04	0.05	-0.04	0.05
Years at Company	-0.02	0.08	-0.01	0.08	-0.04	0.08	0.01	0.08
Years in Industry	-0.06	0.05	-0.07	0.05	-0.08	0.05	-0.08	0.05
Collaborative Culture	-0.09	0.06	-0.06	0.07	-0.05	0.07	-0.05	0.07
Judgmental Culture	0.00	0.04	0.01	0.05	0.02	0.05	0.01	0.05
Intrinsic Motivation	0.14 *	0.06	0.15 *	0.06	0.12 †	0.06	0.11 †	0.06
Identification Motivation	0.07	0.05	0.06	0.05	0.08	0.05	0.08 †	0.05
Social Motives Positive	0.11	0.07	0.13 †	0.08	0.13 †	0.07	0.14 †	0.07
Social Motives Negative	-0.05	0.05	-0.06	0.05	-0.06	0.05	-0.06	0.05
Lose Unique Value	-0.01	0.05	-0.01	0.05	-0.01	0.05	-0.01	0.05
Organization in Flux	0.03	0.04	0.02	0.04	0.03	0.04	0.03	0.04
Subject Anxious About Future	-0.04	0.03	-0.04	0.03	-0.04	0.03	-0.04	0.03
IntID	-0.01	0.13	0.01	0.14	0.03	0.14	0.00	0.13
Interaction Days Ago	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Interaction Duration Log	0.05	0.04	0.06	0.04	0.06	0.04	0.04	0.04
Interaction Group Size	0.03	0.11	0.03	0.11	0.02	0.11	0.03	0.11
Strong Ties	-0.01	0.06	-0.01	0.06	-0.01	0.06	-0.01	0.06
Relationship Length (logged years)	-0.03	0.05	-0.02	0.05	-0.03	0.05	-0.02	0.05
Higher Rank Source	0.05	0.04	0.06	0.04	0.05	0.04	0.06	0.04
Greater Expertise Source	-0.06	0.04	-0.06	0.04	-0.07 †	0.04	-0.06	0.04
Formal Organizational Distance	0.04	0.04	0.05	0.04	0.05	0.04	0.05	0.04
Physical Distance	0.01	0.03	0.01	0.03	0.00	0.03	0.01	0.03
Recipient Sought All Avg	-0.02	0.07	-0.03	0.07	-0.01	0.07	0.01	0.07
Source Provided All Avg	0.21 **	0.07	0.22 **	0.07	0.22 **	0.07	0.18 *	0.07
Feedback (Neg to Pos)	0.07	0.05	0.04	0.05	0.05	0.05	0.06	0.05
Recipient-Initiated Exchange	0.02	0.10	0.01	0.10	0.01	0.10	0.02	0.10
ProcLookProbSoluCent			-0.01	0.02	-0.01	0.02	0.00	0.03
ProcLookGenFeedCent			0.00	0.02	0.00	0.02	-0.01	0.02
ProcProvProbSoluCent			-0.02	0.02	-0.02	0.03	-0.02	0.03
ProcProvGenFeedCent			0.04 †	0.02	0.04	0.02	0.02	0.02
MotExtCent			-0.03	0.04	-0.02	0.04	0.01	0.04
Unsolicited (SeekXProv PS)					0.01	0.01	0.01	0.01
Unsolicited (SeekXProv GF)					0.00	0.00	0.01 †	0.00
MotExtXLookPS					-0.01	0.02	-0.01	0.02
MotExtXLookGF					0.02	0.01	0.01	0.01
MotExtXProvPS					0.02	0.02	0.02	0.02
MotExtXProvGF					0.02	0.02	0.01	0.02
MotExtXLookXProvPS							0.00	0.01
MotExtXLookXProvGF							-0.01 **	0.00
R Square	0.27		0.29		0.33		0.36	
Adjusted R Square	0.15		0.16		0.19		0.21	
R Square Change	0.27 ***		0.02		0.04 *		0.03 *	
F Change	2.33 ***		1.31		2.23 *		4.28 *	

Sample Size: n = 260

Significance Levels: † $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$

Table 20: Introjection Motivation and Unsolicited Problem-Solving Knowledge on Recipient Engagement Regression Results

Dependent Variable: Recipient Engagement

Variables	Model 1		Model 2		Model 3		Model 4	
	B	S.E.	B	S.E.	B	S.E.	B	S.E.
(Constant)	3.19 ***	0.86	3.72 ***	0.91	3.81 ***	0.92	4.00 ***	0.90
Company 2 Dummy	-0.07	0.20	-0.05	0.20	-0.09	0.21	-0.11	0.20
Company 3 Dummy	-0.19	0.15	-0.19	0.15	-0.21	0.15	-0.23	0.15
Company 4 Dummy	-0.18	0.16	-0.17	0.16	-0.16	0.17	-0.21	0.16
Customer Service Dummy	-0.12	0.22	-0.14	0.22	-0.14	0.22	-0.06	0.22
Marketing / Sales Dummy	-0.16	0.16	-0.19	0.16	-0.18	0.16	-0.14	0.16
Administration / Support	-0.25	0.19	-0.24	0.19	-0.20	0.19	-0.18	0.19
Production / Operations Dummy	-0.28 †	0.15	-0.33 *	0.15	-0.28 †	0.15	-0.27 †	0.15
Age	0.10 **	0.04	0.10 **	0.04	0.11 **	0.04	0.08 *	0.04
Education	0.00	0.05	-0.01	0.05	0.00	0.05	0.00	0.05
Years at Job	-0.05	0.05	-0.04	0.05	-0.03	0.05	-0.02	0.05
Years at Company	-0.03	0.08	-0.01	0.08	-0.06	0.08	-0.04	0.08
Years in Industry	-0.05	0.05	-0.07	0.05	-0.04	0.05	-0.02	0.05
Collaborative Culture	-0.05	0.06	-0.06	0.07	-0.07	0.07	-0.09	0.07
Judgmental Culture	0.00	0.05	0.01	0.05	0.02	0.05	0.03	0.05
Intrinsic Motivation	0.16 *	0.06	0.15 *	0.06	0.15 *	0.07	0.13 *	0.06
Identification Motivation	0.08 †	0.05	0.06	0.05	0.07	0.05	0.08 †	0.05
Social Motives Negative	-0.05	0.05	-0.06	0.05	-0.08	0.05	-0.09 †	0.05
Extrinsic Motivation	-0.01	0.04	-0.03	0.04	-0.04	0.04	-0.04	0.04
Lose Unique Value	-0.01	0.05	-0.01	0.05	0.00	0.05	0.02	0.05
Organization in Flux	0.04	0.04	0.02	0.04	0.01	0.04	0.02	0.04
Subject Anxious About Future	-0.05	0.03	-0.04	0.03	-0.05	0.03	-0.06 †	0.03
IntID	0.00	0.13	0.01	0.14	0.02	0.14	0.04	0.13
Interaction Days Ago	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Interaction Duration Log	0.06	0.04	0.06	0.04	0.05	0.04	0.05	0.04
Interaction Group Size	0.05	0.11	0.03	0.11	0.04	0.11	0.03	0.11
Strong Ties	-0.02	0.06	-0.01	0.06	-0.02	0.06	-0.03	0.06
Relationship Length (logged years)	-0.02	0.05	-0.02	0.05	-0.03	0.05	-0.04	0.05
Higher Rank Source	0.05	0.04	0.06	0.04	0.04	0.04	0.05	0.04
Greater Expertise Source	-0.06	0.04	-0.06	0.04	-0.06	0.04	-0.05	0.04
Formal Organizational Distance	0.03	0.04	0.05	0.04	0.04	0.04	0.05	0.04
Physical Distance	0.01	0.03	0.01	0.03	0.00	0.03	-0.01	0.03
Recipient Sought All Avg	-0.02	0.07	-0.03	0.07	-0.05	0.07	-0.03	0.07
Source Provided All Avg	0.22 **	0.07	0.22 **	0.07	0.25 **	0.07	0.22 **	0.07
Feedback (Neg to Pos)	0.07	0.05	0.04	0.05	0.05	0.05	0.05	0.05
Recipient-Initiated Exchange	0.04	0.10	0.01	0.10	0.01	0.10	0.02	0.10
ProcLookProbSoluCent			-0.01	0.02	0.00	0.02	-0.02	0.02
ProcLookGenFeedCent			0.00	0.02	0.01	0.02	-0.01	0.02
ProcProvProbSoluCent			-0.02	0.02	-0.02	0.02	-0.03	0.02
ProcProvGenFeedCent			0.04 †	0.02	0.03	0.02	0.02	0.02
MotIntrojPosCent			0.13 †	0.08	0.14 †	0.08	0.24 **	0.08
Unsolicited (SeekXProv PS)					0.00	0.01	0.01	0.01
Unsolicited (SeekXProv GF)					0.00	0.00	0.01	0.00
MotIntrojPosXLookPS					-0.02	0.03	-0.03	0.03
MotIntrojPosXLookGF					0.02	0.03	0.02	0.03
MotIntrojPosXProvPS					-0.05 †	0.03	-0.05 †	0.03
MotIntrojPosXProvGF					0.01	0.03	0.01	0.03
MotIntrojPosXLookXProvPS							-0.02 *	0.01
MotIntrojPosXLookXProvGF							-0.01 *	0.01
R Square	0.26		0.29		0.32		0.35	
Adjusted R Square	0.14		0.16		0.17		0.21	
R Square Change	0.26 ***		0.03		0.03		0.04 **	
F Change	2.25 ***		1.75		1.45		6.01 **	

Sample Size: n = 260

Significance Levels: † $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$

Table 21: Identification Motivation and Unsolicited Problem-Solving Knowledge on Recipient Engagement Regression Results

Dependent Variable: Recipient Engagement

Variables	Model 1		Model 2		Model 3		Model 4	
	B	S.E.	B	S.E.	B	S.E.	B	S.E.
(Constant)	3.09 ***	0.86	3.36 ***	0.88	3.02 ***	0.89	3.07 ***	0.88
Company 2 Dummy	-0.06	0.20	-0.05	0.20	-0.05	0.21	-0.03	0.21
Company 3 Dummy	-0.16	0.15	-0.19	0.15	-0.23	0.16	-0.21	0.15
Company 4 Dummy	-0.13	0.16	-0.17	0.16	-0.20	0.16	-0.22	0.16
Customer Service Dummy	-0.12	0.22	-0.14	0.22	-0.09	0.22	-0.08	0.22
Marketing / Sales Dummy	-0.14	0.16	-0.19	0.16	-0.13	0.16	-0.15	0.16
Administration / Support	-0.24	0.19	-0.24	0.19	-0.16	0.19	-0.19	0.19
Production / Operations Dummy	-0.28 †	0.15	-0.33 *	0.15	-0.30 *	0.15	-0.29 *	0.15
Age	0.10 **	0.04	0.10 **	0.04	0.10 **	0.04	0.09 *	0.04
Education	-0.02	0.05	-0.01	0.05	-0.01	0.05	0.01	0.05
Years at Job	-0.04	0.05	-0.04	0.05	-0.02	0.05	-0.02	0.05
Years at Company	-0.02	0.08	-0.01	0.08	-0.03	0.08	-0.01	0.08
Years in Industry	-0.06	0.05	-0.07	0.05	-0.06	0.05	-0.06	0.05
Collaborative Culture	-0.06	0.07	-0.06	0.07	-0.05	0.07	-0.04	0.07
Judgmental Culture	0.01	0.05	0.01	0.05	0.02	0.05	0.03	0.05
Intrinsic Motivation	0.15 *	0.06	0.15 *	0.06	0.14 *	0.07	0.13 *	0.06
Social Motives Positive	0.15 †	0.07	0.13 †	0.08	0.14 †	0.08	0.15 †	0.07
Social Motives Negative	-0.06	0.05	-0.06	0.05	-0.07	0.05	-0.08	0.05
Extrinsic Motivation	-0.03	0.04	-0.03	0.04	-0.05	0.04	-0.05	0.04
Lose Unique Value	-0.01	0.05	-0.01	0.05	0.00	0.05	0.02	0.05
Organization in Flux	0.03	0.04	0.02	0.04	0.03	0.04	0.02	0.04
Subject Anxious About Future	-0.04	0.03	-0.04	0.03	-0.04	0.03	-0.04	0.03
IntID	0.00	0.13	0.01	0.14	0.05	0.14	0.03	0.14
Interaction Days Ago	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Interaction Duration Log	0.05	0.04	0.06	0.04	0.06	0.04	0.05	0.04
Interaction Group Size	0.02	0.11	0.03	0.11	0.04	0.11	0.06	0.11
Strong Ties	-0.01	0.06	-0.01	0.06	0.00	0.06	0.01	0.06
Relationship Length (logged years)	-0.02	0.05	-0.02	0.05	-0.02	0.05	-0.01	0.05
Higher Rank Source	0.05	0.04	0.06	0.04	0.06	0.04	0.06	0.04
Greater Expertise Source	-0.07 †	0.04	-0.06	0.04	-0.06	0.04	-0.06	0.04
Formal Organizational Distance	0.05	0.04	0.05	0.04	0.05	0.04	0.05	0.04
Physical Distance	0.01	0.03	0.01	0.03	0.00	0.03	0.01	0.03
Recipient Sought All Avg	-0.02	0.07	-0.03	0.07	-0.01	0.07	-0.01	0.07
Source Provided All Avg	0.22 **	0.07	0.22 **	0.07	0.22 **	0.07	0.21 **	0.07
Feedback (Neg to Pos)	0.07	0.05	0.04	0.05	0.04	0.05	0.02	0.05
Recipient-Initiated Exchange	0.01	0.10	0.01	0.10	0.02	0.10	0.04	0.10
ProcLookProbSoluCent			-0.01	0.02	0.00	0.03	-0.01	0.03
ProcLookGenFeedCent			0.00	0.02	0.01	0.02	0.00	0.02
ProcProvProbSoluCent			-0.02	0.02	-0.03	0.03	-0.04	0.03
ProcProvGenFeedCent			0.04 †	0.02	0.03	0.02	0.04 †	0.02
MotIDCent			0.06	0.05	0.06	0.05	0.08 †	0.05
Unsolicited (SeekXProv PS)					0.00	0.01	0.00	0.01
Unsolicited (SeekXProv GF)					0.00	0.00	0.00	0.00
MotIDXLookPS					-0.01	0.02	0.00	0.02
MotIDXLookGF					-0.02	0.02	-0.02	0.02
MotIDXProvPS					-0.04 †	0.02	-0.02	0.02
MotIDXProvGF					0.03	0.02	0.03	0.02
MotIDXLookXProvPS							-0.01 *	0.01
MotIDXLookXProvGF							0.00	0.00
R Square	0.26		0.29		0.32		0.34	
Adjusted R Square	0.15		0.16		0.17		0.19	
R Square Change	0.26 ***		0.03		0.03		0.02 *	
F Change	2.28 ***		1.59		1.54		3.29 *	

Sample Size: n = 260

Significance Levels: † $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$

Table 22: Intrinsic Motivation and Unsolicited Problem-Solving Knowledge on Recipient Engagement Regression Results

Dependent Variable: Recipient Engagement

Variables	Model 1		Model 2		Model 3		Model 4	
	B	S.E.	B	S.E.	B	S.E.	B	S.E.
(Constant)	3.55 ***	0.84	3.92 ***	0.84	3.75 ***	0.83	3.85 ***	0.82
Company 2 Dummy	-0.04	0.20	-0.05	0.20	-0.17	0.20	-0.15	0.20
Company 3 Dummy	-0.17	0.15	-0.19	0.15	-0.27 †	0.15	-0.29 †	0.15
Company 4 Dummy	-0.13	0.17	-0.17	0.16	-0.31 †	0.16	-0.30 †	0.16
Customer Service Dummy	-0.12	0.22	-0.14	0.22	0.00	0.22	-0.01	0.21
Marketing / Sales Dummy	-0.20	0.16	-0.19	0.16	-0.16	0.15	-0.17	0.15
Administration / Support	-0.28	0.19	-0.24	0.19	-0.24	0.19	-0.24	0.18
Production / Operations Dummy	-0.29 †	0.15	-0.33 *	0.15	-0.30 *	0.15	-0.30 *	0.14
Age	0.11 **	0.04	0.10 **	0.04	0.10 **	0.04	0.10 **	0.04
Education	0.00	0.05	-0.01	0.05	-0.01	0.05	-0.02	0.05
Years at Job	-0.05	0.05	-0.04	0.05	-0.04	0.05	-0.07	0.05
Years at Company	-0.04	0.08	-0.01	0.08	-0.05	0.08	-0.04	0.08
Years in Industry	-0.05	0.05	-0.07	0.05	-0.06	0.05	-0.06	0.05
Collaborative Culture	-0.09	0.07	-0.06	0.07	-0.04	0.07	-0.04	0.06
Judgmental Culture	0.00	0.05	0.01	0.05	0.02	0.05	0.01	0.05
Identification Motivation	0.08 †	0.05	0.06	0.05	0.05	0.05	0.05	0.05
Social Motives Positive	0.15 *	0.08	0.13 †	0.08	0.16 *	0.07	0.14 †	0.07
Social Motives Negative	-0.04	0.05	-0.06	0.05	-0.06	0.05	-0.07	0.05
Extrinsic Motivation	-0.03	0.04	-0.03	0.04	-0.02	0.04	-0.01	0.04
Lose Unique Value	-0.01	0.05	-0.01	0.05	-0.01	0.04	-0.01	0.04
Organization in Flux	0.04	0.04	0.02	0.04	0.02	0.04	0.02	0.04
Subject Anxious About Future	-0.04	0.03	-0.04	0.03	-0.05	0.03	-0.03	0.03
IntID	-0.03	0.14	0.01	0.14	0.03	0.13	0.02	0.13
Interaction Days Ago	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Interaction Duration Log	0.05	0.04	0.06	0.04	0.06	0.04	0.05	0.04
Interaction Group Size	0.02	0.11	0.03	0.11	0.06	0.11	0.05	0.11
Strong Ties	-0.02	0.06	-0.01	0.06	-0.01	0.06	-0.02	0.06
Relationship Length (logged years)	-0.04	0.05	-0.02	0.05	0.00	0.05	0.01	0.05
Higher Rank Source	0.05	0.04	0.06	0.04	0.06	0.04	0.04	0.04
Greater Expertise Source	-0.07 †	0.04	-0.06	0.04	-0.06	0.04	-0.06	0.04
Formal Organizational Distance	0.05	0.04	0.05	0.04	0.07	0.04	0.06	0.04
Physical Distance	0.01	0.03	0.01	0.03	-0.01	0.03	-0.01	0.03
Recipient Sought All Avg	-0.02	0.07	-0.03	0.07	-0.05	0.07	-0.05	0.07
Source Provided All Avg	0.22 **	0.07	0.22 **	0.07	0.26 ***	0.07	0.24 ***	0.07
Feedback (Neg to Pos)	0.08	0.05	0.04	0.05	0.02	0.05	0.05	0.05
Recipient-Initiated Exchange	0.00	0.10	0.01	0.10	0.04	0.10	0.06	0.10
ProcLookProbSoluCent			-0.01	0.02	0.00	0.02	0.01	0.02
ProcLookGenFeedCent			0.00	0.02	-0.01	0.02	0.00	0.02
ProcProvProbSoluCent			-0.02	0.02	-0.03	0.02	-0.04	0.02
ProcProvGenFeedCent			0.04 †	0.02	0.05 *	0.02	0.05 *	0.02
MotIntrinCent			0.15 *	0.06	0.21 **	0.07	0.17 *	0.07
Unsolicited (SeekXProv PS)					0.01 †	0.01	0.01 †	0.01
Unsolicited (SeekXProv GF)					0.00	0.00	0.00	0.00
MotIntrinXLookPS					0.04	0.03	0.03	0.03
MotIntrinXLookGF					-0.02	0.02	-0.03	0.02
MotIntrinXProvPS					-0.10 ***	0.03	-0.10 ***	0.03
MotIntrinXProvGF					-0.04 †	0.02	-0.04 †	0.02
MotIntrinXLookXProvPS							0.00	0.01
MotIntrinXLookXProvGF							0.01 **	0.00
R Square	0.25		0.29		0.35		0.37	
Adjusted R Square	0.14		0.16		0.21		0.23	
R Square Change	0.25 ***		0.03 †		0.06 **		0.02 *	
F Change	2.17 ***		2.15 †		3.38 **		4.07 *	

Sample Size: n = 260

Significance Levels: † $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$

Table 23: Push vs. Pull Exchange Usefulness for Higher vs. Lower Expertise Sources
Regression Results

Dependent Variable: **Exchange Usefulness (to Recipient)**

Variables	Model 1		Model 2		Model 3		Model 4	
	B	S.E.	B	S.E.	B	S.E.	B	S.E.
(Constant)	1.93 **	0.70	1.98 **	0.69	1.97 **	0.69	2.03 **	0.69
Company 2 Dummy	0.48 **	0.17	0.44 **	0.16	0.43 **	0.16	0.45 **	0.17
Company 3 Dummy	0.40 **	0.12	0.33 **	0.12	0.35 **	0.12	0.36 **	0.12
Company 4 Dummy	0.09	0.12	0.05	0.12	0.07	0.12	0.08	0.12
IntID	0.27	0.53	0.20	0.52	0.25	0.52	0.21	0.52
Interaction Duration Log	0.05	0.05	0.07	0.05	0.06	0.05	0.06	0.05
Interaction Days Ago	0.00	0.01	0.00	0.01	0.00	0.01	0.00	0.01
Interaction Group Size	-0.02	0.10	0.00	0.10	-0.02	0.10	-0.02	0.10
Strong Ties	0.07	0.05	0.09 †	0.05	0.09 †	0.05	0.08 †	0.05
Relationship Length (years)	-0.01	0.01	-0.01	0.01	-0.01	0.01	-0.01	0.01
Higher Rank Source	-0.04	0.04	-0.08 *	0.04	-0.08 *	0.04	-0.08 *	0.04
Formal Organizational Distance	0.03	0.04	0.02	0.04	0.02	0.04	0.03	0.04
Physical Distance	0.03	0.03	0.03	0.03	0.04	0.03	0.03	0.03
Recipient Sought All Avg	0.08	0.06	0.08	0.06	0.08	0.06	0.07	0.06
Source Provided All Avg	0.27 ***	0.06	0.26 ***	0.06	0.27 ***	0.06	0.28 ***	0.06
Feedback (Neg to Pos)	0.12 **	0.04	0.13 **	0.04	0.13 **	0.04	0.13 **	0.04
Source-Initiated Exchange (cent)			-0.13	0.09	-0.12	0.09	-0.03	0.14
Greater Expertise Source (cent)			0.14 ***	0.03	0.14 ***	0.03	0.13 ***	0.03
InterPushXSpecExp					0.14 *	0.06	0.13 *	0.07
Subject-Initiated Exchange							0.06	0.13
Subject Sharer Dummy							-0.18	0.21
R Square	0.17		0.20		0.21		0.21	
Adjusted R Square	0.14		0.17		0.18		0.18	
R Square Change	0.17 ***		0.04 ***		0.01 *		0.00	
F Change	5.98 ***		10.68 ***		4.52 *		0.41	

Sample Size: n = 463

Significance Levels: † $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$

Table 24: Unsolicited / Unsought Exchange Usefulness for Higher vs. Lower Expertise Sources Regression Results

Dependent Variable: Exchange Usefulness (to Recipient)

Variables	Model 1		Model 2		Model 3		Model 4		Model 5	
	B	S.E.	B	S.E.	B	S.E.	B	S.E.	B	S.E.
(Constant)	3.06 ***	0.71	3.48 ***	0.68	3.43 ***	0.66	3.45 ***	0.66	3.61 ***	0.68
Company 2 Dummy	0.57 **	0.17	0.35 *	0.17	0.25	0.17	0.22	0.17	0.22	0.17
Company 3 Dummy	0.44 ***	0.13	0.28 *	0.12	0.21 †	0.12	0.20	0.12	0.20	0.12
Company 4 Dummy	0.14	0.13	0.08	0.12	0.05	0.12	0.04	0.12	0.05	0.12
IntID	0.23	0.56	0.18	0.52	0.21	0.51	0.21	0.51	0.16	0.51
Interaction Days Ago	0.00	0.01	0.00	0.01	0.00	0.01	0.00	0.01	0.00	0.01
Interaction Duration Log	0.11 *	0.05	0.11 *	0.05	0.13 *	0.05	0.14 **	0.05	0.14 **	0.05
Interaction Group Size	0.00	0.11	-0.01	0.10	-0.02	0.10	-0.03	0.10	-0.03	0.10
Strong Ties	0.09 †	0.05	0.11 *	0.05	0.11 *	0.05	0.11 *	0.05	0.10 *	0.05
Relationship Length (logged)	0.00	0.04	0.00	0.04	0.01	0.04	0.01	0.04	0.02	0.04
Higher Rank Source	-0.04	0.04	-0.08 *	0.04	-0.08 *	0.04	-0.08 *	0.04	-0.08 *	0.04
Formal Organizational	0.05	0.04	0.03	0.04	0.03	0.04	0.03	0.04	0.03	0.04
Physical Distance	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Feedback (Neg to Pos)	0.15 ***	0.04	0.12 **	0.04	0.10 *	0.04	0.10 *	0.04	0.10 *	0.04
Recipient-Initiated Exchange	0.11	0.10	0.12	0.09	0.13	0.09	0.12	0.09	0.04	0.13
Recipient Sought All Max			0.03	0.06	0.05	0.06	0.03	0.06	0.03	0.06
Source Provided All Max			0.34 ***	0.06	0.42 ***	0.07	0.44 ***	0.07	0.45 ***	0.07
Greater Expertise Source			0.12 ***	0.03	0.15 ***	0.03	0.13 ***	0.03	0.13 ***	0.03
Unsolicited (SeekXProv Max)					0.15 ***	0.03	0.18 ***	0.04	0.18 ***	0.04
SpecExpXLookMax					-0.11 **	0.04	-0.11 **	0.04	-0.11 **	0.04
SpecExpXProvMax					-0.01	0.04	-0.01	0.04	-0.01	0.04
SpecExpXLookXProvMax							0.05	0.03	0.05	0.03
Subject-Initiated Exchange									-0.15	0.14
Subject Searcher Dummy									0.15	0.20
R Square	0.09		0.20		0.24		0.25		0.25	
Adjusted R Square	0.06		0.17		0.21		0.21		0.21	
R Square Change	0.09 ***		0.11 ***		0.04 ***		0.00		0.00	
F Change	3.08 ***		20.80 ***		7.76 ***		2.53		0.54	

Sample Size: n = 460

Significance Levels: † $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$

Table 25: Predicting Recipient Seeking of Problem-Solving Phases Regression Results**Table 25a: Problem-to-Solution Knowledge****Dependent Variable: Seeking Problem-to-Solution Knowledge**

Variables	Model 1		Model 2		Model 3		Model 4	
	B	S.E.	B	S.E.	B	S.E.	B	S.E.
(Constant)	1.89	1.45	1.19	2.12	-0.93	2.59	0.06	2.72
Company 2 Dummy	-0.28	0.58	-0.13	0.60	-0.10	0.61	-0.16	0.62
Company 3 Dummy	-0.48	0.43	-0.52	0.45	-0.60	0.46	-0.65	0.46
Company 4 Dummy	-0.18	0.48	-0.32	0.50	-0.34	0.51	-0.34	0.51
Customer Service Dummy	0.31	0.64	0.42	0.65	0.19	0.68	0.15	0.68
Marketing / Sales Dummy	0.06	0.44	0.11	0.46	-0.02	0.48	-0.05	0.48
Administration / Support	0.16	0.55	0.27	0.56	0.18	0.58	0.14	0.58
Production / Operations Dummy	-0.17	0.44	-0.09	0.44	-0.04	0.46	-0.09	0.47
Age	0.02	0.11	0.00	0.11	0.00	0.11	0.02	0.11
Education	-0.23 †	0.13	-0.25 †	0.14	-0.22	0.15	-0.23	0.15
Years at Job	0.32 *	0.15	0.37 *	0.16	0.43 *	0.16	0.40 *	0.17
Years at Company	0.05	0.23	0.07	0.24	0.15	0.25	0.13	0.25
Years in Industry	-0.30 *	0.15	-0.28 †	0.15	-0.24	0.16	-0.25	0.16
Organization in Flux	-0.17	0.13	-0.18	0.13	-0.18	0.13	-0.17	0.13
Subject Anxious About Future	0.04	0.08	0.08	0.10	0.08	0.10	0.07	0.10
IntID	0.38	0.40	0.45	0.41	0.45	0.41	0.47	0.42
Interaction Days Ago	0.00	0.02	0.00	0.02	0.00	0.02	0.00	0.02
Interaction Duration Log	-0.09	0.13	-0.07	0.13	-0.06	0.13	-0.04	0.13
Interaction Group Size	0.19	0.32	0.20	0.33	0.22	0.34	0.23	0.34
Recipient-Initiated Exchange	0.00	0.29	-0.02	0.30	-0.01	0.31	0.00	0.31
Collaborative Culture			0.41 *	0.20	0.41 *	0.20	0.39 †	0.21
Judgmental Culture			-0.04	0.14	-0.03	0.14	-0.02	0.14
Intrinsic Motivation			0.08	0.19	0.07	0.20	0.11	0.20
Identification Motivation			-0.23	0.14	-0.22	0.15	-0.20	0.15
Social Motives Positive			-0.02	0.23	-0.03	0.23	0.01	0.23
Social Motives Negative			0.02	0.16	-0.01	0.16	-0.03	0.17
Extrinsic Motivation			-0.13	0.11	-0.11	0.12	-0.11	0.12
Lose Unique Value			-0.05	0.14	-0.03	0.14	-0.04	0.14
Strong Ties					0.23	0.18	0.23	0.18
Relationship Length (logged years)					-0.21	0.15	-0.21	0.15
Higher Rank Source					0.04	0.13	0.06	0.13
Greater Expertise Source					0.11	0.12	0.09	0.12
Formal Organizational Distance					-0.01	0.13	0.00	0.13
Physical Distance					0.04	0.09	0.05	0.09
Engagement Recipient							-0.19	0.20
Recipient Sought All Avg							-0.10	0.16
R Square	0.07		0.10		0.12		0.12	
Adjusted R Square	0.00		0.00		-0.01		-0.02	
R Square Change	0.07		0.03		0.01		0.01	
F Change	1.02		0.91		0.56		0.78	

Sample Size: n = 260

Significance Levels: † $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$

Table 25b: Generation-to-Feedback Knowledge**Dependent Variable: Seeking Generation-to-Feedback Knowledge**

Variables	Model 1		Model 2		Model 3		Model 4	
	Beta	S.E.	Beta	S.E.	Beta	S.E.	Beta	S.E.
(Constant)	0.00	1.88	0.00	2.75	0.00	3.34	0.00	3.49
Company 2 Dummy	-0.19 *	0.75	-0.21 *	0.78	-0.21 *	0.79	-0.20 *	0.79
Company 3 Dummy	-0.22 *	0.56	-0.23 *	0.58	-0.21 *	0.59	-0.20 *	0.60
Company 4 Dummy	-0.06	0.63	-0.02	0.65	0.00	0.65	0.00	0.65
Customer Service Dummy	0.02	0.83	0.00	0.84	0.00	0.88	0.01	0.88
Marketing / Sales Dummy	-0.04	0.57	-0.06	0.60	-0.03	0.62	-0.03	0.62
Administration / Support	-0.11	0.71	-0.12	0.72	-0.09	0.75	-0.08	0.75
Production / Operations Dummy	0.01	0.57	0.00	0.58	0.02	0.59	0.03	0.60
Age	0.13	0.14	0.16 †	0.14	0.16 †	0.14	0.13	0.14
Education	-0.13 †	0.17	-0.17 *	0.18	-0.15 *	0.19	-0.14 †	0.19
Years at Job	0.03	0.20	0.03	0.20	0.02	0.21	0.03	0.21
Years at Company	-0.02	0.30	-0.04	0.31	-0.02	0.32	-0.01	0.32
Years in Industry	-0.09	0.19	-0.11	0.20	-0.11	0.20	-0.11	0.20
Organization in Flux	-0.04	0.17	-0.05	0.17	-0.06	0.17	-0.07	0.17
Subject Anxious About Future	-0.03	0.11	-0.03	0.13	-0.02	0.13	-0.01	0.13
IntID	0.07	0.52	0.07	0.53	0.08	0.53	0.08	0.53
Interaction Days Ago	-0.07	0.02	-0.07	0.02	-0.06	0.02	-0.06	0.02
Interaction Duration Log	-0.06	0.16	-0.07	0.17	-0.09	0.17	-0.11	0.17
Interaction Group Size	0.06	0.42	0.04	0.43	0.08	0.44	0.08	0.44
Recipient-Initiated Exchange	0.09	0.38	0.07	0.39	0.06	0.39	0.05	0.39
Collaborative Culture			-0.13	0.26	-0.13	0.26	-0.12	0.26
Judgmental Culture			-0.02	0.18	-0.01	0.18	-0.01	0.18
Intrinsic Motivation			-0.06	0.25	-0.04	0.25	-0.06	0.26
Identification Motivation			0.03	0.19	0.03	0.19	0.01	0.19
Social Motives Positive			0.16 †	0.30	0.14	0.30	0.12	0.30
Social Motives Negative			0.06	0.21	0.05	0.21	0.06	0.21
Extrinsic Motivation			-0.06	0.15	-0.07	0.15	-0.07	0.15
Lose Unique Value			-0.04	0.18	-0.05	0.18	-0.04	0.18
Strong Ties					0.05	0.23	0.05	0.23
Relationship Length (logged years)					0.04	0.19	0.04	0.19
Higher Rank Source					0.01	0.16	0.00	0.17
Greater Expertise Source					-0.01	0.16	0.00	0.16
Formal Organizational Distance					-0.16 *	0.17	-0.17 *	0.17
Physical Distance					0.05	0.12	0.04	0.12
Engagement Recipient							0.08	0.26
Recipient Sought All Avg							0.05	0.20
R Square	0.09		0.11		0.14		0.15	
Adjusted R Square	0.02		0.01		0.02		0.02	
R Square Change	0.09		0.02		0.03		0.01	
F Change	1.26		0.81		1.29		1.12	

Sample Size: n = 260

Significance Levels: † $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$

Table 26: Predicting Source Providing Disagreeing (Negative) vs. Agreeing (Positive) Feedback Regression Results

Dependent Variable: Source Provided Negative-to-Positive Feedback

Variables	Model 1		Model 2		Model 3		Model 4	
	B	S.E.	B	S.E.	B	S.E.	B	S.E.
(Constant)	4.97 ***	0.72	3.72 ***	1.10	3.66 **	1.20	3.54 **	1.23
Company 2 Dummy	0.10	0.28	0.04	0.29	0.06	0.28	0.00	0.28
Company 3 Dummy	-0.25	0.23	-0.18	0.24	-0.02	0.25	-0.08	0.25
Company 4 Dummy	-0.12	0.25	-0.11	0.26	-0.09	0.26	-0.14	0.25
Customer Service Dummy	0.13	0.31	0.08	0.31	0.18	0.31	0.19	0.31
Marketing / Sales Dummy	0.14	0.24	0.13	0.24	0.25	0.24	0.26	0.24
Administration / Support	-0.25	0.27	-0.30	0.28	-0.22	0.27	-0.26	0.27
Production / Operations Dummy	0.40 †	0.22	0.39 †	0.22	0.44 †	0.23	0.44 †	0.23
Age	-0.10 †	0.05	-0.09 †	0.05	-0.09 †	0.05	-0.09 †	0.05
Education	0.00	0.06	-0.01	0.06	-0.02	0.06	-0.01	0.06
Years at Job	-0.10	0.07	-0.07	0.07	-0.07	0.07	-0.08	0.07
Years at Company	0.07	0.09	0.07	0.09	0.02	0.09	0.03	0.09
Years in Industry	0.21 **	0.08	0.18 *	0.08	0.17 *	0.08	0.16 *	0.08
Organization in Flux	0.04	0.07	0.02	0.07	0.02	0.07	0.01	0.07
Subject Anxious About Future	-0.02	0.04	0.03	0.05	0.02	0.05	0.01	0.05
IntID	-0.16	0.22	-0.16	0.22	-0.18	0.22	-0.19	0.22
Interaction Days Ago	-0.01 †	0.01	-0.01 †	0.01	-0.01	0.01	-0.01	0.01
Interaction Duration Log	-0.01	0.09	-0.04	0.09	-0.03	0.09	-0.04	0.09
Interaction Group Size	-0.02	0.16	0.03	0.16	0.07	0.16	0.05	0.16
Recipient-Initiated Exchange	0.00	0.15	0.02	0.15	0.04	0.15	0.07	0.15
Collaborative Culture			0.01	0.10	-0.04	0.10	-0.06	0.10
Judgmental Culture			0.13 †	0.07	0.08	0.07	0.10	0.07
Intrinsic Motivation			0.02	0.10	0.04	0.10	0.02	0.10
Identification Motivation			0.05	0.07	0.03	0.07	0.02	0.07
Social Motives Positive			0.16	0.10	0.15	0.10	0.12	0.10
Social Motives Negative			-0.19 *	0.09	-0.15 †	0.09	-0.15 †	0.09
Extrinsic Motivation			0.02	0.06	0.03	0.06	0.03	0.06
Lose Unique Value			0.06	0.07	0.08	0.07	0.08	0.07
Strong Ties					0.14 *	0.07	0.13 †	0.07
Relationship Length (logged years)					0.08	0.07	0.07	0.07
Higher Rank Source					0.05	0.06	0.04	0.06
Greater Expertise Source					-0.13 **	0.05	-0.13 *	0.05
Formal Organizational Distance					-0.01	0.06	-0.02	0.06
Physical Distance					0.01	0.05	0.01	0.05
Recipient Sought All Avg							0.18 *	0.08
Source Provided All Avg							-0.05	0.10
R Square	0.09		0.14		0.19		0.21	
Adjusted R Square	0.02		0.05		0.09		0.10	
R Square Change	0.09		0.05 †		0.05 **		0.02 †	
F Change	1.36		1.85 †		2.89 **		2.61 †	

Sample Size: n = 288

Significance Levels: † $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$

Table 27: Predicting Source Providing of Problem-Solving Phases Regression Results**Table 27a: Problem-to-Solution Knowledge****Dependent Variable: Provide Problem-to-Solution Knowledge**

Variables	Model 1		Model 2		Model 3		Model 4	
	B	S.E.	B	S.E.	B	S.E.	B	S.E.
(Constant)	-0.19	1.22	-1.48	1.88	0.53	2.07	0.51	2.19
Recipient Sought Prob-to-Solu	0.41 ***	0.05	0.42 ***	0.05	0.39 ***	0.05	0.39 ***	0.06
Company 2 Dummy	0.07	0.48	0.22	0.49	0.23	0.49	0.25	0.50
Company 3 Dummy	0.05	0.39	0.23	0.41	0.49	0.43	0.51	0.43
Company 4 Dummy	-0.24	0.42	-0.11	0.44	-0.09	0.44	-0.08	0.44
Customer Service Dummy	0.53	0.52	0.55	0.53	0.85	0.54	0.84	0.54
Marketing / Sales Dummy	0.18	0.40	0.28	0.41	0.36	0.41	0.36	0.41
Administration / Support	0.72	0.46	0.84 †	0.47	1.05 *	0.47	1.07 *	0.47
Production / Operations Dummy	0.50	0.38	0.60	0.38	0.70 †	0.39	0.67 †	0.39
Age	-0.10	0.09	-0.11	0.09	-0.12	0.09	-0.11	0.09
Education	-0.04	0.10	-0.07	0.11	-0.07	0.11	-0.08	0.11
Years at Job	-0.05	0.12	-0.05	0.12	-0.03	0.12	-0.02	0.13
Years at Company	0.19	0.15	0.24	0.15	0.21	0.16	0.21	0.16
Years in Industry	0.23 †	0.13	0.22	0.14	0.23 †	0.13	0.22	0.14
Organization in Flux	-0.03	0.11	0.00	0.12	-0.01	0.12	-0.01	0.12
Subject Anxious About Future	0.07	0.07	0.05	0.09	0.04	0.08	0.04	0.09
IntID	-0.36	0.37	-0.42	0.38	-0.54	0.38	-0.54	0.38
Interaction Days Ago	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Interaction Duration Log	-0.08	0.15	-0.10	0.15	-0.10	0.15	-0.09	0.15
Interaction Group Size	0.17	0.27	0.24	0.28	0.18	0.28	0.17	0.29
Recipient-Initiated Exchange	-0.28	0.25	-0.29	0.25	-0.24	0.25	-0.26	0.25
Collaborative Culture			0.10	0.17	0.10	0.17	0.10	0.17
Judgmental Culture			-0.07	0.13	-0.09	0.13	-0.10	0.13
Intrinsic Motivation			0.17	0.18	0.21	0.17	0.22	0.18
Identification Motivation			-0.22 †	0.13	-0.24 †	0.13	-0.23 †	0.13
Social Motives Positive			0.08	0.17	0.03	0.17	0.03	0.17
Social Motives Negative			0.08	0.15	0.10	0.15	0.10	0.15
Extrinsic Motivation			0.11	0.10	0.11	0.10	0.11	0.10
Lose Unique Value			0.09	0.13	0.07	0.13	0.07	0.13
Strong Ties					-0.17	0.12	-0.17	0.12
Relationship Length (logged years)					0.10	0.12	0.10	0.12
Higher Rank Source					0.10	0.10	0.10	0.10
Greater Expertise Source					-0.21 *	0.09	-0.21 *	0.09
Formal Organizational Distance					-0.28 *	0.11	-0.27 *	0.11
Physical Distance					0.03	0.08	0.03	0.08
Recipient Sought All Avg							-0.02	0.15
Source Provided All Avg							-0.06	0.17
Feedback (Neg to Pos)							0.07	0.11
R Square	0.23		0.25		0.29		0.29	
Adjusted R Square	0.17		0.17		0.19		0.19	
R Square Change	0.23 ***		0.02		0.04 *		0.00	
F Change	3.98 ***		0.86		2.38 *		0.20	

Sample Size: n = 288

Significance Levels: † $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$

Table 27b: Generation-to-Feedback Knowledge**Dependent Variable: Provide Generation-to-Feedback Knowledge**

Variables	Model 1		Model 2		Model 3		Model 4	
	B	S.E.	B	S.E.	B	S.E.	B	S.E.
(Constant)	-1.68	1.27	-3.08	1.97	-4.67 *	2.18	-4.44 *	2.24
Recipient Sought Gen-to-Feed	0.56 ***	0.04	0.57 ***	0.05	0.56 ***	0.05	0.55 ***	0.05
Company 2 Dummy	0.59	0.49	0.79	0.51	0.84 †	0.51	0.81	0.51
Company 3 Dummy	0.30	0.41	0.46	0.43	0.49	0.44	0.46	0.44
Company 4 Dummy	0.19	0.43	0.25	0.45	0.10	0.46	0.02	0.45
Customer Service Dummy	-0.19	0.55	-0.23	0.56	-0.09	0.58	-0.10	0.57
Marketing / Sales Dummy	-0.88 *	0.42	-0.79 †	0.42	-0.78 †	0.43	-0.70 †	0.43
Administration / Support	-0.45	0.48	-0.43	0.49	-0.34	0.49	-0.36	0.48
Production / Operations Dummy	0.12	0.39	0.17	0.39	0.15	0.41	0.06	0.40
Age	0.07	0.09	0.04	0.09	0.05	0.09	0.06	0.09
Education	0.04	0.11	0.06	0.11	0.04	0.11	0.03	0.11
Years at Job	-0.30 *	0.12	-0.31 *	0.13	-0.29 *	0.13	-0.24 †	0.13
Years at Company	0.19	0.15	0.20	0.16	0.18	0.16	0.17	0.16
Years in Industry	-0.17	0.14	-0.15	0.14	-0.17	0.14	-0.23	0.14
Organization in Flux	0.41 ***	0.12	0.45 ***	0.12	0.46 ***	0.12	0.42 ***	0.12
Subject Anxious About Future	0.01	0.08	0.01	0.09	0.01	0.09	0.01	0.09
IntID	-0.18	0.39	-0.24	0.39	-0.31	0.39	-0.36	0.39
Interaction Days Ago	-0.04 **	0.01	-0.04 **	0.01	-0.03 *	0.01	-0.03 *	0.01
Interaction Duration Log	-0.13	0.15	-0.16	0.15	-0.18	0.15	-0.12	0.15
Interaction Group Size	-0.05	0.28	0.11	0.28	0.08	0.30	-0.02	0.29
Recipient-Initiated Exchange	0.17	0.26	0.20	0.26	0.22	0.26	0.18	0.26
Collaborative Culture			0.17	0.17	0.11	0.18	0.06	0.17
Judgmental Culture			-0.06	0.13	-0.08	0.13	-0.08	0.13
Intrinsic Motivation			-0.05	0.18	-0.06	0.18	-0.06	0.18
Identification Motivation			0.00	0.13	-0.01	0.13	0.00	0.13
Social Motives Positive			-0.03	0.18	0.01	0.18	-0.01	0.18
Social Motives Negative			-0.04	0.16	-0.03	0.16	-0.02	0.16
Extrinsic Motivation			0.13	0.11	0.13	0.11	0.13	0.11
Lose Unique Value			0.25 †	0.13	0.32 *	0.13	0.30 *	0.13
Strong Ties					0.23 †	0.12	0.20	0.12
Relationship Length (logged years)					-0.10	0.13	-0.13	0.13
Higher Rank Source					0.14	0.11	0.14	0.10
Greater Expertise Source					-0.05	0.09	-0.03	0.09
Formal Organizational Distance					0.00	0.12	0.03	0.12
Physical Distance					0.16 †	0.09	0.16 †	0.08
Recipient Sought All Avg							0.31 *	0.15
Source Provided All Avg							-0.40 *	0.18
Feedback (Neg to Pos)							0.20 †	0.11
R Square	0.42		0.43		0.45		0.47	
Adjusted R Square	0.37		0.37		0.38		0.40	
R Square Change	0.42 ***		0.02		0.02		0.02 *	
F Change	9.55 ***		1.04		1.39		3.58 *	

Sample Size: n = 288

Significance Levels: † $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$

Table 28: Recipient Receptivity to Unsolicited Problem-Solving Knowledge Regression Results

Table 28a: Recipient Engagement

Dependent Variable: Recipient Engagement

Variables	Model 1		Model 2		Model 3		Model 4		Model 5	
	B	S.E.	B	S.E.	B	S.E.	B	S.E.	B	S.E.
(Constant)	3.20 ***	0.60	3.23 ***	0.60	2.92 ***	0.60	3.00 ***	0.59	3.10 ***	0.60
Company 2 Dummy	0.06	0.14	0.08	0.14	-0.01	0.14	-0.02	0.14	-0.01	0.14
Company 3 Dummy	-0.01	0.10	0.00	0.11	-0.07	0.11	-0.10	0.10	-0.09	0.10
Company 4 Dummy	-0.22 *	0.10	-0.21 *	0.10	-0.22 *	0.10	-0.23 *	0.10	-0.22 *	0.10
IntID	0.15	0.45	0.17	0.45	0.31	0.45	0.34	0.45	0.31	0.45
Interaction Days Ago	0.01	0.00	0.01 †	0.00	0.01 *	0.00	0.01 *	0.00	0.01 *	0.00
Interaction Duration Log	-0.05	0.04	-0.06	0.04	-0.06	0.04	-0.06	0.04	-0.06	0.04
Interaction Group Size	-0.07	0.09	-0.06	0.09	-0.07	0.09	-0.09	0.09	-0.09	0.09
Strong Ties	0.09 *	0.04	0.08 †	0.04	0.08 *	0.04	0.07 †	0.04	0.06	0.04
Relationship Length (logged years)	-0.05	0.04	-0.05	0.04	-0.05	0.04	-0.06	0.03	-0.05	0.03
Higher Rank Source	0.00	0.03	0.01	0.03	0.02	0.03	0.03	0.03	0.02	0.03
Formal Organizational Distance	0.06 †	0.03	0.06 †	0.03	0.07 *	0.03	0.06 †	0.03	0.06 †	0.03
Physical Distance	0.03	0.02	0.02	0.02	0.03	0.02	0.03	0.02	0.03	0.02
Recipient Sought All Avg	0.20 ***	0.05	0.20 ***	0.05	0.22 ***	0.05	0.21 ***	0.05	0.21 ***	0.05
Source Provided All Avg	0.07	0.05	0.07	0.05	0.09 †	0.05	0.10 †	0.05	0.11 †	0.05
Feedback (Neg to Pos)	0.14 ***	0.04	0.13 ***	0.04	0.12 **	0.04	0.11 **	0.04	0.11 **	0.04
Recipient-Initiated Exchange	0.06	0.08	0.06	0.08	0.07	0.08	0.08	0.08	0.01	0.11
ProcLookProbSoluCent			-0.01	0.02	-0.01	0.02	-0.02	0.02	-0.02	0.02
ProcLookGenFeedCent			0.00	0.02	0.00	0.02	-0.01	0.02	-0.01	0.02
ProcProvProbSoluCent			-0.01	0.02	-0.02	0.02	-0.02	0.02	-0.02	0.02
ProcProvGenFeedCent			0.02	0.02	0.02	0.02	0.01	0.02	0.01	0.02
Greater Expertise Source (cent)			-0.03	0.03	-0.04	0.03	-0.02	0.03	-0.03	0.03
Unsolicited (SeekXProv PS)					0.01 **	0.00	0.01 *	0.01	0.01 *	0.01
Unsolicited (SeekXProv GF)					0.00 †	0.00	0.01 *	0.00	0.01 *	0.00
SpecExpXLookPS					-0.01	0.01	-0.01	0.01	-0.02	0.01
SpecExpXLookGF					0.02	0.01	0.02 †	0.01	0.02 †	0.01
SpecExpXProvPS					0.02 †	0.01	0.02	0.01	0.02	0.01
SpecExpXProvGF					0.02	0.01	0.02	0.01	0.02 †	0.01
SpecExpXLookXProvPS							0.00	0.00	0.00	0.00
SpecExpXLookXProvGF							-0.01 ***	0.00	-0.01 ***	0.00
Subject-Initiated Exchange									-0.12	0.12
Subject Searcher Dummy									0.11	0.17
R Square	0.16		0.17		0.21		0.24		0.24	
Adjusted R Square	0.13		0.13		0.16		0.19		0.19	
R Square Change	0.16 ***		0.01		0.04 **		0.03 ***		0.00	
F Change	5.19 ***		1.00		3.47 **		7.98 ***		0.54	

Sample Size: n = 446

Significance Levels: † $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$

Table 28b: Exchange Usefulness

Dependent Variable: Exchange Usefulness (to Recipient)

Variables	Model 1		Model 2		Model 3		Model 4		Model 5	
	B	S.E.	B	S.E.	B	S.E.	B	S.E.	B	S.E.
(Constant)	1.78 *	0.72	1.89 **	0.72	1.66 *	0.72	1.75 *	0.71	1.82 *	0.73
Company 2 Dummy	0.49 **	0.17	0.47 **	0.17	0.34 *	0.17	0.33 †	0.17	0.33 †	0.17
Company 3 Dummy	0.42 ***	0.13	0.35 **	0.13	0.28 *	0.13	0.25 *	0.12	0.25 *	0.13
Company 4 Dummy	0.11	0.12	0.07	0.12	0.06	0.12	0.05	0.12	0.06	0.12
IntID	0.27	0.54	0.20	0.54	0.22	0.54	0.26	0.53	0.24	0.54
Interaction Days Ago	0.00	0.01	0.00	0.01	0.00	0.01	0.00	0.01	0.00	0.01
Interaction Duration Log	0.06	0.05	0.08	0.05	0.08	0.05	0.08	0.05	0.08	0.05
Interaction Group Size	-0.01	0.11	0.00	0.10	0.01	0.10	-0.02	0.10	-0.02	0.10
Strong Ties	0.07	0.05	0.08	0.05	0.07	0.05	0.06	0.05	0.05	0.05
Relationship Length (logged years)	0.00	0.04	0.00	0.04	-0.01	0.04	-0.01	0.04	-0.01	0.04
Higher Rank Source	-0.05	0.04	-0.08 *	0.04	-0.07 *	0.04	-0.07 †	0.04	-0.07 †	0.04
Formal Organizational Distance	0.03	0.04	0.02	0.04	0.02	0.04	0.01	0.04	0.01	0.04
Physical Distance	0.03	0.03	0.03	0.03	0.04	0.03	0.04	0.03	0.04	0.03
Recipient Sought All Avg	0.08	0.06	0.07	0.06	0.10 †	0.06	0.09	0.06	0.09	0.06
Source Provided All Avg	0.27 ***	0.06	0.26 ***	0.06	0.29 ***	0.06	0.29 ***	0.06	0.30 ***	0.06
Feedback (Neg to Pos)	0.12 **	0.04	0.14 **	0.04	0.12 **	0.04	0.11 **	0.04	0.11 *	0.04
Recipient-Initiated Exchange	0.16 †	0.10	0.13	0.09	0.14	0.09	0.15	0.09	0.11	0.14
ProcLookProbSoluCent			0.00	0.02	0.00	0.02	-0.01	0.02	-0.01	0.02
ProcLookGenFeedCent			-0.01	0.02	-0.02	0.02	-0.03	0.02	-0.03	0.02
ProcProvProbSoluCent			0.00	0.02	-0.01	0.02	0.00	0.02	0.00	0.02
ProcProvGenFeedCent			0.00	0.02	0.01	0.02	0.00	0.02	0.00	0.02
Greater Expertise Source (cent)			0.14 ***	0.03	0.13 ***	0.03	0.14 ***	0.03	0.14 ***	0.04
Unsolicited (SeekXProv PS)					0.02 **	0.01	0.01 *	0.01	0.01 *	0.01
Unsolicited (SeekXProv GF)					0.01	0.00	0.01 *	0.00	0.01 *	0.00
SpecExpXLookPS					-0.02	0.01	-0.02 †	0.01	-0.02 †	0.01
SpecExpXLookGF					0.01	0.01	0.01	0.01	0.01	0.01
SpecExpXProvPS					0.04 *	0.02	0.03 *	0.02	0.03 *	0.02
SpecExpXProvGF					0.00	0.01	0.01	0.01	0.01	0.01
SpecExpXLookXProvPS							0.01 *	0.00	0.01 †	0.00
SpecExpXLookXProvGF							-0.01 **	0.00	-0.01 **	0.00
Subject-Initiated Exchange									-0.10	0.15
Subject Searcher Dummy									0.06	0.20
R Square	0.17		0.20		0.24		0.26		0.26	
Adjusted R Square	0.14		0.16		0.19		0.21		0.21	
R Square Change	0.17 ***		0.03 **		0.03 **		0.02 **		0.00	
F Change	5.45 ***		3.56 **		3.11 **		6.54 **		0.27	

Sample Size: n = 446

Significance Levels: † $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$

Table 29: Knowledge Characteristics Factor Analysis

Rotated Component Matrix(a)					
		Factor			
		1	2	3	4
Tadit Exchange	...NAME shared... Was (or could have been) explained without too much effort	0.83	-0.03	-0.01	-0.03
	...I shared... Was (or could have been) easily articulated	0.81	-0.04	0.07	0.12
	...NAME shared... Was (or could have been) easily articulated	0.80	-0.13	0.05	-0.08
	...I shared... Was (or could have been) explained without too much effort	0.79	0.07	-0.07	0.10
	...NAME shared... Was (or could have been) conveyed in writing with little difficulty	0.75	0.05	-0.07	-0.08
	...I shared... Was (or could have been) conveyed in writing with little difficulty	0.73	0.07	-0.05	-0.01
Novel to Recipient	...NAME shared... Was quite novel to me	-0.01	0.87	0.03	-0.02
	...NAME shared... Was much different than what I had experience with in the past	0.00	0.85	0.01	-0.11
Complex Exchange	...I shared... Had many interrelated / interdependent components or steps	0.07	-0.13	0.89	-0.08
	...NAME shared... Had many interrelated / interdependent components or steps	0.01	0.20	0.79	0.13
	...I shared... Was very complex / complicated	-0.13	-0.12	0.73	-0.16
	...NAME shared... Was very complex / complicated	-0.16	0.21	0.68	0.10
Novel to Source	...I shared... Was quite novel to [NAME]	-0.05	0.03	-0.04	-0.86
	...I shared... Was much different than what [NAME] had experience with in the past	0.05	0.08	0.08	-0.83
Eigenvalues:		5.045	1.936	1.398	1.263
% of Variance Explained:		36%	14%	10%	9%
Cumulative % of Variance Explained:		36%	50%	60%	69%

Notes: Reflects an example where subject was the recipient for these examples of item full text

Table 30: T-Tests for Knowledge Characteristics by Pull vs. Push Exchanges

	Source-Initiated Exchange		Recipient-Initiated Exchange	
	n = 211		n = 277	
	Mean	StdDev	Mean	StdDev
Tacit Interaction	3.4	1.1 **	3.6	1.2 **
Complex Interaction	4.1	1.2	4.1	1.3
Source Knowledge Novel to Recipient	3.5	1.4	3.5	1.4

Table 31: Tacitness of Unsolicited / Unsought Exchanges Regression Results

Dependent Variable: Tacit Exchange

Variables	Model 1		Model 2		Model 3		Model 4		Model 5	
	B	S.E.	B	S.E.	B	S.E.	B	S.E.	B	S.E.
(Constant)	2.86 *	1.33	3.17 *	1.34	3.22 *	1.35	3.42 *	1.38	3.26 *	1.29
Company 2 Dummy	0.38	0.31	0.27	0.32	0.27	0.32	0.27	0.32	0.17	0.28
Company 3 Dummy	0.61 *	0.24	0.58 *	0.24	0.58 *	0.24	0.57 *	0.24	0.56 **	0.21
Company 4 Dummy	0.30	0.26	0.25	0.26	0.25	0.26	0.26	0.26	0.35	0.23
Customer Service Dummy	-0.06	0.35	-0.05	0.35	-0.04	0.35	-0.03	0.35	0.00	0.31
Marketing / Sales Dummy	-0.46 †	0.25	-0.48 †	0.25	-0.47 †	0.25	-0.46 †	0.25	-0.32	0.22
Administration / Support	-0.12	0.30	-0.11	0.30	-0.10	0.30	-0.08	0.30	0.09	0.26
Production / Operations Dummy	-0.37	0.24	-0.41 †	0.24	-0.40 †	0.24	-0.40 †	0.24	-0.32	0.21
Age	0.03	0.06	0.04	0.06	0.04	0.06	0.04	0.06	0.05	0.05
Education	0.03	0.08	0.03	0.08	0.03	0.08	0.02	0.08	-0.01	0.07
Years at Job	-0.22 **	0.08	-0.22 **	0.08	-0.22 *	0.08	-0.21 *	0.09	-0.14 †	0.08
Years at Company	0.09	0.13	0.09	0.13	0.08	0.13	0.09	0.13	-0.01	0.11
Years in Industry	-0.07	0.08	-0.06	0.08	-0.06	0.08	-0.07	0.08	-0.04	0.07
Collaborative Culture	-0.20 †	0.10	-0.21 *	0.10	-0.21 *	0.11	-0.21 *	0.11	-0.16 †	0.09
Judgmental Culture	0.00	0.07	-0.01	0.07	-0.01	0.07	-0.01	0.07	-0.04	0.06
Intrinsic Motivation	-0.05	0.10	-0.05	0.10	-0.06	0.10	-0.05	0.10	-0.05	0.09
Identification Motivation	0.02	0.08	0.01	0.08	0.01	0.08	0.02	0.08	-0.04	0.07
Social Motives Positive	-0.14	0.12	-0.16	0.12	-0.16	0.12	-0.16	0.12	-0.16	0.11
Social Motives Negative	-0.11	0.08	-0.12	0.08	-0.12	0.08	-0.12	0.08	-0.11	0.07
Extrinsic Motivation	0.07	0.06	0.07	0.06	0.07	0.06	0.07	0.06	0.06	0.05
Lose Unique Value	-0.01	0.07	-0.01	0.07	-0.01	0.07	-0.01	0.07	-0.01	0.06
Organization in Flux	0.14 *	0.07	0.13 †	0.07	0.13 †	0.07	0.13 †	0.07	0.07	0.06
Subject Anxious About Future	0.00	0.05	0.01	0.05	0.01	0.05	0.00	0.05	0.00	0.04
IntID	-0.02	0.21	-0.01	0.21	0.00	0.21	0.00	0.21	0.06	0.19
Interaction Days Ago	0.02 †	0.01	0.02 †	0.01	0.02 †	0.01	0.02	0.01	0.01	0.01
Interaction Duration Log	0.25 ***	0.07	0.25 ***	0.07	0.26 ***	0.07	0.26 ***	0.07	0.13 *	0.06
Interaction Group Size	0.08	0.17	0.09	0.17	0.09	0.18	0.09	0.18	-0.04	0.15
Strong Ties	0.04	0.09	0.05	0.09	0.05	0.09	0.05	0.09	0.00	0.08
Relationship Length (logged years)	-0.04	0.08	-0.05	0.08	-0.04	0.08	-0.05	0.08	-0.02	0.07
Higher Rank Source	0.05	0.07	0.05	0.07	0.05	0.07	0.06	0.07	0.04	0.06
Greater Expertise Source	-0.08	0.06	-0.10	0.06	-0.10	0.06	-0.09	0.06	-0.11 †	0.06
Formal Organizational Distance	0.10	0.07	0.11 †	0.07	0.11 †	0.07	0.11	0.07	0.06	0.06
Physical Distance	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.04
Recipient-Initiated Exchange	0.17	0.16	0.19	0.16	0.18	0.16	0.18	0.16	0.15	0.14
Recipient Sought All Max (cent)			-0.09	0.10	-0.08	0.11	-0.08	0.11	-0.17 †	0.10
Source Provided All Max (cent)			0.20 †	0.10	0.20 †	0.10	0.22 *	0.11	0.15	0.10
Unsolicited (SeekXProv Max)					0.02	0.05	0.03	0.05	0.01	0.05
Feedback (Neg to Pos)							-0.07	0.08	-0.07	0.08
Complex Interaction									0.43 ***	0.06
Source Knowledge Novel to Recipient									0.10 †	0.06
Recipient Knowledge Novel to Source									-0.04	0.06
R Square	0.23		0.25		0.25		0.25		0.44	
Adjusted R Square	0.12		0.13		0.13		0.12		0.33	
R Square Change	0.23 ***		0.01		0.00		0.00		0.19 ***	
F Change	2.10 ***		1.81		0.14		0.66		24.23 ***	

Sample Size: n = 260

Significance Levels: † $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$

Table 32: Tacitness of Problem-to-Solution Knowledge Regression Results

Dependent Variable: Tacit Exchange

Variables	Model 1		Model 2		Model 3		Model 4		Model 5	
	B	S.E.	B	S.E.	B	S.E.	B	S.E.	B	S.E.
(Constant)	2.86 *	1.33	2.90 *	1.32	2.88 *	1.33	2.52 †	1.35	3.11 *	1.24
Company 2 Dummy	0.38	0.31	0.32	0.31	0.29	0.32	0.23	0.33	0.14	0.29
Company 3 Dummy	0.61 *	0.24	0.57 *	0.24	0.55 *	0.25	0.54 *	0.24	0.53 *	0.21
Company 4 Dummy	0.30	0.26	0.27	0.26	0.26	0.26	0.20	0.26	0.30	0.23
Customer Service Dummy	-0.06	0.35	-0.04	0.35	-0.04	0.35	0.00	0.35	0.04	0.30
Marketing / Sales Dummy	-0.46 †	0.25	-0.49 *	0.25	-0.50 *	0.25	-0.50 *	0.25	-0.36	0.22
Administration / Support	-0.12	0.30	-0.08	0.30	-0.07	0.30	-0.04	0.30	0.17	0.27
Production / Operations Dummy	-0.37	0.24	-0.35	0.24	-0.35	0.24	-0.37	0.24	-0.30	0.21
Age	0.03	0.06	0.04	0.06	0.05	0.06	0.06	0.06	0.06	0.05
Education	0.03	0.08	0.00	0.08	0.00	0.08	0.00	0.08	-0.02	0.07
Years at Job	-0.22 **	0.08	-0.18 *	0.09	-0.18 *	0.09	-0.16 †	0.09	-0.11	0.08
Years at Company	0.09	0.13	0.09	0.13	0.08	0.13	0.09	0.13	-0.02	0.12
Years in Industry	-0.07	0.08	-0.10	0.08	-0.10	0.08	-0.11	0.08	-0.07	0.07
Collaborative Culture	-0.20 †	0.10	-0.18 †	0.11	-0.18 †	0.11	-0.20 †	0.11	-0.15	0.09
Judgmental Culture	0.00	0.07	-0.01	0.07	-0.01	0.07	0.00	0.07	-0.03	0.06
Intrinsic Motivation	-0.05	0.10	-0.03	0.10	-0.03	0.10	-0.04	0.10	-0.05	0.09
Identification Motivation	0.02	0.08	0.01	0.08	0.01	0.08	0.01	0.08	-0.05	0.07
Social Motives Positive	-0.14	0.12	-0.12	0.12	-0.12	0.12	-0.12	0.12	-0.14	0.10
Social Motives Negative	-0.11	0.08	-0.11	0.08	-0.12	0.09	-0.12	0.08	-0.12	0.07
Extrinsic Motivation	0.07	0.06	0.06	0.06	0.06	0.06	0.04	0.06	0.04	0.05
Lose Unique Value	-0.01	0.07	-0.01	0.07	-0.01	0.07	0.01	0.07	0.01	0.06
Organization in Flux	0.14 *	0.07	0.12 †	0.07	0.12 †	0.07	0.10	0.07	0.05	0.06
Subject Anxious About Future	0.00	0.05	0.01	0.05	0.01	0.05	0.01	0.05	0.01	0.04
IntID	-0.02	0.21	-0.01	0.21	-0.01	0.22	-0.05	0.21	0.03	0.19
Interaction Days Ago	0.02 †	0.01	0.02	0.01	0.02	0.01	0.01	0.01	0.01	0.01
Interaction Duration Log	0.25 ***	0.07	0.24 ***	0.07	0.24 ***	0.07	0.23 ***	0.07	0.12 *	0.06
Interaction Group Size	0.08	0.17	0.16	0.18	0.16	0.18	0.15	0.18	0.02	0.16
Strong Ties	0.04	0.09	0.06	0.09	0.06	0.09	0.04	0.09	-0.01	0.08
Relationship Length (logged years)	-0.04	0.08	-0.05	0.08	-0.05	0.08	-0.06	0.08	-0.02	0.07
Higher Rank Source	0.05	0.07	0.05	0.06	0.05	0.07	0.04	0.07	0.03	0.06
Greater Expertise Source	-0.08	0.06	-0.08	0.06	-0.08	0.06	-0.08	0.06	-0.10 †	0.06
Formal Organizational Distance	0.10	0.07	0.09	0.07	0.09	0.07	0.09	0.07	0.05	0.06
Physical Distance	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.04	0.04
Recipient-Initiated Exchange	0.17	0.16	0.17	0.16	0.17	0.16	0.15	0.16	0.10	0.14
ProcLookProbSoluCent			-0.09 *	0.04	-0.09 *	0.04	-0.08 *	0.04	-0.07 *	0.03
ProcLookGenFeedCent			-0.05 †	0.03	-0.05	0.03	-0.06 †	0.03	-0.05 †	0.03
ProcProvProbSoluCent			0.05	0.04	0.05	0.04	0.06	0.04	0.06	0.03
ProcProvGenFeedCent			0.03	0.03	0.03	0.03	0.04	0.03	0.06 †	0.03
Unsolicited (SeekXProv PS)					0.00	0.01	0.01	0.01	0.01	0.01
Unsolicited (SeekXProv GF)					0.00	0.01	0.00	0.01	0.00	0.00
Recipient Sought All Avg							0.03	0.11	-0.06	0.10
Source Provided All Avg							0.20 †	0.12	0.13	0.10
Feedback (Neg to Pos)							-0.07	0.08	-0.09	0.08
Complex Interaction									0.42 ***	0.06
Source Knowledge Novel to Recipient									0.09	0.06
Recipient Knowledge Novel to Source									-0.03	0.07
R Square	0.23		0.26		0.26		0.28		0.45	
Adjusted R Square	0.12		0.14		0.13		0.14		0.34	
R Square Change	0.23 ***		0.03		0.00		0.02 †		0.17 ***	
F Change	2.10 ***		1.93		0.04		2.15 †		22.20 ***	

Sample Size: n = 260

Significance Levels: † $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$

Table 33: Novelty of Unsolicited / Unsought Exchanges Regression Results

Dependent Variable: Recipient Novelty

Variables	Model 1		Model 2		Model 3		Model 4		Model 5	
	B	S.E.	B	S.E.	B	S.E.	B	S.E.	B	S.E.
(Constant)	1.79	1.47	2.36	1.47	2.41	1.48	3.50 *	1.46	0.99	1.48
Company 2 Dummy	0.75 *	0.35	0.73 *	0.35	0.73 *	0.35	0.70 *	0.34	0.78 *	0.32
Company 3 Dummy	0.23	0.26	0.20	0.26	0.20	0.26	0.15	0.25	0.06	0.24
Company 4 Dummy	-0.12	0.29	-0.18	0.29	-0.19	0.29	-0.15	0.28	-0.09	0.26
Customer Service Dummy	0.03	0.39	0.06	0.38	0.07	0.38	0.10	0.37	0.07	0.35
Marketing / Sales Dummy	-0.10	0.27	-0.11	0.27	-0.10	0.27	-0.03	0.26	0.01	0.25
Administration / Support	-0.18	0.33	-0.12	0.33	-0.11	0.33	-0.01	0.32	0.08	0.30
Production / Operations Dummy	-0.13	0.26	-0.14	0.26	-0.13	0.26	-0.14	0.25	0.01	0.24
Age	-0.06	0.06	-0.07	0.06	-0.07	0.06	-0.06	0.06	-0.06	0.06
Education	0.02	0.08	0.03	0.08	0.03	0.08	0.01	0.08	0.02	0.08
Years at Job	-0.15	0.09	-0.15 †	0.09	-0.15	0.09	-0.11	0.09	-0.08	0.09
Years at Company	0.03	0.14	0.04	0.14	0.04	0.14	0.06	0.14	0.07	0.13
Years in Industry	-0.05	0.09	-0.05	0.09	-0.04	0.09	-0.06	0.09	-0.06	0.08
Collaborative Culture	0.15	0.12	0.14	0.11	0.14	0.12	0.12	0.11	0.17	0.11
Judgmental Culture	0.10	0.08	0.11	0.08	0.10	0.08	0.12	0.08	0.09	0.07
Intrinsic Motivation	0.01	0.11	-0.03	0.11	-0.04	0.11	0.00	0.11	-0.05	0.10
Identification Motivation	0.01	0.08	0.01	0.08	0.02	0.08	0.05	0.08	0.02	0.08
Social Motives Positive	-0.14	0.13	-0.18	0.13	-0.19	0.13	-0.16	0.13	-0.11	0.12
Social Motives Negative	-0.02	0.09	-0.03	0.09	-0.03	0.09	-0.05	0.09	-0.01	0.08
Extrinsic Motivation	0.01	0.07	0.01	0.06	0.01	0.06	0.01	0.06	0.00	0.06
Lose Unique Value	0.00	0.08	0.03	0.08	0.02	0.08	0.03	0.08	-0.01	0.07
Organization in Flux	0.06	0.08	0.05	0.07	0.05	0.08	0.04	0.07	0.03	0.07
Subject Anxious About Future	0.07	0.05	0.07	0.05	0.07	0.05	0.05	0.05	0.04	0.05
IntID	-0.31	0.23	-0.30	0.23	-0.29	0.23	-0.29	0.23	-0.35	0.21
Interaction Days Ago	0.00	0.01	0.00	0.01	0.00	0.01	0.00	0.01	0.00	0.01
Interaction Duration Log	0.10	0.08	0.09	0.07	0.10	0.08	0.11	0.07	0.02	0.07
Interaction Group Size	0.08	0.19	0.06	0.19	0.05	0.19	0.03	0.19	0.04	0.18
Strong Ties	-0.05	0.10	-0.05	0.10	-0.06	0.10	-0.02	0.10	0.05	0.09
Relationship Length (logged years)	0.14 †	0.08	0.14	0.08	0.14 †	0.08	0.11	0.08	0.10	0.08
Higher Rank Source	0.04	0.07	0.02	0.07	0.02	0.07	0.05	0.07	0.05	0.07
Greater Expertise Source	0.12 †	0.07	0.11	0.07	0.11	0.07	0.16 *	0.07	0.25 ***	0.07
Formal Organizational Distance	0.16 *	0.07	0.16 *	0.07	0.15 *	0.07	0.14 *	0.07	0.10	0.07
Physical Distance	-0.03	0.05	-0.04	0.05	-0.04	0.05	-0.04	0.05	-0.02	0.05
Recipient-Initiated Exchange	-0.03	0.17	-0.08	0.17	-0.10	0.18	-0.11	0.17	-0.12	0.16
Recipient Sought All Max (cent)			0.23 *	0.11	0.25 *	0.12	0.27 *	0.12	0.24 *	0.11
Source Provided All Max (cent)			0.08	0.11	0.08	0.11	0.18	0.11	0.05	0.11
Unsolicited (SeekXProv Max)					0.02	0.06	0.06	0.06	0.04	0.05
Feedback (Neg to Pos)							-0.35 ***	0.09	-0.31 ***	0.08
Tacit Interaction									0.13 †	0.08
Complex Interaction									0.16 *	0.07
Recipient Knowledge Novel to Source									0.27 ***	0.07
R Square	0.14		0.17		0.17		0.22		0.33	
Adjusted R Square	0.01		0.04		0.04		0.10		0.21	
R Square Change	0.14		0.03 *		0.00		0.06 ***		0.11 ***	
F Change	1.12		3.80 *		0.19		16.01 ***		11.51 ***	

Sample Size: n = 260

Significance Levels: † $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$

Table 34: Novelty of Problem-to-Solution Knowledge Regression Results**Dependent Variable: Source Knowledge Novel to Recipient**

Variables	Model 1		Model 2		Model 3		Model 4		Model 5	
	B	S.E.	B	S.E.	B	S.E.	B	S.E.	B	S.E.
(Constant)	1.79	1.47	1.93	1.46	1.87	1.46	1.53	1.41	-0.09	1.40
Company 2 Dummy	0.75 *	0.35	0.63 †	0.35	0.62 †	0.36	0.53	0.34	0.55 †	0.32
Company 3 Dummy	0.23	0.26	0.12	0.27	0.14	0.27	0.11	0.25	0.00	0.24
Company 4 Dummy	-0.12	0.29	-0.09	0.29	-0.10	0.29	-0.18	0.27	-0.12	0.26
Customer Service Dummy	0.03	0.39	0.02	0.38	0.02	0.38	0.09	0.36	0.07	0.34
Marketing / Sales Dummy	-0.10	0.27	-0.07	0.27	-0.11	0.27	-0.09	0.26	-0.04	0.24
Administration / Support	-0.18	0.33	-0.29	0.33	-0.27	0.33	-0.14	0.31	-0.06	0.30
Production / Operations Dummy	-0.13	0.26	-0.10	0.26	-0.09	0.26	-0.14	0.24	-0.02	0.23
Age	-0.06	0.06	-0.05	0.06	-0.05	0.06	-0.02	0.06	-0.02	0.06
Education	0.02	0.08	0.00	0.08	-0.01	0.08	-0.01	0.08	0.00	0.07
Years at Job	-0.15	0.09	-0.15	0.09	-0.17 †	0.09	-0.11	0.09	-0.09	0.08
Years at Company	0.03	0.14	0.03	0.14	0.04	0.14	0.06	0.13	0.06	0.13
Years in Industry	-0.05	0.09	-0.05	0.09	-0.05	0.09	-0.08	0.08	-0.07	0.08
Collaborative Culture	0.15	0.12	0.11	0.12	0.10	0.12	0.07	0.11	0.10	0.10
Judgmental Culture	0.10	0.08	0.10	0.08	0.09	0.08	0.11	0.08	0.09	0.07
Intrinsic Motivation	0.01	0.11	-0.02	0.11	-0.01	0.11	0.00	0.11	-0.06	0.10
Identification Motivation	0.01	0.08	0.03	0.08	0.04	0.08	0.05	0.08	0.02	0.07
Social Motives Positive	-0.14	0.13	-0.12	0.13	-0.12	0.13	-0.09	0.12	-0.06	0.12
Social Motives Negative	-0.02	0.09	-0.01	0.09	0.00	0.09	-0.01	0.09	0.01	0.08
Extrinsic Motivation	0.01	0.07	0.00	0.07	0.00	0.07	-0.04	0.06	-0.03	0.06
Lose Unique Value	0.00	0.08	-0.01	0.08	-0.01	0.08	0.04	0.08	-0.01	0.07
Organization in Flux	0.06	0.08	0.06	0.08	0.06	0.08	0.02	0.07	0.02	0.07
Subject Anxious About Future	0.07	0.05	0.06	0.05	0.07	0.05	0.04	0.05	0.03	0.05
IntID	-0.31	0.23	-0.26	0.24	-0.26	0.24	-0.36	0.22	-0.37 †	0.21
Interaction Days Ago	0.00	0.01	0.00	0.01	0.00	0.01	0.00	0.01	0.00	0.01
Interaction Duration Log	0.10	0.08	0.08	0.07	0.08	0.08	0.07	0.07	0.00	0.07
Interaction Group Size	0.08	0.19	0.05	0.20	0.03	0.20	0.01	0.18	0.03	0.18
Strong Ties	-0.05	0.10	-0.04	0.10	-0.03	0.10	-0.05	0.09	0.03	0.09
Relationship Length (logged years)	0.14 †	0.08	0.14	0.08	0.14	0.08	0.10	0.08	0.11	0.08
Higher Rank Source	0.04	0.07	0.03	0.07	0.03	0.07	0.02	0.07	0.04	0.06
Greater Expertise Source	0.12 †	0.07	0.12 †	0.07	0.12 †	0.07	0.15 *	0.07	0.22 ***	0.06
Formal Organizational Distance	0.16 *	0.07	0.13 †	0.07	0.13 †	0.07	0.12 †	0.07	0.09	0.07
Physical Distance	-0.03	0.05	-0.02	0.05	-0.02	0.05	-0.02	0.05	-0.01	0.05
Recipient-Initiated Exchange	-0.03	0.17	0.01	0.17	-0.01	0.17	-0.05	0.16	-0.04	0.15
ProcLookProbSoluCent			0.02	0.04	0.02	0.04	0.04	0.04	0.06 †	0.04
ProcLookGenFeedCent			-0.03	0.03	-0.03	0.03	-0.04	0.03	-0.05 †	0.03
ProcProvProbSoluCent			-0.03	0.04	-0.03	0.04	-0.01	0.04	-0.03	0.04
ProcProvGenFeedCent			-0.07 †	0.04	-0.07 †	0.04	-0.02	0.04	-0.03	0.03
Unsolicited (SeekXProv PS)					-0.01	0.01	0.00	0.01	0.01	0.01
Unsolicited (SeekXProv GF)					0.01	0.01	0.01 **	0.01	0.01 †	0.01
Recipient Sought All Avg							0.12	0.11	0.03	0.11
Source Provided All Avg							0.35 **	0.12	0.28 *	0.12
Feedback (Neg to Pos)							-0.34 ***	0.09	-0.31 ***	0.08
Tacit Interaction									0.11	0.08
Complex Interaction									0.15 *	0.07
Recipient Knowledge Novel to Source									0.28 ***	0.07
R Square	0.14		0.17		0.18		0.28		0.38	
Adjusted R Square	0.01		0.03		0.03		0.15		0.25	
R Square Change	0.14		0.03 †		0.01		0.10 ***		0.09 ***	
F Change	1.12		2.01 †		1.31		10.64 ***		10.69 ***	

Sample Size: n = 260

Significance Levels: † $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$

Table 35: Exchange Usefulness for Unsolicited / Unsought Exchanges by Tacitness

Regression Results

Dependent Variable: Exchange Usefulness (to Recipient)

Variables	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6	
	B	S.E.	B	S.E.	B	S.E.	B	S.E.	B	S.E.	B	S.E.
(Constant)	2.73 *	1.24	3.80 **	1.17	4.15 ***	1.14	4.17 ***	1.14	3.60 **	1.15	4.12 ***	1.22
Company 2 Dummy	0.16	0.29	-0.15	0.28	-0.12	0.27	-0.12	0.27	-0.11	0.27	-0.22	0.27
Company 3 Dummy	0.06	0.22	-0.02	0.21	-0.09	0.20	-0.09	0.20	-0.07	0.20	-0.04	0.20
Company 4 Dummy	0.24	0.24	0.08	0.23	0.08	0.22	0.08	0.22	0.06	0.22	0.08	0.22
Customer Service Dummy	-0.40	0.33	-0.34	0.30	-0.27	0.29	-0.28	0.30	-0.29	0.29	-0.28	0.29
Marketing / Sales Dummy	-0.27	0.23	-0.29	0.22	-0.24	0.21	-0.25	0.21	-0.28	0.21	-0.25	0.21
Administration / Support	-0.30	0.28	-0.24	0.26	-0.22	0.25	-0.23	0.26	-0.27	0.25	-0.26	0.25
Production / Operations Dummy	-0.20	0.22	-0.29	0.21	-0.21	0.20	-0.21	0.20	-0.20	0.20	-0.22	0.20
Age	0.10 †	0.05	0.11 *	0.05	0.11 *	0.05	0.11 *	0.05	0.10 *	0.05	0.11 *	0.05
Education	-0.11	0.07	-0.11 †	0.07	-0.11 †	0.06	-0.11 †	0.06	-0.10	0.06	-0.12 †	0.06
Years at Job	-0.12	0.08	-0.12 †	0.07	-0.09	0.07	-0.08	0.07	-0.10	0.07	-0.08	0.07
Years at Company	-0.16	0.12	-0.17	0.11	-0.21 †	0.11	-0.21 †	0.11	-0.22 *	0.11	-0.27 *	0.11
Years in Industry	-0.03	0.08	-0.02	0.07	-0.01	0.07	-0.01	0.07	0.00	0.07	0.01	0.07
Collaborative Culture	0.08	0.10	0.05	0.09	0.02	0.09	0.02	0.09	0.03	0.09	0.02	0.09
Judgmental Culture	-0.01	0.07	-0.02	0.06	-0.04	0.06	-0.04	0.06	-0.05	0.06	-0.06	0.06
Intrinsic Motivation	0.19 †	0.09	0.16 †	0.09	0.11	0.09	0.11	0.09	0.10	0.09	0.12	0.09
Identification Motivation	0.04	0.07	0.02	0.07	0.05	0.06	0.05	0.06	0.03	0.06	0.02	0.06
Social Motives Positive	-0.09	0.11	-0.16	0.10	-0.20 *	0.10	-0.20 †	0.10	-0.21 *	0.10	-0.22 *	0.10
Social Motives Negative	-0.04	0.08	-0.05	0.07	-0.04	0.07	-0.04	0.07	-0.03	0.07	-0.03	0.07
Extrinsic Motivation	0.06	0.06	0.05	0.05	0.07	0.05	0.06	0.05	0.06	0.05	0.06	0.05
Lose Unique Value	0.02	0.07	0.03	0.06	0.00	0.06	0.00	0.06	0.00	0.06	0.01	0.06
Organization in Flux	0.03	0.06	0.00	0.06	0.03	0.06	0.03	0.06	0.04	0.06	0.02	0.06
Subject Anxious About Future	-0.05	0.05	-0.04	0.04	-0.06	0.04	-0.06	0.04	-0.05	0.04	-0.05	0.04
IntID	0.20	0.20	0.25	0.18	0.32 †	0.18	0.31 †	0.18	0.32 †	0.18	0.39 *	0.18
Interaction Days Ago	0.01	0.01	0.01	0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Interaction Duration Log	0.12 †	0.06	0.13 *	0.06	0.15 *	0.06	0.15 *	0.06	0.14 *	0.06	0.13 *	0.06
Interaction Group Size	0.05	0.16	0.08	0.15	0.05	0.15	0.05	0.15	0.06	0.15	0.01	0.15
Strong Ties	0.10	0.08	0.11	0.08	0.10	0.08	0.11	0.08	0.09	0.08	0.05	0.08
Relationship Length (logged years)	0.02	0.07	0.01	0.07	0.02	0.06	0.02	0.06	0.03	0.06	0.04	0.06
Higher Rank Source	-0.06	0.06	-0.04	0.06	-0.04	0.06	-0.05	0.06	-0.06	0.06	-0.08	0.06
Greater Expertise Source	0.15 *	0.06	0.09	0.06	0.12 *	0.05	0.11 *	0.05	0.09 †	0.05	0.04	0.06
Formal Organizational Distance	0.03	0.06	0.05	0.06	0.03	0.06	0.03	0.06	0.04	0.06	0.03	0.06
Physical Distance	0.07	0.04	0.04	0.04	0.05	0.04	0.05	0.04	0.04	0.04	0.04	0.04
Recipient-Initiated Exchange	0.07	0.15	0.10	0.14	-0.02	0.14	-0.02	0.14	-0.01	0.13	-0.01	0.13
Recipient Sought All Max (cent)			-0.15 †	0.09	-0.01	0.09	-0.01	0.10	-0.01	0.09	-0.05	0.09
Source Provided All Max (cent)			0.54 ***	0.09	0.56 ***	0.09	0.56 ***	0.09	0.50 ***	0.10	0.52 ***	0.10
Tacit Exchange (cent)			0.02	0.06	-0.01	0.06	0.01	0.06	0.01	0.06	-0.04	0.07
Unsolicited (SeekXProv Max)					0.16 ***	0.04	0.14 **	0.05	0.13 *	0.05	0.12 *	0.05
TacitXLookMax					0.16 †	0.08	0.15 †	0.08	0.17 *	0.08	0.15 †	0.08
TacitXProvMax					-0.02	0.08	-0.02	0.08	-0.05	0.08	-0.05	0.08
TacitXLookXProvMax							-0.03	0.06	-0.03	0.06	-0.05	0.06
Feedback (Neg to Pos)									0.17 *	0.07	0.18 *	0.07
Complex Interaction											0.08	0.06
Source Knowledge Novel to Recipient											0.11 *	0.06
Recipient Knowledge Novel to Source											-0.13 *	0.06
R Square	0.19		0.31		0.36		0.36		0.38		0.41	
Adjusted R Square	0.07		0.20		0.25		0.25		0.27		0.28	
R Square Change	0.19 *		0.12 ***		0.06 ***		0.00		0.02 *		0.02 *	
F Change	1.59 *		12.94 ***		6.39 ***		0.30		6.16 *		3.00 *	

Sample Size: n = 260

Significance Levels: † $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$

Table 36: Exchange Usefulness for Unsolicited / Unsought Problem-Solving Knowledge by Tacitness

Dependent Variable: Exchange Usefulness (to Recipient)

Variables	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6	
	B	S.E.	B	S.E.	B	S.E.	B	S.E.	B	S.E.	B	S.E.
(Constant)	2.73 *	1.24	2.76 *	1.25	2.56 *	1.26	2.91 *	1.27	2.16 †	1.16	2.61 *	1.22
Company 2 Dummy	0.16	0.29	0.13	0.30	0.11	0.31	0.15	0.31	-0.10	0.28	-0.14	0.28
Company 3 Dummy	0.06	0.22	-0.02	0.23	-0.07	0.24	-0.01	0.24	0.00	0.21	0.04	0.21
Company 4 Dummy	0.24	0.24	0.22	0.24	0.18	0.25	0.25	0.25	0.10	0.22	0.13	0.22
Customer Service Dummy	-0.40	0.33	-0.39	0.33	-0.40	0.33	-0.40	0.33	-0.26	0.30	-0.25	0.29
Marketing / Sales Dummy	-0.27	0.23	-0.23	0.23	-0.26	0.24	-0.26	0.24	-0.27	0.21	-0.25	0.21
Administration / Support	-0.30	0.28	-0.31	0.28	-0.30	0.29	-0.32	0.29	-0.35	0.26	-0.31	0.26
Production / Operations Dummy	-0.20	0.22	-0.18	0.22	-0.17	0.23	-0.12	0.23	-0.17	0.20	-0.19	0.20
Age	0.10 †	0.05	0.10 †	0.05	0.10 †	0.05	0.09 †	0.05	0.13 **	0.05	0.13 **	0.05
Education	-0.11	0.07	-0.13 †	0.07	-0.10	0.07	-0.09	0.07	-0.08	0.07	-0.09	0.07
Years at Job	-0.12	0.08	-0.09	0.08	-0.09	0.08	-0.10	0.08	-0.10	0.07	-0.09	0.07
Years at Company	-0.16	0.12	-0.15	0.12	-0.16	0.12	-0.14	0.12	-0.21 †	0.11	-0.24 *	0.11
Years in Industry	-0.03	0.08	-0.03	0.08	-0.02	0.08	-0.02	0.08	-0.03	0.07	-0.02	0.07
Collaborative Culture	0.08	0.10	0.11	0.10	0.09	0.10	0.10	0.10	0.08	0.09	0.08	0.09
Judgmental Culture	-0.01	0.07	-0.01	0.07	0.00	0.07	0.00	0.07	-0.01	0.06	-0.01	0.06
Intrinsic Motivation	0.19 †	0.09	0.18 †	0.10	0.16 †	0.10	0.15	0.10	0.11	0.09	0.12	0.09
Identification Motivation	0.04	0.07	0.04	0.07	0.05	0.07	0.06	0.07	0.02	0.07	0.01	0.07
Social Motives Positive	-0.09	0.11	-0.09	0.11	-0.08	0.11	-0.11	0.11	-0.18 †	0.10	-0.19 †	0.10
Social Motives Negative	-0.04	0.08	-0.03	0.08	-0.02	0.08	-0.03	0.08	-0.03	0.07	-0.04	0.07
Extrinsic Motivation	0.06	0.06	0.05	0.06	0.06	0.06	0.07	0.06	0.03	0.05	0.03	0.05
Lose Unique Value	0.02	0.07	0.02	0.07	0.01	0.07	0.00	0.07	0.02	0.06	0.03	0.06
Organization in Flux	0.03	0.06	0.02	0.06	0.02	0.07	0.02	0.07	0.01	0.06	0.00	0.06
Subject Anxious About Future	-0.05	0.05	-0.05	0.05	-0.05	0.05	-0.05	0.05	-0.05	0.04	-0.05	0.04
IntID	0.20	0.20	0.23	0.20	0.22	0.21	0.15	0.21	0.14	0.19	0.18	0.19
Interaction Days Ago	0.01	0.01	0.00	0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Interaction Duration Log	0.12 †	0.06	0.10	0.07	0.10	0.07	0.09	0.07	0.09	0.06	0.08	0.06
Interaction Group Size	0.05	0.16	0.03	0.17	0.05	0.17	0.06	0.17	0.04	0.15	0.00	0.15
Strong Ties	0.10	0.08	0.11	0.09	0.13	0.09	0.11	0.09	0.01	0.08	-0.03	0.08
Relationship Length (logged years)	0.02	0.07	0.01	0.07	0.00	0.07	0.02	0.07	0.07	0.07	0.07	0.07
Higher Rank Source	-0.06	0.06	-0.06	0.06	-0.06	0.06	-0.06	0.06	-0.07	0.06	-0.08	0.06
Greater Expertise Source	0.15 *	0.06	0.16 **	0.06	0.16 **	0.06	0.15 *	0.06	0.06	0.05	0.02	0.06
Formal Organizational Distance	0.03	0.06	0.02	0.06	0.02	0.06	0.01	0.06	0.02	0.06	0.01	0.06
Physical Distance	0.07	0.04	0.07	0.04	0.07	0.04	0.06	0.04	0.04	0.04	0.04	0.04
Recipient-Initiated Exchange	0.07	0.15	0.07	0.15	0.10	0.15	0.11	0.15	0.09	0.13	0.08	0.13
ProcLookProbSoluCent			-0.04	0.04	-0.04	0.04	-0.04	0.04	-0.04	0.03	-0.05	0.03
ProcLookGenFeedCent			0.01	0.03	0.01	0.03	0.01	0.03	-0.01	0.03	-0.01	0.03
ProcProvProbSoluCent			-0.01	0.04	-0.01	0.04	0.00	0.04	0.03	0.03	0.03	0.03
ProcProvGenFeedCent			-0.02	0.03	-0.03	0.03	-0.01	0.03	0.01	0.03	0.02	0.03
Tacit Exchange (cent)			0.06	0.06	0.07	0.06	0.02	0.07	-0.03	0.06	-0.08	0.07
Unsolicited (SeekXProv PS)					0.00	0.01	0.01	0.01	0.02 *	0.01	0.01 †	0.01
Unsolicited (SeekXProv GF)					0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01
TacitXLookPS					0.02	0.03	0.03	0.03	0.00	0.03	0.01	0.03
TacitXLookGF					0.03	0.02	0.03	0.02	0.00	0.02	0.00	0.02
TacitXProvPS					0.00	0.03	-0.01	0.03	0.02	0.03	0.01	0.03
TacitXProvGF					-0.04 †	0.02	-0.03	0.02	0.00	0.02	0.00	0.02
TacitXLookXProvPS							0.01	0.01	0.00	0.01	0.00	0.01
TacitXLookXProvGF							0.01	0.00	0.01 *	0.00	0.01 *	0.00
Recipient Sought All Avg									-0.28 **	0.09	-0.28 **	0.09
Source Provided All Avg									0.61 ***	0.10	0.59 ***	0.10
Feedback (Neg to Pos)									0.20 **	0.07	0.20 **	0.08
Complex Interaction											0.07	0.06
Source Knowledge Novel to Recipient											0.09	0.06
Recipient Knowledge Novel to Source											-0.09	0.06
R Square	0.19		0.20		0.22		0.23		0.39		0.41	
Adjusted R Square	0.07		0.06		0.06		0.06		0.25		0.26	
R Square Change	0.19 *		0.01		0.02		0.01		0.16 ***		0.01	
F Change	1.59 *		0.69		0.75		1.91		18.61 ***		1.66	

Sample Size: n = 260

Significance Levels: † $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$

Table 37: Exchange Usefulness for Unsolicited / Unsought Exchanges by Novelty Regression Results

Dependent Variable: Exchange Usefulness (to Recipient)

Variables	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6	
	B	S.E.	B	S.E.	B	S.E.	B	S.E.	B	S.E.	B	S.E.
(Constant)	2.73 *	1.24	3.86 **	1.17	4.16 ***	1.14	4.36 ***	1.10	4.00 ***	1.11	4.95 ***	1.20
Company 2 Dummy	0.16	0.29	-0.19	0.28	-0.04	0.27	-0.04	0.26	-0.07	0.26	-0.12	0.26
Company 3 Dummy	0.06	0.22	-0.02	0.21	-0.03	0.20	-0.07	0.19	-0.06	0.19	-0.05	0.19
Company 4 Dummy	0.24	0.24	0.10	0.23	0.14	0.22	0.07	0.21	0.06	0.21	0.06	0.21
Customer Service Dummy	-0.40	0.33	-0.35	0.30	-0.30	0.29	-0.26	0.28	-0.27	0.28	-0.26	0.28
Marketing / Sales Dummy	-0.27	0.23	-0.29	0.21	-0.21	0.21	-0.20	0.20	-0.23	0.20	-0.19	0.20
Administration / Support	-0.30	0.28	-0.23	0.26	-0.24	0.25	-0.16	0.24	-0.21	0.24	-0.21	0.25
Production / Operations Dummy	-0.20	0.22	-0.30	0.21	-0.20	0.20	-0.19	0.19	-0.19	0.19	-0.21	0.19
Age	0.10 †	0.05	0.12 *	0.05	0.11 *	0.05	0.10 *	0.05	0.10 *	0.05	0.10 *	0.05
Education	-0.11	0.07	-0.12 †	0.07	-0.11 †	0.06	-0.10	0.06	-0.09	0.06	-0.11 †	0.06
Years at Job	-0.12	0.08	-0.12	0.07	-0.10	0.07	-0.10	0.07	-0.11	0.07	-0.10	0.07
Years at Company	-0.16	0.12	-0.18	0.11	-0.19 †	0.11	-0.19 †	0.10	-0.20 †	0.10	-0.24 *	0.10
Years in Industry	-0.03	0.08	-0.02	0.07	-0.02	0.07	-0.01	0.07	0.00	0.06	0.01	0.06
Collaborative Culture	0.08	0.10	0.04	0.09	0.00	0.09	0.00	0.09	0.00	0.09	0.01	0.09
Judgmental Culture	-0.01	0.07	-0.02	0.06	-0.04	0.06	-0.03	0.06	-0.04	0.06	-0.04	0.06
Intrinsic Motivation	0.19 †	0.09	0.17 †	0.09	0.14	0.09	0.15 †	0.08	0.14	0.08	0.16 †	0.08
Identification Motivation	0.04	0.07	0.02	0.07	0.03	0.06	0.03	0.06	0.02	0.06	0.01	0.06
Social Motives Positive	-0.09	0.11	-0.15	0.10	-0.20 *	0.10	-0.25 *	0.10	-0.26 **	0.10	-0.27 **	0.10
Social Motives Negative	-0.04	0.08	-0.05	0.07	-0.05	0.07	-0.06	0.07	-0.05	0.07	-0.06	0.07
Extrinsic Motivation	0.06	0.06	0.05	0.05	0.05	0.05	0.07	0.05	0.07	0.05	0.06	0.05
Lose Unique Value	0.02	0.07	0.03	0.06	0.01	0.06	0.00	0.06	0.00	0.06	0.01	0.06
Organization in Flux	0.03	0.06	0.00	0.06	0.03	0.06	0.05	0.06	0.05	0.06	0.03	0.06
Subject Anxious About Future	-0.05	0.05	-0.05	0.04	-0.06	0.04	-0.07	0.04	-0.06	0.04	-0.06	0.04
IntID	0.20	0.20	0.27	0.18	0.28	0.18	0.29	0.17	0.30 †	0.17	0.33 †	0.17
Interaction Days Ago	0.01	0.01	0.01	0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.00	0.01
Interaction Duration Log	0.12 †	0.06	0.13 *	0.06	0.18 **	0.06	0.16 **	0.06	0.15 **	0.06	0.15 *	0.06
Interaction Group Size	0.05	0.16	0.08	0.15	0.06	0.15	0.07	0.14	0.08	0.14	0.03	0.14
Strong Ties	0.10	0.08	0.12	0.08	0.11	0.08	0.09	0.07	0.08	0.07	0.04	0.08
Relationship Length (logged years)	0.02	0.07	0.00	0.07	0.02	0.06	0.03	0.06	0.04	0.06	0.06	0.06
Higher Rank Source	-0.06	0.06	-0.04	0.06	-0.07	0.06	-0.07	0.05	-0.08	0.05	-0.10 †	0.05
Greater Expertise Source	0.15 *	0.06	0.08	0.06	0.14 *	0.06	0.16 **	0.05	0.13 *	0.06	0.10	0.06
Formal Organizational Distance	0.03	0.06	0.04	0.06	0.02	0.06	0.03	0.06	0.03	0.05	0.03	0.05
Physical Distance	0.07	0.04	0.05	0.04	0.04	0.04	0.03	0.04	0.03	0.04	0.03	0.04
Recipient-Initiated Exchange	0.07	0.15	0.11	0.14	-0.01	0.14	0.02	0.13	0.03	0.13	0.01	0.13
Recipient Sought All Max (cent)			-0.17 †	0.09	-0.14	0.11	-0.15	0.11	-0.18 †	0.11	-0.19 †	0.11
Source Provided All Max (cent)			0.54 ***	0.09	0.60 ***	0.10	0.64 ***	0.10	0.62 ***	0.10	0.64 ***	0.10
Source Knowledge Novel to Recipient			0.06	0.05	0.10 †	0.05	0.16 **	0.05	0.18 **	0.05	0.20 ***	0.06
Unsolicited (SeekXProv Max)					0.24 ***	0.05	-0.02	0.08	-0.02	0.08	0.02	0.09
SourceNovelXLookMax					-0.16 *	0.08	-0.18 *	0.08	-0.19 *	0.08	-0.20 *	0.08
SourceNovelXProvMax					-0.03	0.08	-0.03	0.08	0.00	0.08	-0.01	0.08
SourceNovelXLookXProvMax							-0.14 ***	0.04	-0.12 ***	0.04	-0.11 **	0.04
Feedback (Neg to Pos)									0.14 †	0.07	0.12	0.07
Tacit Interaction											-0.01	0.06
Complex Interaction											0.06	0.06
Recipient Knowledge Novel to Source											-0.13 *	0.06
R Square	0.19		0.31		0.37		0.41		0.42		0.44	
Adjusted R Square	0.07		0.20		0.26		0.31		0.31		0.32	
R Square Change	0.19 *		0.12 ***		0.06 ***		0.04 ***		0.01 †		0.01	
F Change	1.59 *		13.45 ***		7.32 ***		14.33 ***		3.64 †		1.86	

Sample Size: n = 260

Significance Levels: † $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$

Table 38: Exchange Usefulness for Unsolicited / Unsought Problem-Solving Knowledge by Novelty

Dependent Variable: Exchange Usefulness (to Recipient)

Variables	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6	
	B	S.E.	B	S.E.	B	S.E.	B	S.E.	B	S.E.	B	S.E.
(Constant)	2.73 *	1.24	2.85 *	1.25	2.82 *	1.27	2.54 *	1.24	1.89	1.15	2.37 †	1.23
Company 2 Dummy	0.16	0.29	0.09	0.30	0.07	0.31	0.14	0.31	-0.17	0.28	-0.18	0.29
Company 3 Dummy	0.06	0.22	0.00	0.23	-0.02	0.23	-0.04	0.23	-0.02	0.21	0.00	0.21
Company 4 Dummy	0.24	0.24	0.24	0.24	0.23	0.25	0.12	0.25	0.00	0.22	0.01	0.22
Customer Service Dummy	-0.40	0.33	-0.40	0.33	-0.40	0.33	-0.24	0.33	-0.14	0.30	-0.13	0.30
Marketing / Sales Dummy	-0.27	0.23	-0.25	0.23	-0.23	0.24	-0.25	0.23	-0.26	0.21	-0.25	0.21
Administration / Support	-0.30	0.28	-0.29	0.28	-0.28	0.29	-0.21	0.28	-0.25	0.25	-0.22	0.26
Production / Operations Dummy	-0.20	0.22	-0.19	0.22	-0.20	0.22	-0.19	0.22	-0.21	0.20	-0.22	0.20
Age	0.10 †	0.05	0.10 †	0.05	0.10 †	0.05	0.10 †	0.05	0.14 **	0.05	0.14 **	0.05
Education	-0.11	0.07	-0.13 †	0.07	-0.11	0.07	-0.14 †	0.07	-0.13 †	0.07	-0.14 *	0.07
Years at Job	-0.12	0.08	-0.09	0.08	-0.09	0.08	-0.10	0.08	-0.09	0.07	-0.09	0.07
Years at Company	-0.16	0.12	-0.15	0.12	-0.14	0.12	-0.11	0.12	-0.21 †	0.11	-0.24 *	0.11
Years in Industry	-0.03	0.08	-0.03	0.08	-0.03	0.08	-0.04	0.08	-0.05	0.07	-0.04	0.07
Collaborative Culture	0.08	0.10	0.08	0.10	0.08	0.10	0.08	0.10	0.06	0.09	0.07	0.09
Judgmental Culture	-0.01	0.07	-0.02	0.07	-0.01	0.07	-0.02	0.07	-0.02	0.06	-0.02	0.06
Intrinsic Motivation	0.19 †	0.09	0.18 †	0.10	0.17 †	0.10	0.18 †	0.09	0.13	0.09	0.14	0.09
Identification Motivation	0.04	0.07	0.04	0.07	0.03	0.07	0.05	0.07	0.02	0.06	0.01	0.06
Social Motives Positive	-0.09	0.11	-0.08	0.11	-0.10	0.11	-0.05	0.11	-0.10	0.10	-0.11	0.10
Social Motives Negative	-0.04	0.08	-0.04	0.08	-0.05	0.08	-0.02	0.08	-0.01	0.07	-0.02	0.07
Extrinsic Motivation	0.06	0.06	0.06	0.06	0.07	0.06	0.07	0.06	0.01	0.05	0.01	0.05
Love Unique Value	0.02	0.07	0.02	0.07	0.01	0.07	0.02	0.07	0.05	0.06	0.06	0.06
Organization in Flux	0.03	0.06	0.02	0.06	0.02	0.07	0.03	0.06	0.02	0.06	0.01	0.06
Subject Anxious About Future	-0.05	0.05	-0.05	0.05	-0.05	0.05	-0.05	0.05	-0.05	0.04	-0.05	0.04
IntID	0.20	0.20	0.25	0.20	0.25	0.21	0.23	0.20	0.24	0.18	0.25	0.18
Interaction Days Ago	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.01	0.00	0.01	0.00	0.01
Interaction Duration Log	0.12 †	0.06	0.11 †	0.06	0.10	0.07	0.08	0.06	0.09	0.06	0.08	0.06
Interaction Group Size	0.05	0.16	0.04	0.17	0.06	0.17	0.04	0.17	0.04	0.15	0.00	0.15
Strong Ties	0.10	0.08	0.11	0.08	0.13	0.09	0.12	0.09	0.01	0.08	-0.02	0.08
Relationship Length (logged years)	0.02	0.07	-0.01	0.07	-0.02	0.07	-0.03	0.07	0.02	0.07	0.03	0.07
Higher Rank Source	-0.06	0.06	-0.06	0.06	-0.07	0.06	-0.05	0.06	-0.07	0.06	-0.07	0.06
Greater Expertise Source	0.15 *	0.06	0.14 *	0.06	0.14 *	0.06	0.15 *	0.06	0.06	0.06	0.04	0.06
Formal Organizational Distance	0.03	0.06	0.01	0.06	0.00	0.07	0.01	0.06	0.02	0.06	0.02	0.06
Physical Distance	0.07	0.04	0.07	0.04	0.08 †	0.04	0.08 †	0.04	0.05	0.04	0.05	0.04
Recipient-Initiated Exchange	0.07	0.15	0.08	0.15	0.12	0.15	0.12	0.15	0.10	0.14	0.08	0.14
ProcLookProbSoluCent			-0.04	0.04	-0.04	0.04	-0.04	0.04	-0.05	0.03	-0.05	0.03
ProcLookGenFeedCent			0.01	0.03	0.02	0.03	0.00	0.03	-0.03	0.03	-0.03	0.03
ProcProvProbSoluCent			-0.01	0.04	-0.01	0.04	-0.01	0.04	0.03	0.03	0.03	0.03
ProcProvGenFeedCent			-0.01	0.03	-0.04	0.04	-0.08 *	0.04	-0.03	0.04	-0.02	0.04
Source Knowledge Novel to Recipient (cent)			0.09	0.06	0.09	0.06	0.10	0.06	0.08	0.06	0.08	0.06
Unsolicited (SeekXProv PS)					0.00	0.01	0.00	0.01	0.01	0.01	0.01 †	0.01
Unsolicited (SeekXProv GF)					-0.01	0.01	0.00	0.01	0.00	0.01	0.00	0.01
SourceNovelXLookPS					0.00	0.03	0.00	0.03	0.00	0.02	0.01	0.02
SourceNovelXLookGF					0.01	0.02	-0.01	0.02	-0.04	0.02	-0.03	0.02
SourceNovelXProvPS					-0.01	0.03	-0.01	0.03	0.00	0.03	0.00	0.03
SourceNovelXProvGF					-0.03	0.03	-0.04	0.03	0.00	0.03	0.00	0.03
SourceNovelXLookXProvPS							0.00	0.01	0.00	0.01	0.00	0.01
SourceNovelXLookXProvGF							-0.01 ***	0.00	-0.01 **	0.00	-0.01 *	0.00
Recipient Sought All Avg									-0.27 **	0.09	-0.28 **	0.09
Source Provided All Avg									0.56 ***	0.10	0.56 ***	0.10
Feedback (Neg to Pos)									0.23 **	0.07	0.21 **	0.08
Tacit Interaction											-0.03	0.07
Complex Interaction											0.08	0.06
Recipient Knowledge Novel to Source											-0.06	0.06
R Square	0.19		0.21		0.21		0.26		0.40		0.41	
Adjusted R Square	0.07		0.07		0.05		0.10		0.26		0.26	
R Square Change	0.19 *		0.02		0.01		0.04 **		0.15 ***		0.01	
F Change	1.59 *		0.97		0.40		6.10 **		17.34 ***		0.80	

Sample Size: n = 260

Significance Levels: † $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$

FIGURES

Figure 1: Four Roles in Knowledge Exchange

	Knowledge Recipient	Knowledge Source
	←← Knowledge Flows ←←	
“Pull” (Recipient-Initiated)	Searcher Initiator →	Transferor
“Push” (Source-Initiated)	Acceptor / Adopter	Sharer ← Initiator

Figure 2: Off-Diagonals in Knowledge Exchange Research

	Recipient Initiated 'Pull' Exchanges	Source Initiated 'Push' Exchanges
Solicited / Sought Knowledge	Well Studied	Under Studied (Overlooked?)
Unsolicited / Unsought Knowledge	Under Studied (Overlooked?)	Well Studied (w/o term 'knowledge')

Figure 3: Simplified Problem-Solving process

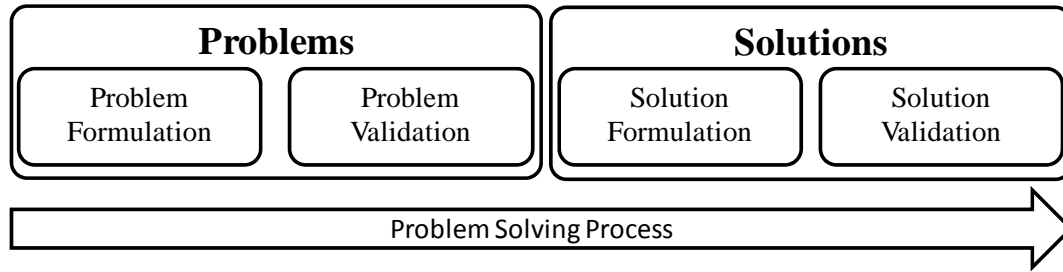


Figure 4: Knowledge Exchange within the Problem-Solving Process

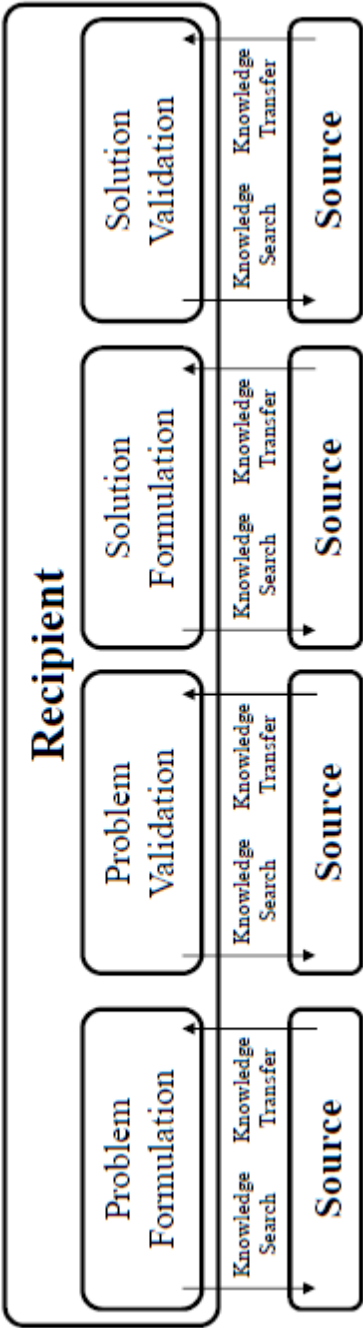


Figure 5: Solicited & Unsolicited Knowledge in the Problem-Solving Process

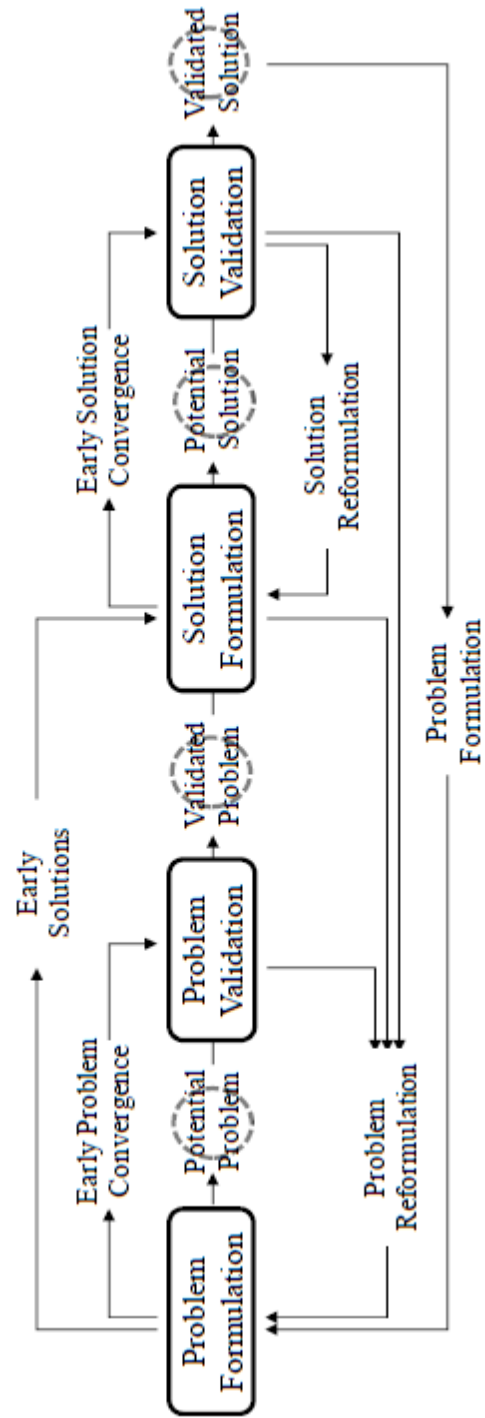


Figure 6: Divergence and Convergence in the Problem-Solving Process

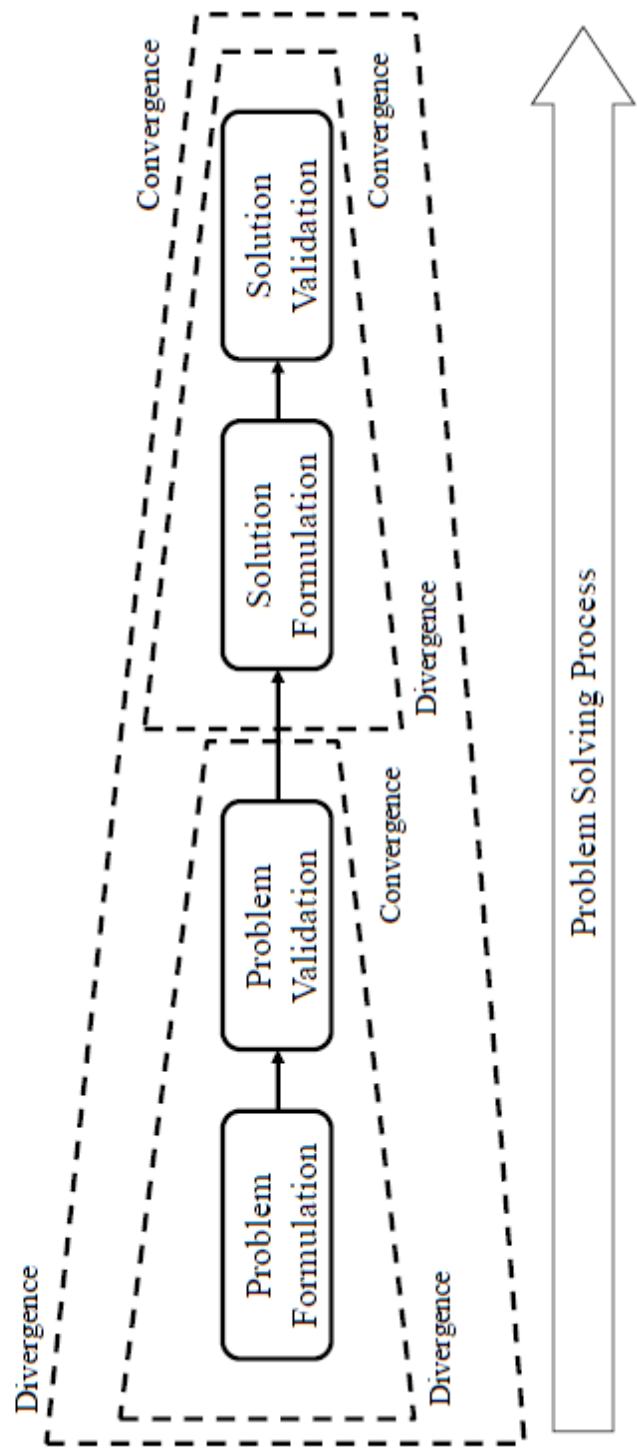


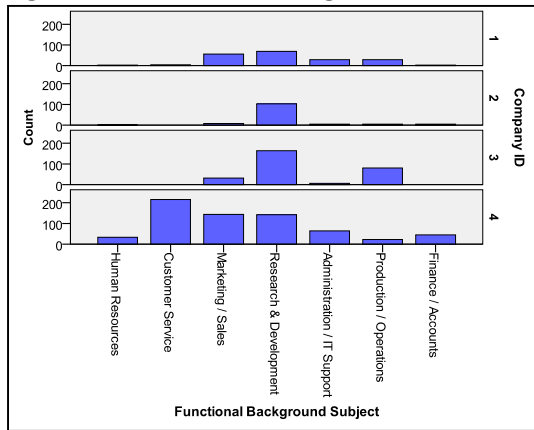
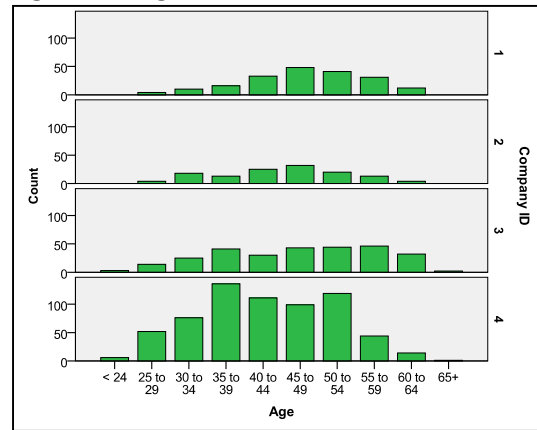
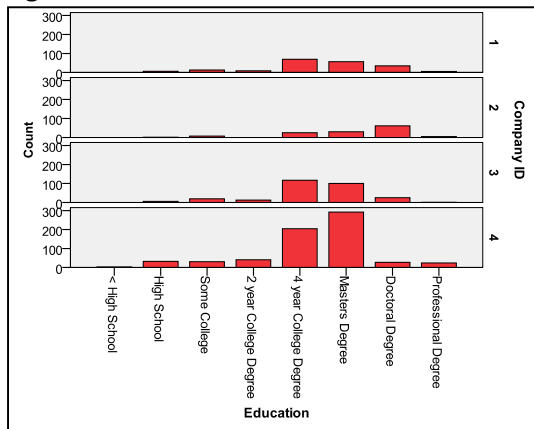
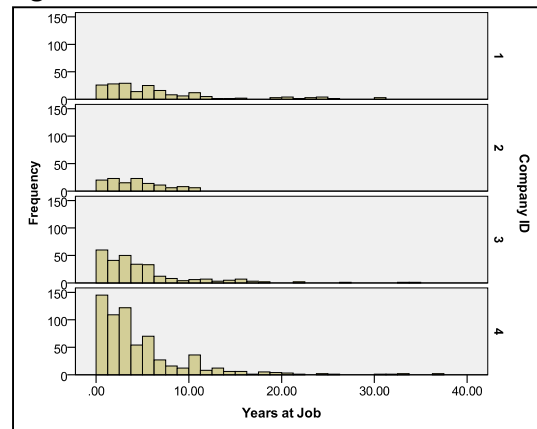
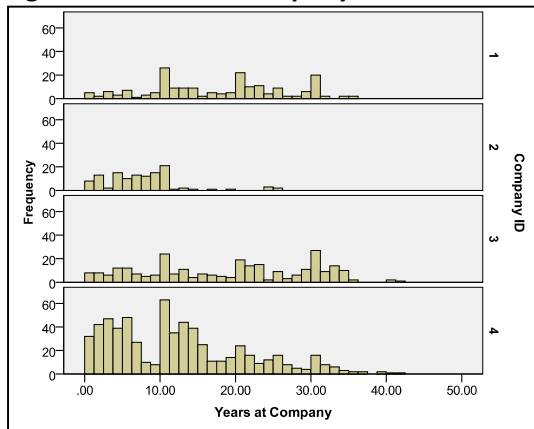
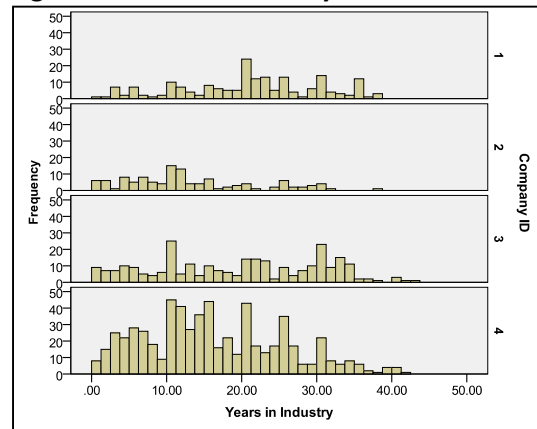
Figure 7: Subject Demographics**Figure 7a: Functional Background****Figure 7b: Age****Figure 7c: Education****Figure 7d: Years at Job****Figure 7e: Years at Company****Figure 7f: Years in industry**

Figure 8: Subject Reported Frequency of Participating in Various Exchange Roles

Figure 8a: Subject Searcher Frequency

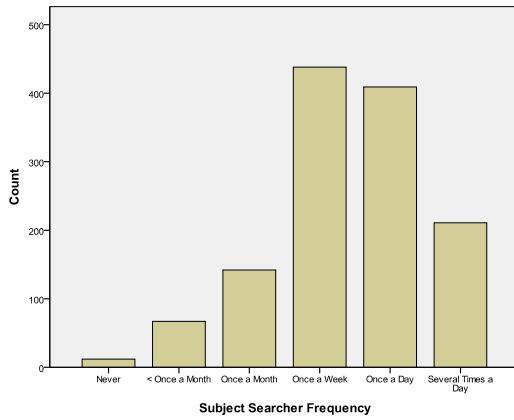


Figure 8b: Subject Searcher Relative Frequency

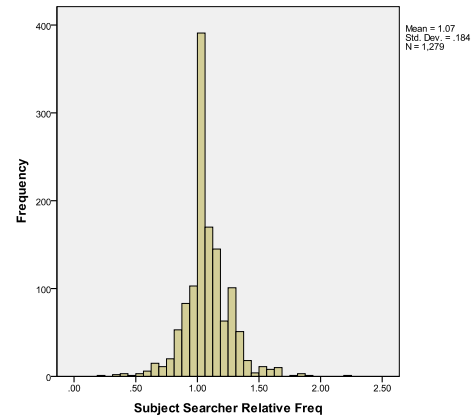


Figure 8c: Subject Transferor Frequency

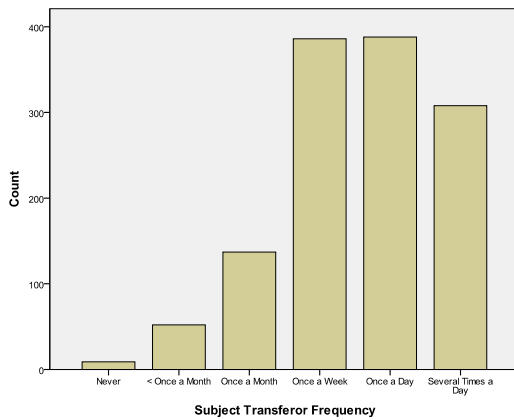


Figure 8d: Subject Transferor Relative Frequency

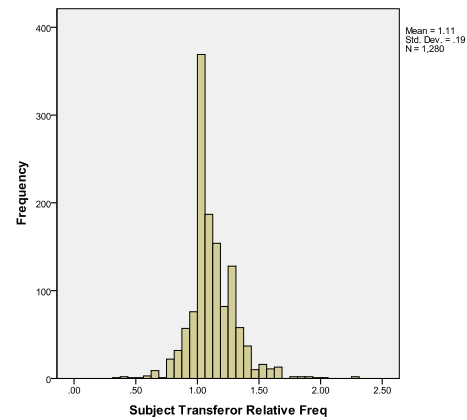


Figure 8e: Subject Sharer Frequency

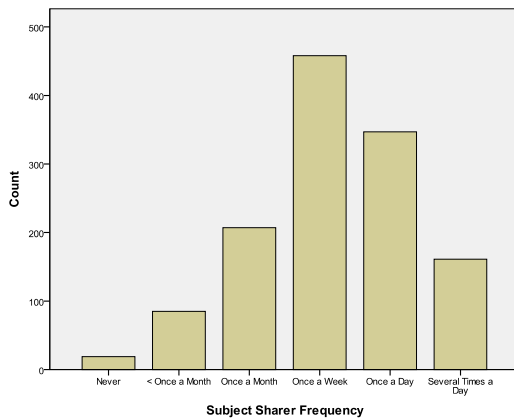


Figure 8f: Subject Sharer Relative Frequency

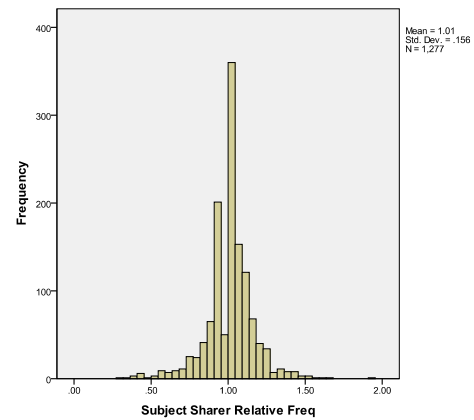


Figure 8g: Subject Adopter Frequency

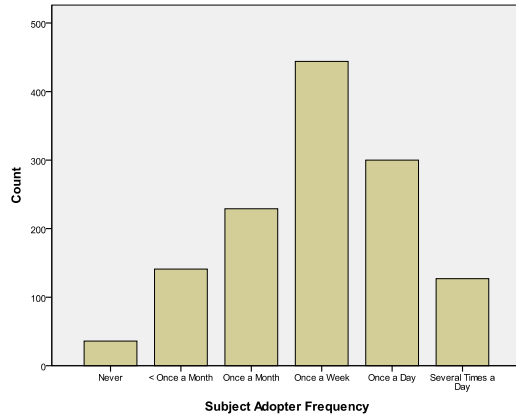


Figure 8h: Subject Adopter Relative Frequency

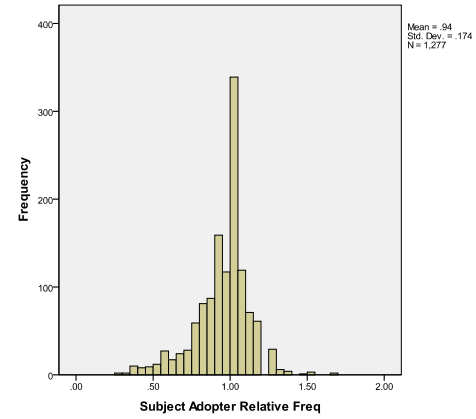


Figure 8i: Subject Mixed Frequency

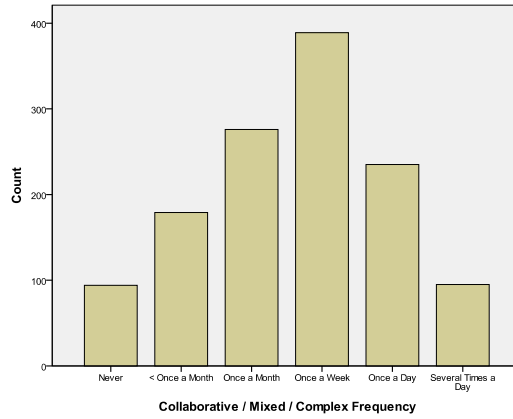


Figure 8j: Subject Mixed Relative Frequency

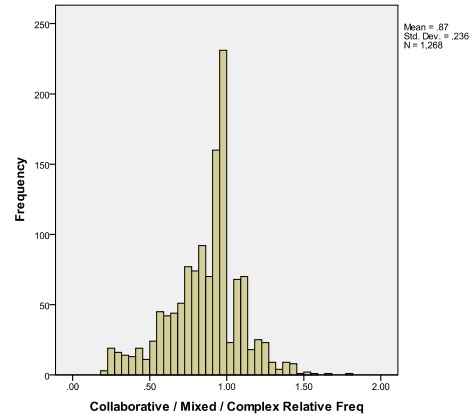


Figure 9: Exploring Reasonable Exchanges

Figure 9a: Exchange Days Ago

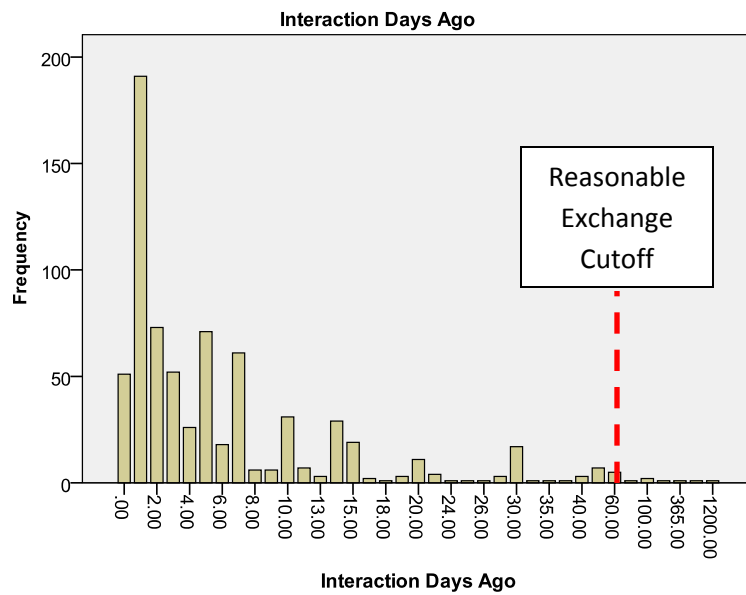


Figure 9b: Exchange Duration

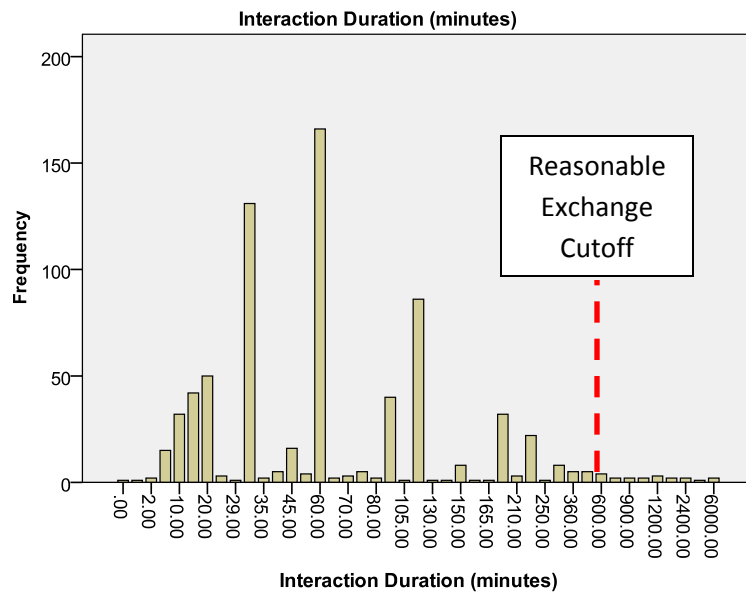


Figure 10: Knowledge Seeking & Providing Maximum Values vs. Average Values

Figure 10a: Seeking Maximum vs. Average

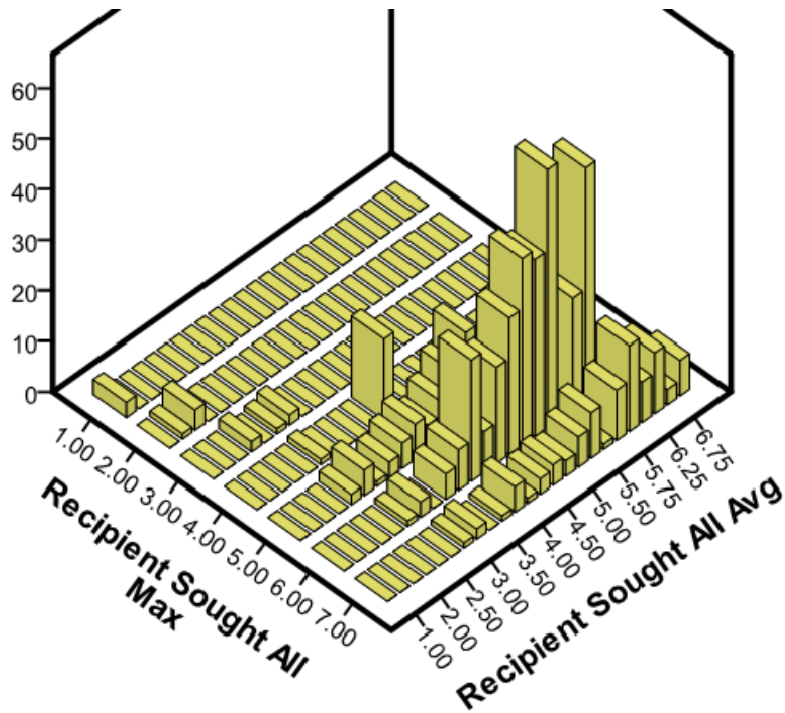


Figure 10b: Providing Maximum vs. Average

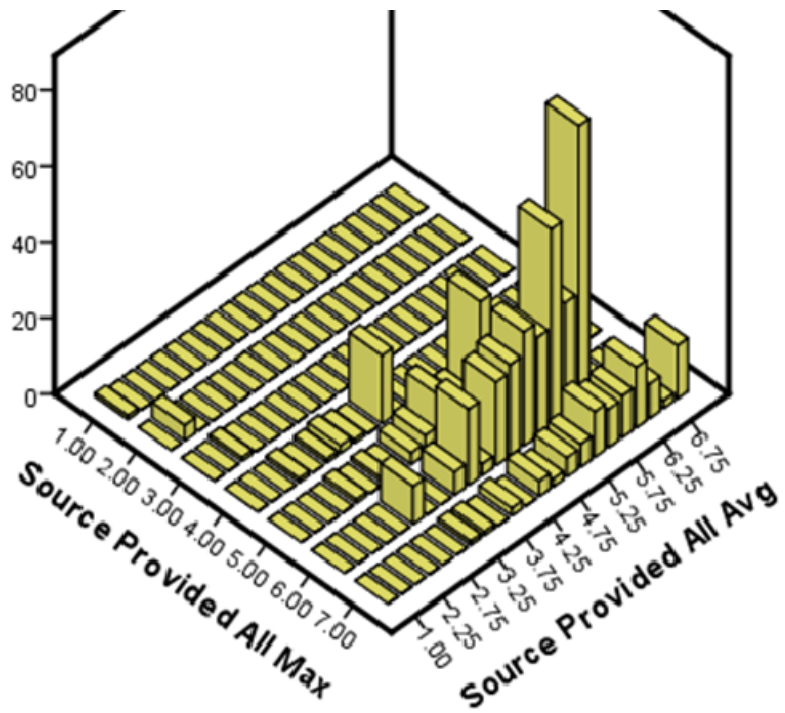


Figure 11: Knowledge Seeking in Problem Solving Process MDS Results

Figure 11a: Seeking Dimension Map (2 dimensions)

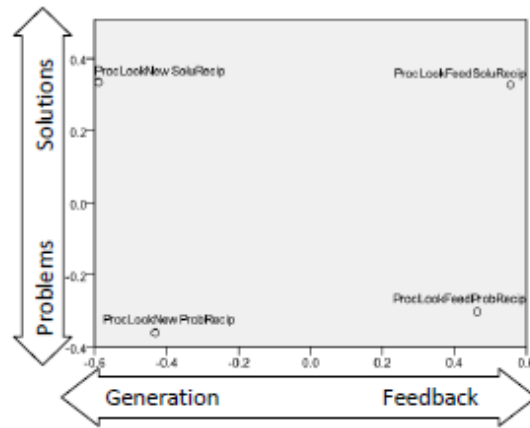


Figure 11b: Seeking Stress (1 to 3 dimensions)

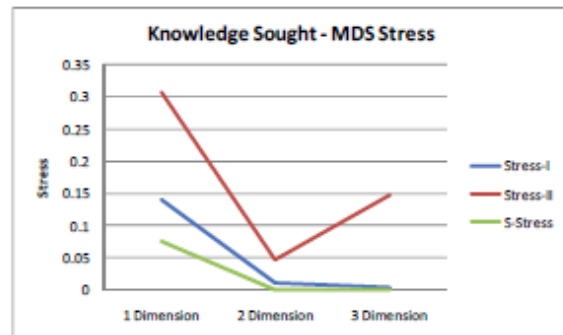


Figure 11c: Providing Dimension Map (2 dimensions)

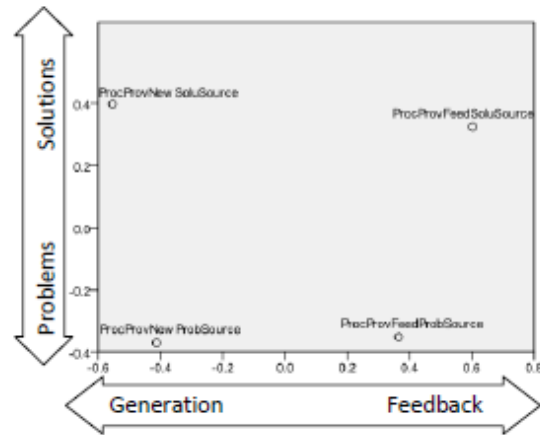


Figure 11d: Providing Stress (1 to 3 dimensions)

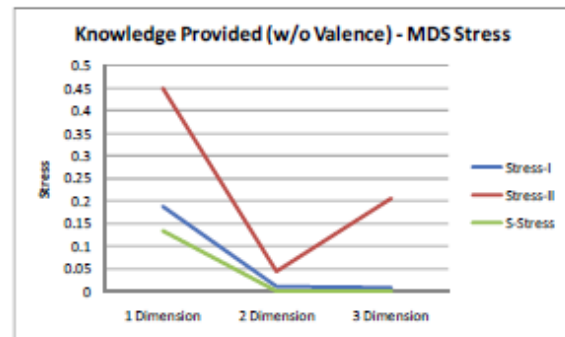


Figure 12: Possible Reinterpretation of Cross et al., 2001 MDS results (Figure 2)

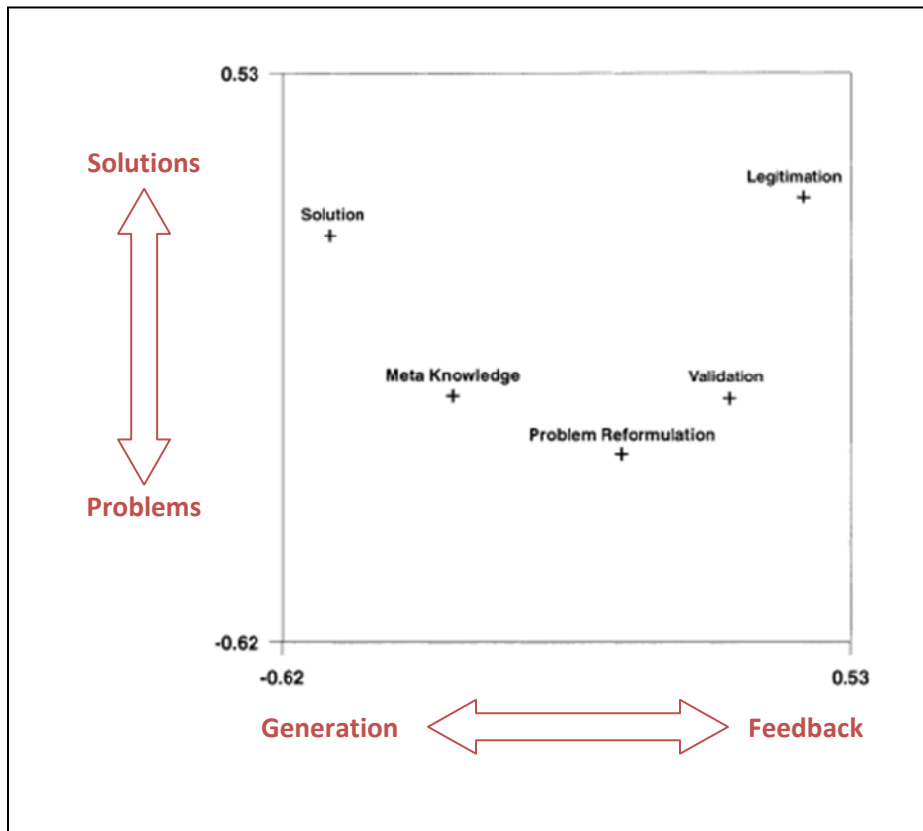


Figure 13: Example Response Sets from Quadrants of Problem-to-Solution (PS) by Generation-to-Feedback (GF) Continuums

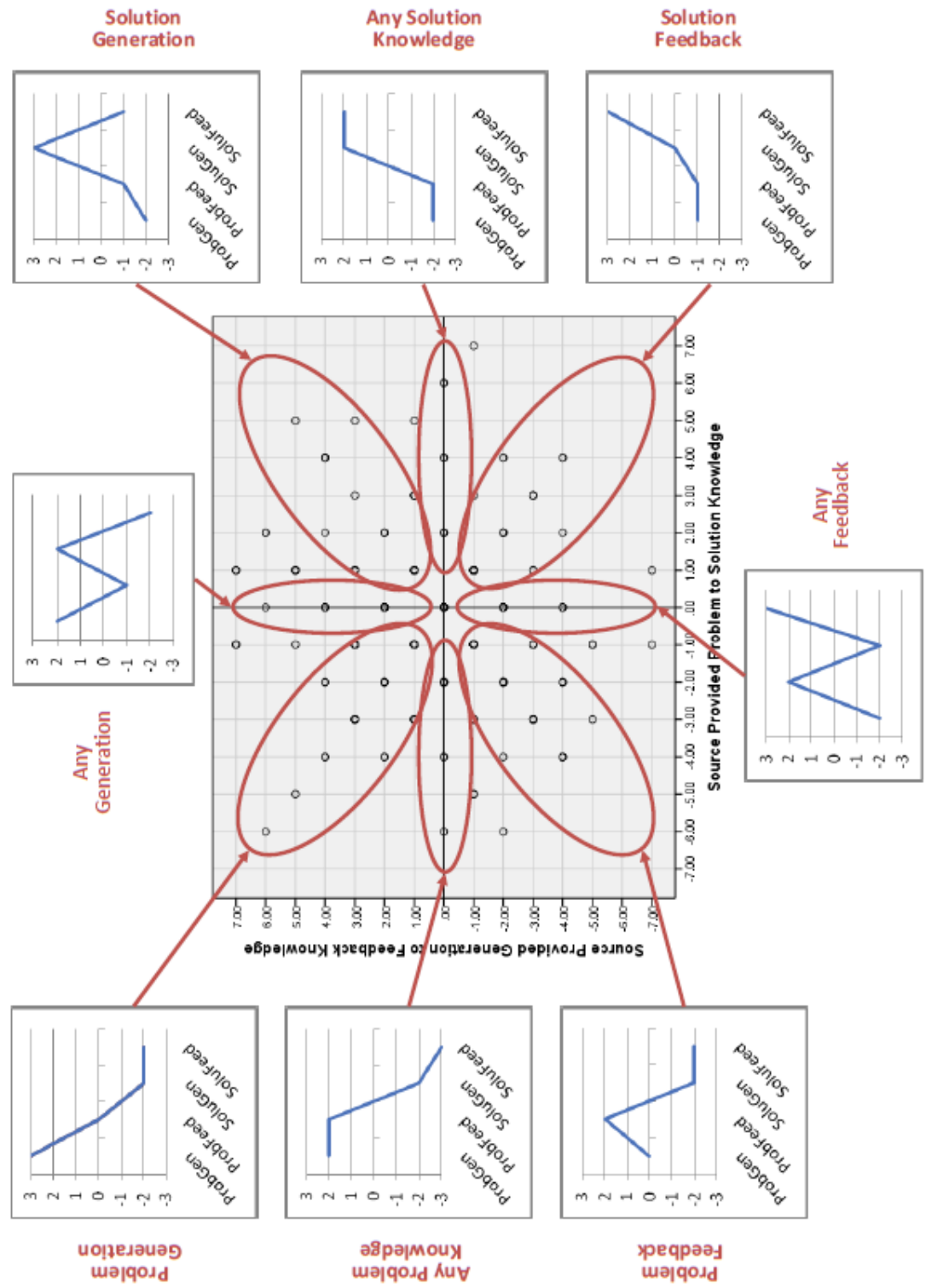


Figure 14: Response Frequencies for Seeking and Providing in PSxGF Continuums¹

Figure 14a: Recipient Seeking PSxGF

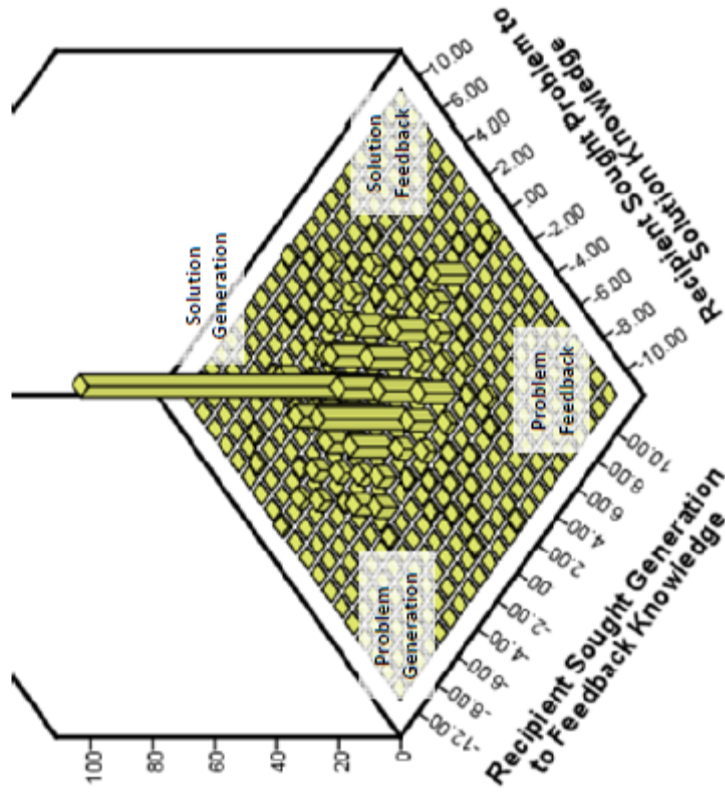
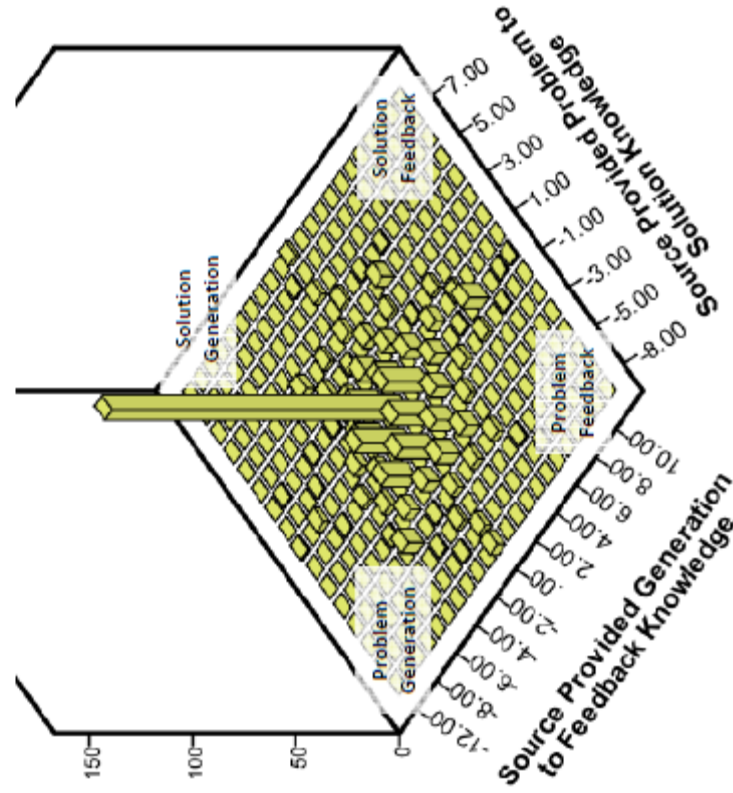


Figure 14b: Source Providing PSxGF



¹ The method described above for constructing my process variables tends to create greater dispersion along the axes and less along the diagonals (as can be observed in the figures above). This is because the diagonals represent cases where only a single seeking or providing type (problem generation, problem feedback, solution generation, solution feedback) is high. When this is combined with the other three variables it results in a relatively low calculated value for each dimension (maximum potential values on diagonals are -6,-6; -6, 6; 6,-6; 6, 6). Conversely, if scores are for two types of seeking or providing are high, as are those along the axes, the combination results in a significantly higher resulting calculated value along that axis (maximum potential values along axes -12,0; 0, -12; 0,12; 12,0). This should not affect analyses, but does make observations on the diagonals seem less prevalent than those along the axes in these types of graphs.

Figure 15: Source and Recipient Engagement for Perceived Self vs. Perceived Other

Figure 15a: Recipient Engagement

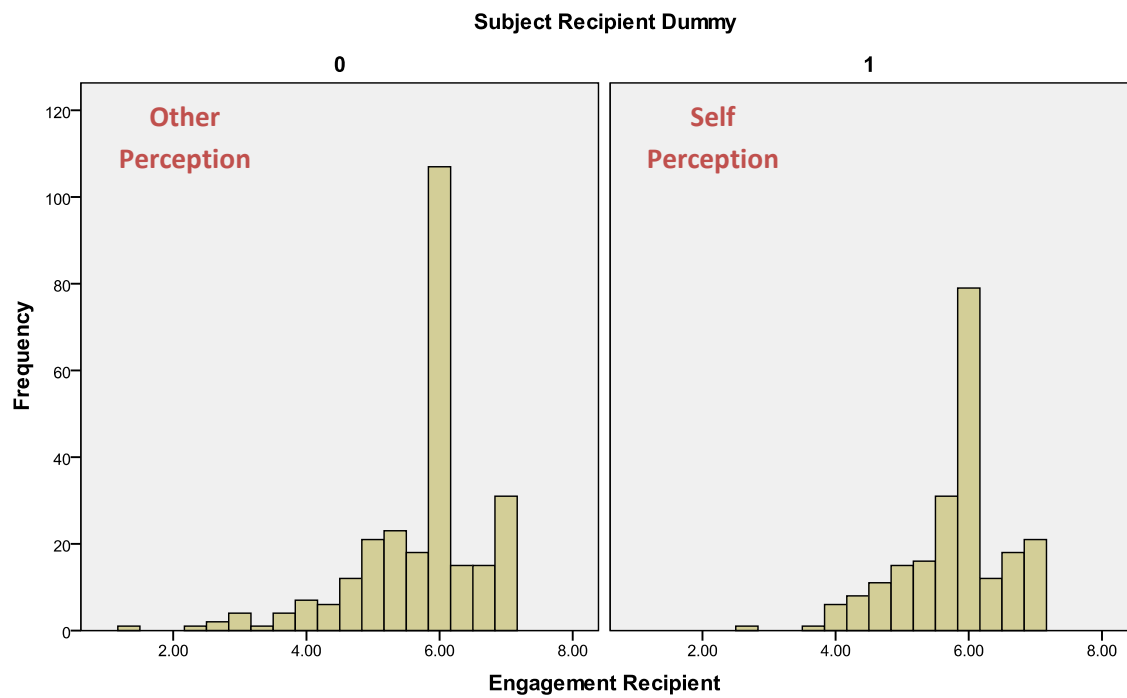


Figure 15b: Source Engagement

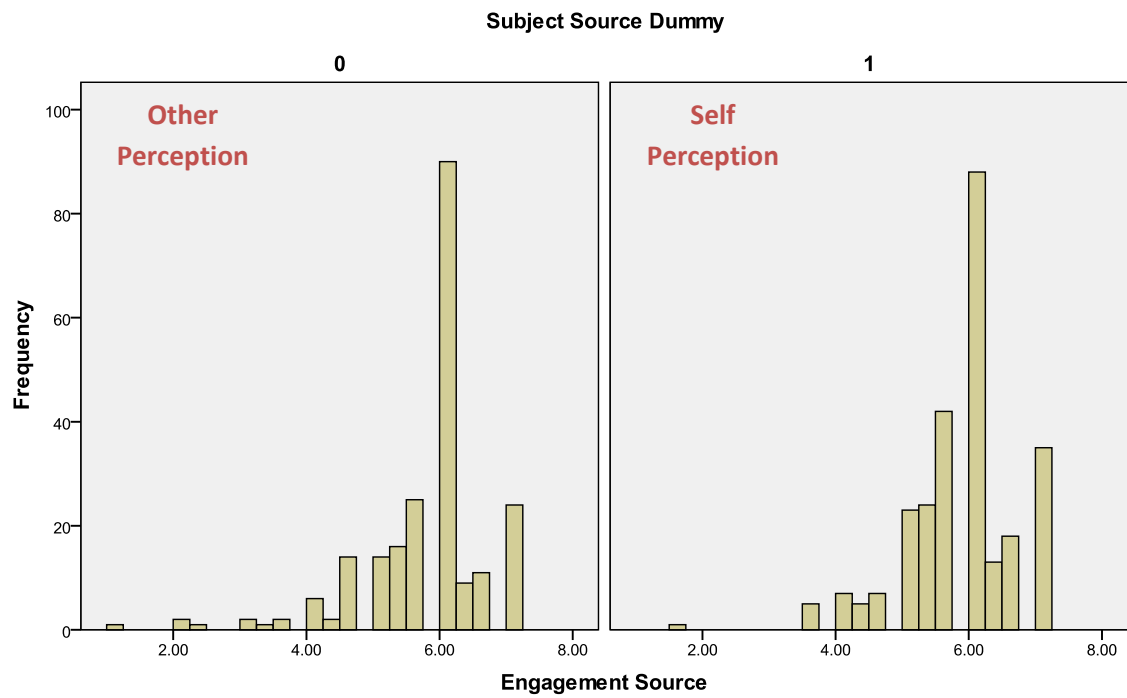


Figure 15c: All Dependent Variables & Mediators for Perceived Self vs. Perceived Other

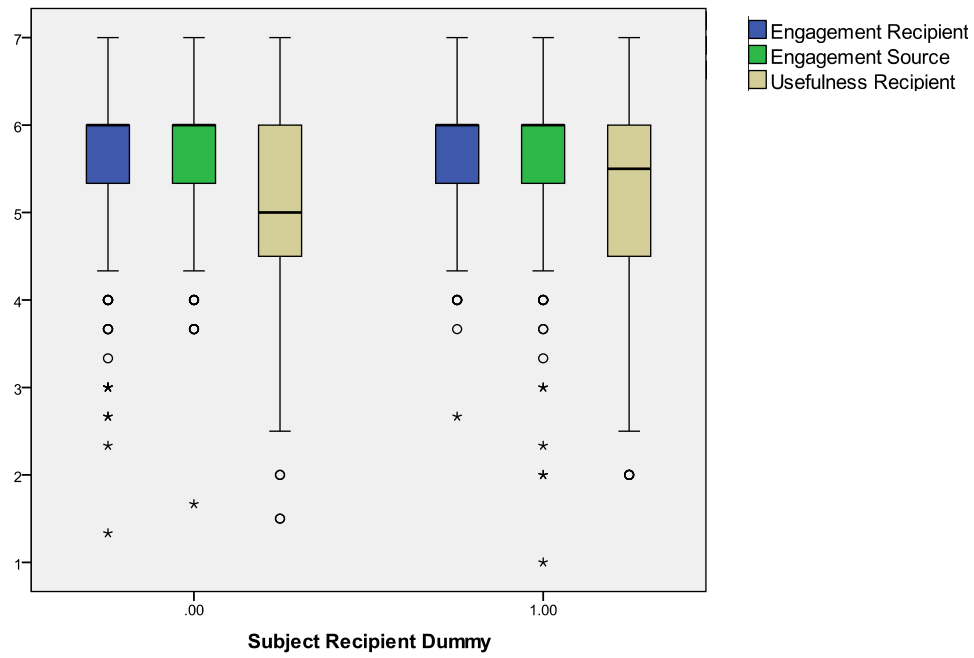


Figure 16: Overall Unsolicited Knowledge in Pull vs. Push Exchange Interactions

Figure 16a: Unsolicited / Unsought Pull Exchanges

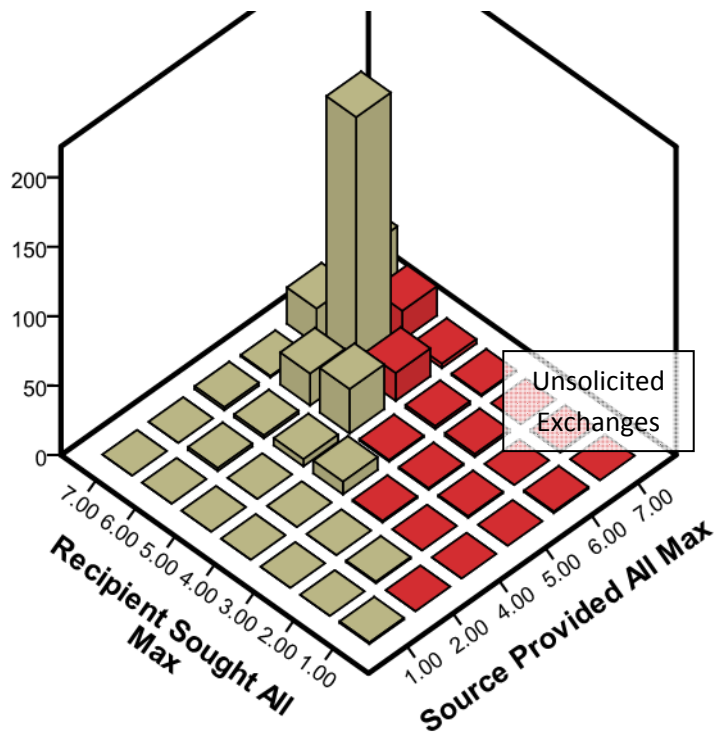


Figure 16b: Unsolicited / Unsought Push Exchanges

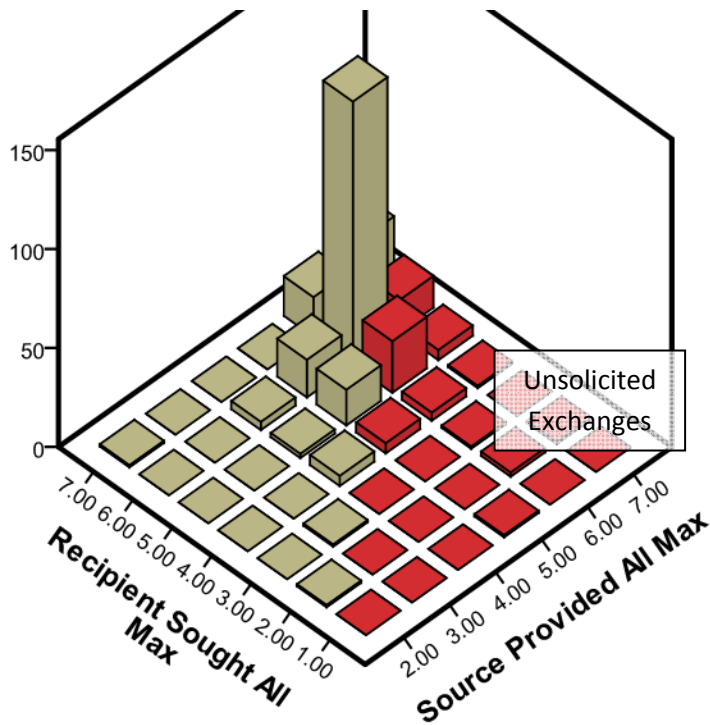


Figure 17: Unsolicited Problem-solving process Knowledge in Pull vs. Push Exchanges

Figure 17a: Unsolicited / Unsought PS Knowledge in Pull Exchanges

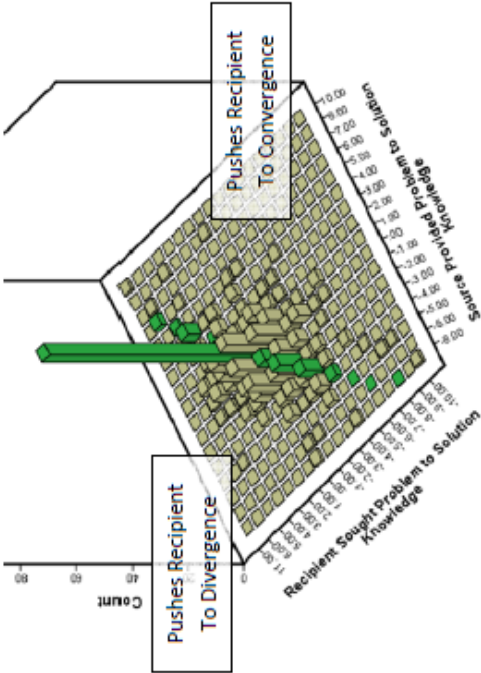


Figure 17b: Unsolicited / Unsought PS Knowledge in Push Exchanges

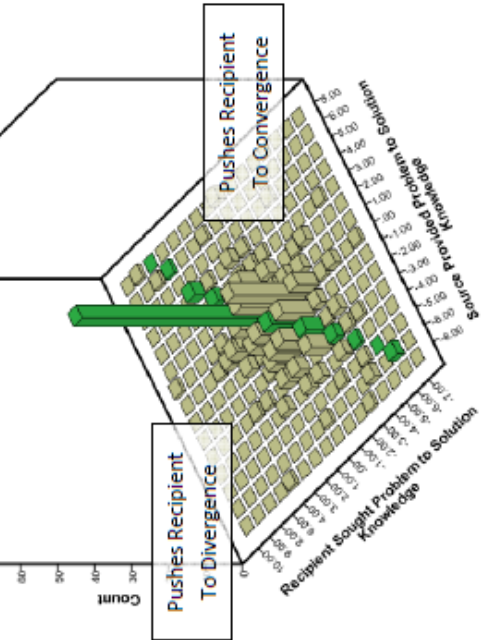


Figure 17c: Unsolicited / Unsought GF Knowledge in Pull Exchanges

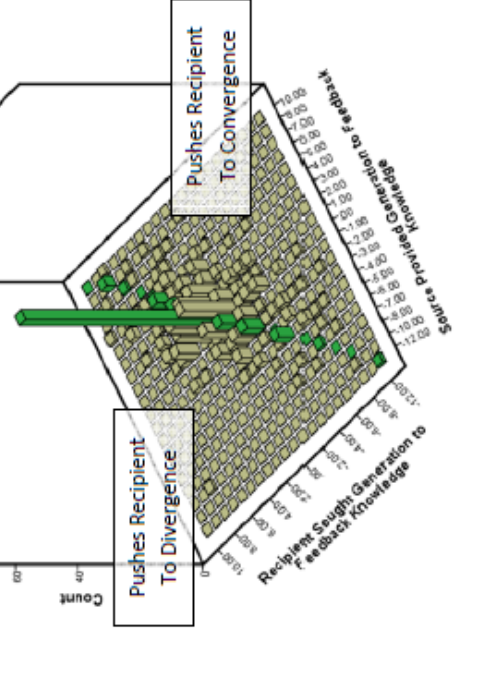


Figure 17d: Unsolicited / Unsought GF Knowledge in Push Exchanges

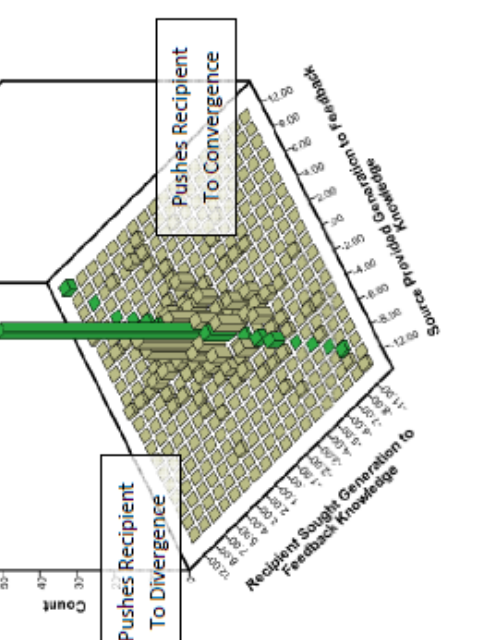


Figure 18: Unsolicited Exchange Interaction Graphs

Figure 18a: Unsolicited Exchange and Recipient Engagement

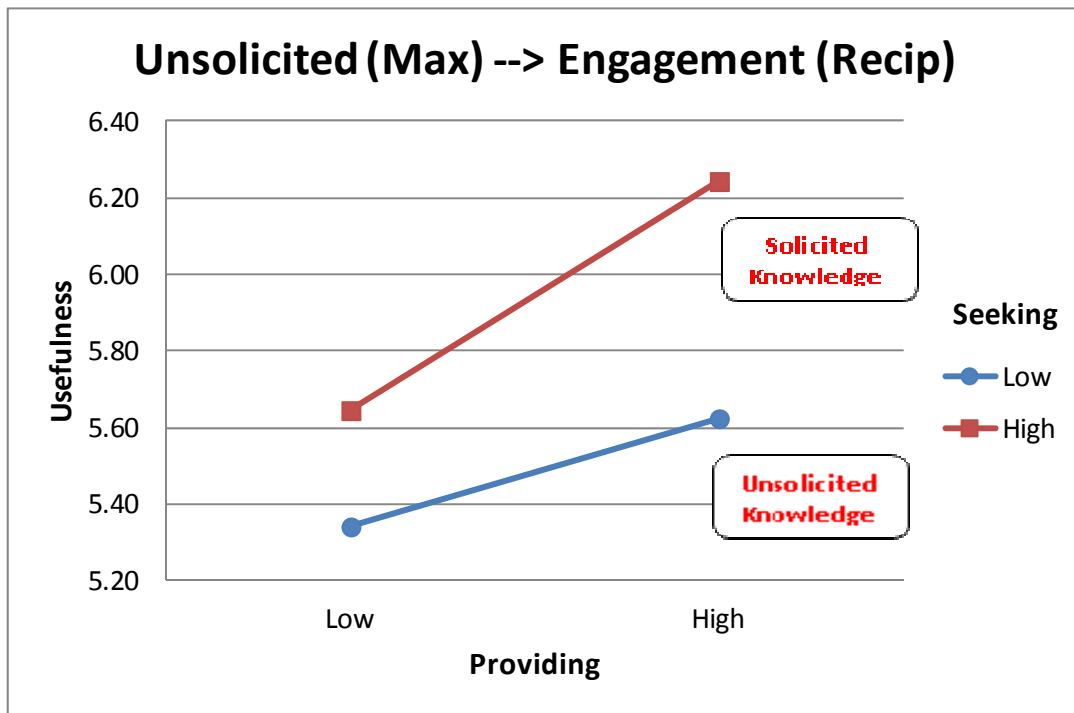


Figure 18b: Unsolicited Exchange and Exchange Usefulness

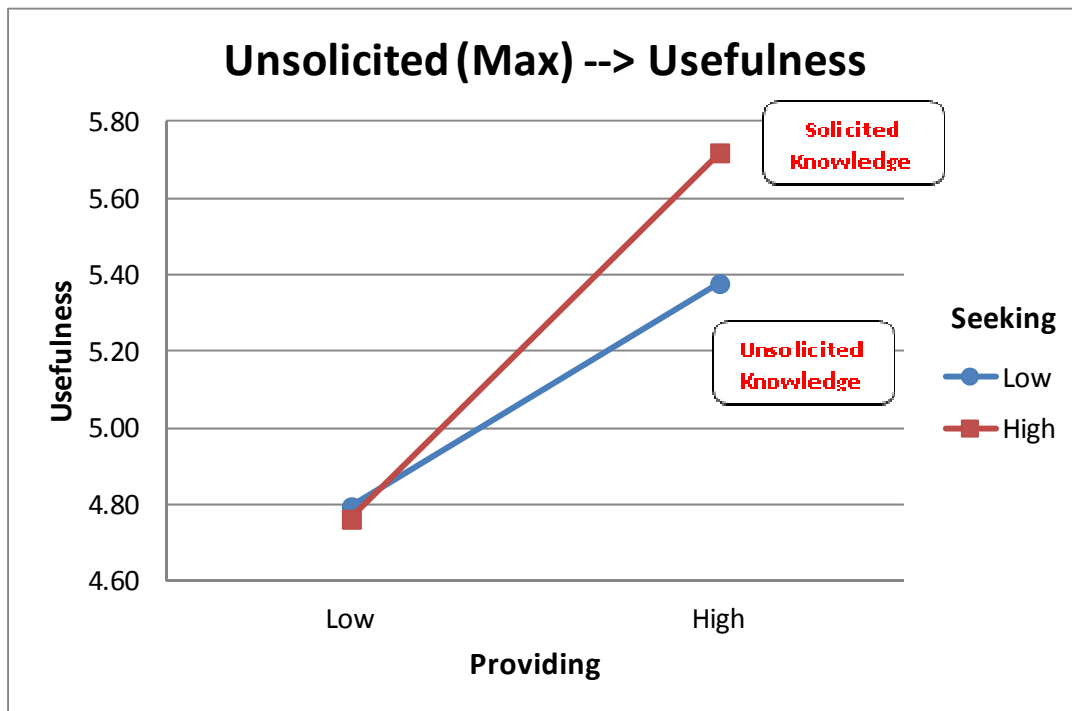


Figure 19: Unsolicited Exchange by Initiation Interaction Graphs

Figure 19a: Unsolicited Exchange by Initiation and Recipient Engagement

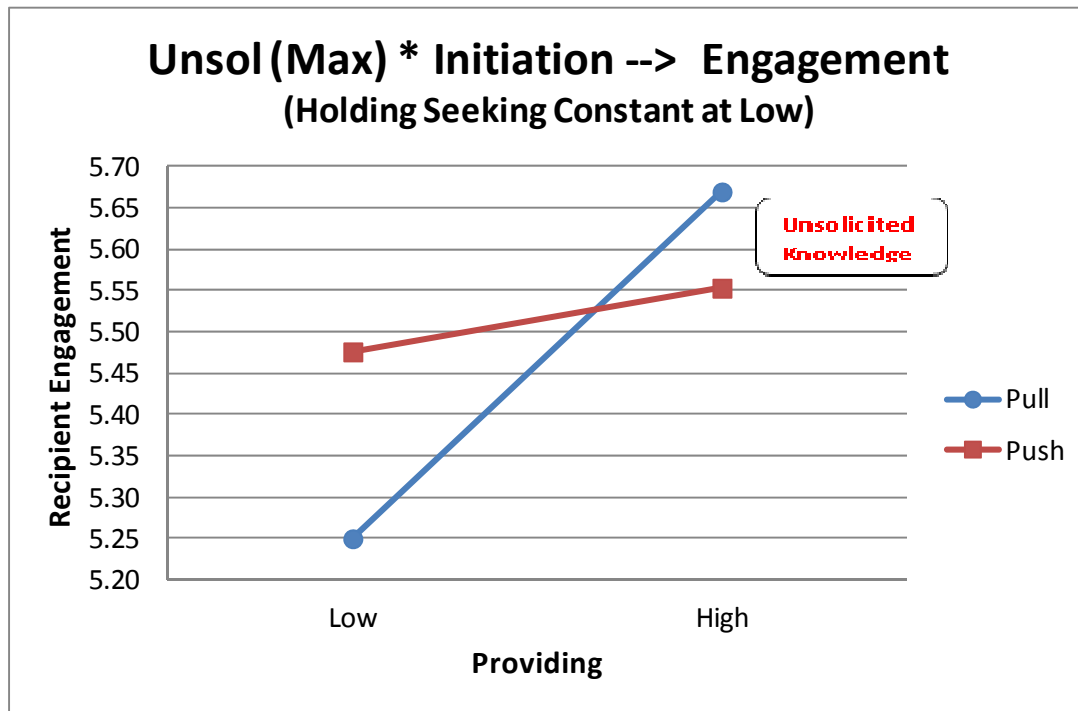


Figure 19b: Unsolicited Exchange by Initiation and Exchange Usefulness

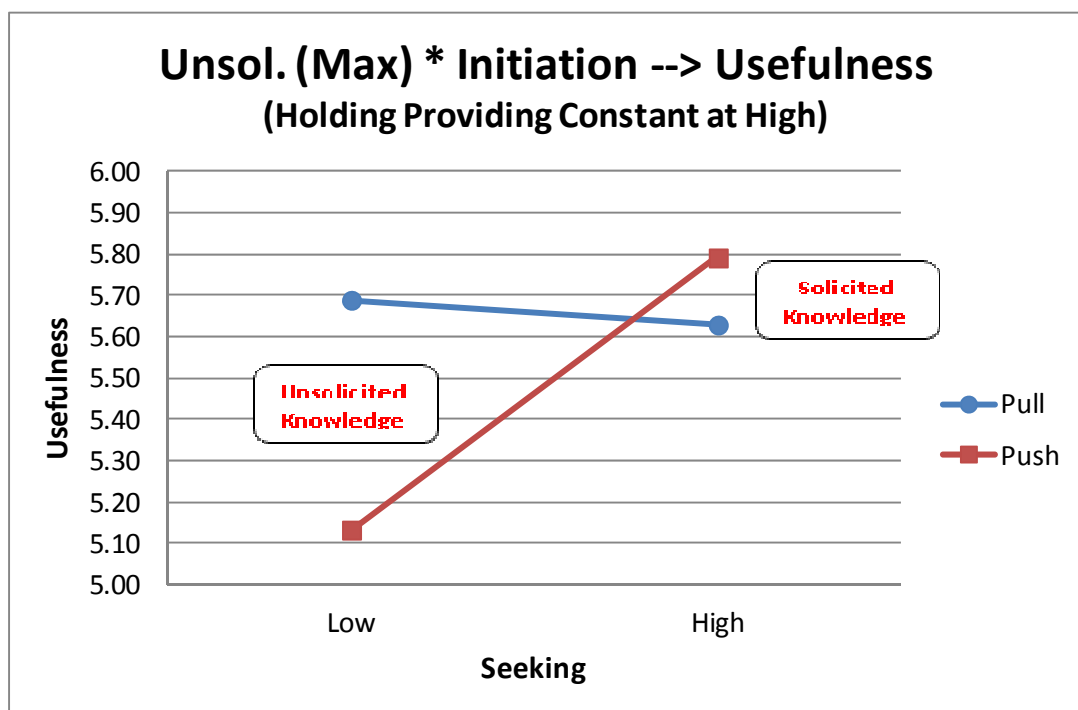


Figure 20: Unsolicited Problem Solving Knowledge Interaction Graphs

Figure 20a: Unsolicited Problem-to-Solution Knowledge and Recipient Engagement

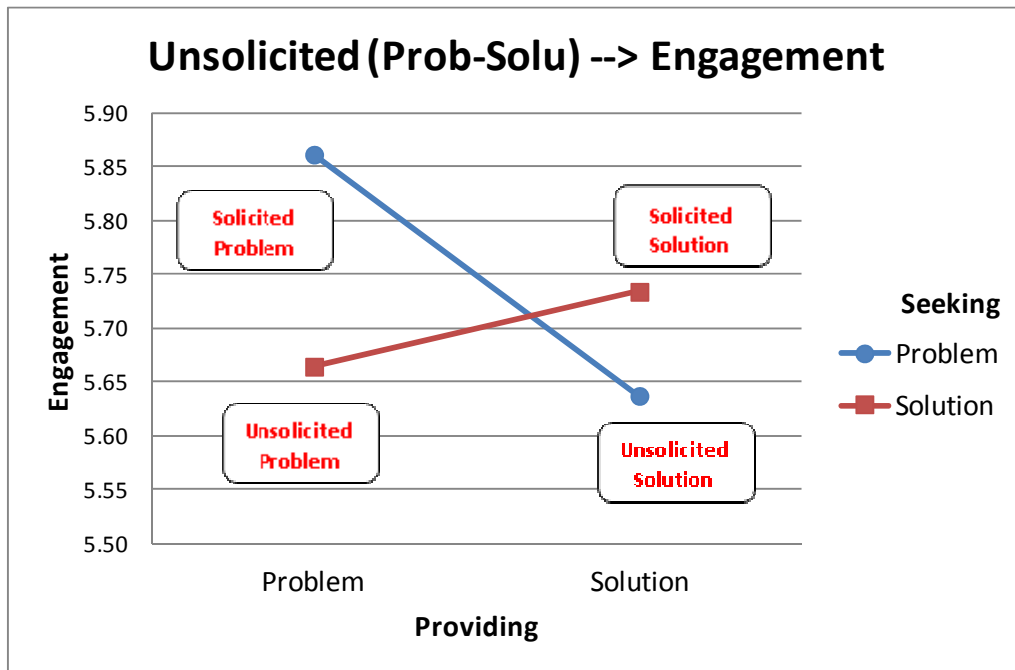


Figure 20b: Unsolicited Problem-to-Solution Knowledge and Exchange Usefulness

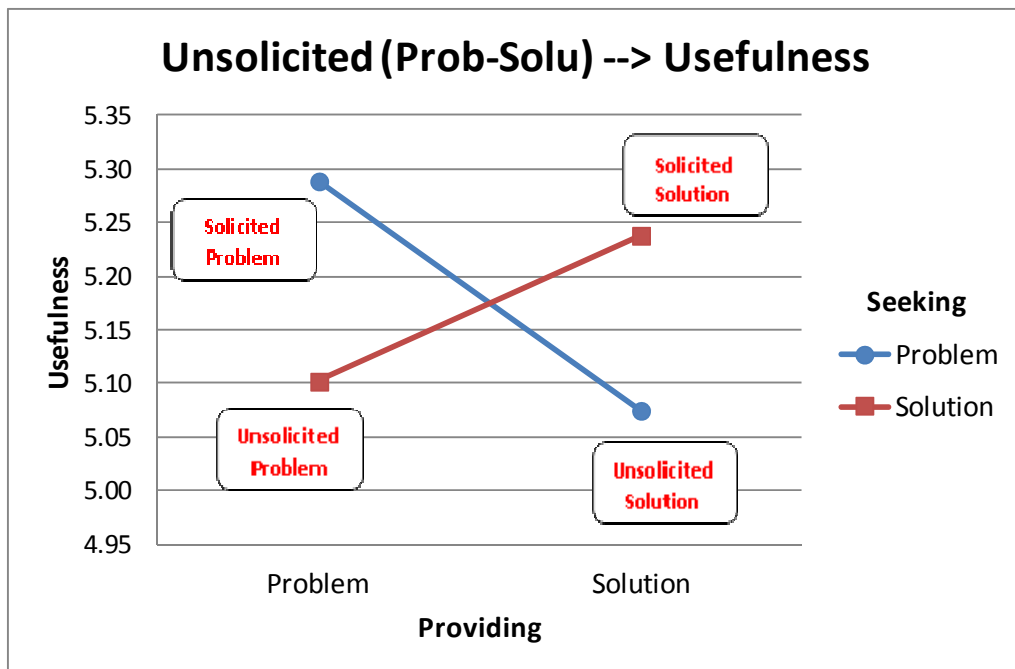


Figure 21: Unsolicited Problem Solving Knowledge by Initiation Interaction Graphs

Figure 21a: Unsolicited Generation-to-Feedback Knowledge and Exchange Usefulness for Push Exchanges

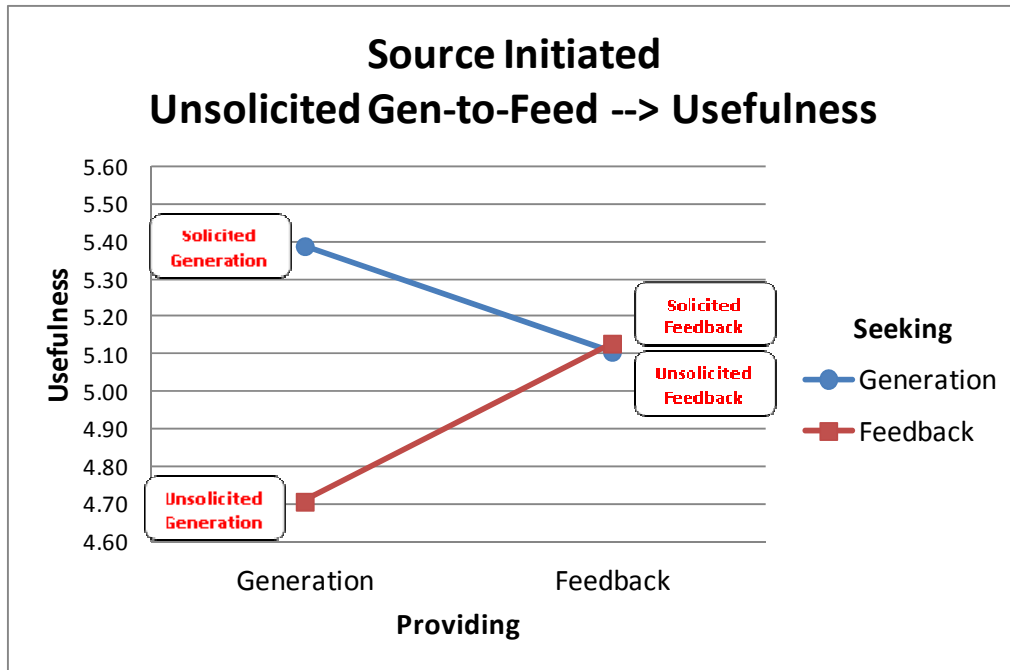


Figure 21b: Unsolicited Generation-to-Feedback Knowledge and Exchange Usefulness for Pull Exchanges

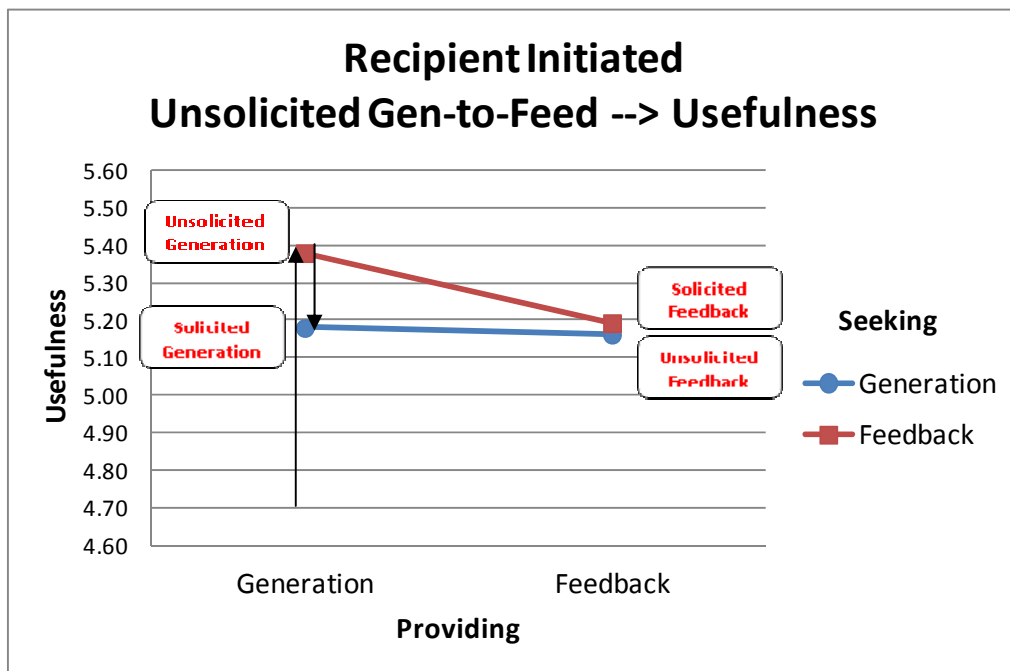


Figure 22: Unsolicited Problem Solving Knowledge by Recipient Performance Interaction Graphs

Figure 22a: Unsol PS and Engage for Low Perf

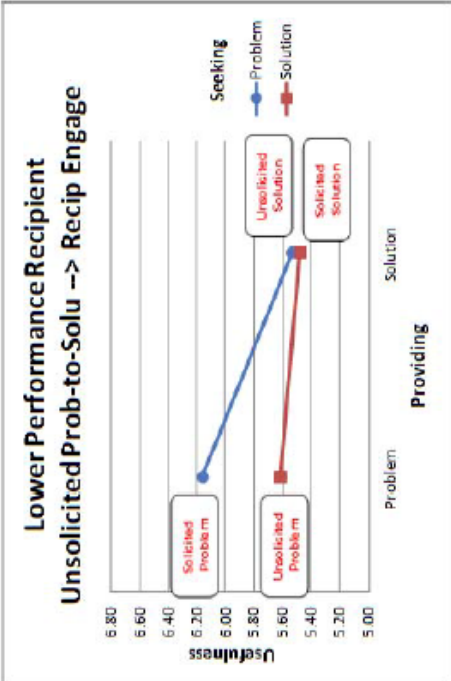


Figure 22b: Unsol PS and Engage for High Perf

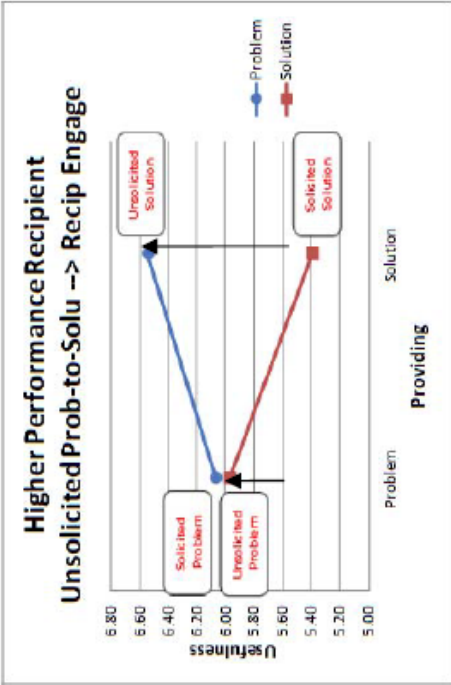


Figure 22c: Unsol PS and Exch Use for Low Perf

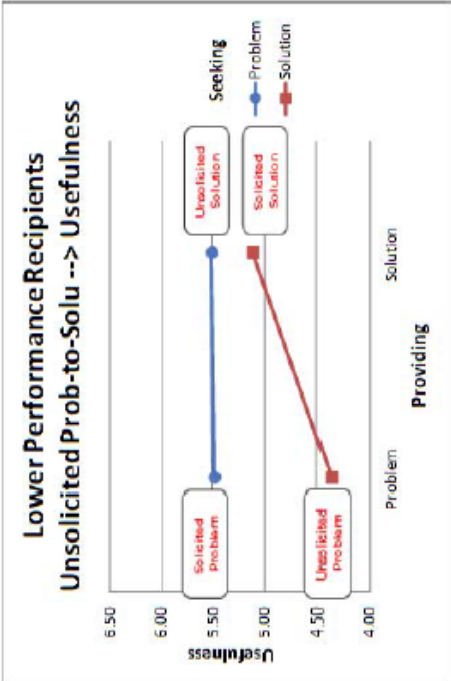


Figure 22d: Unsol PS and Exch Use for High Perf

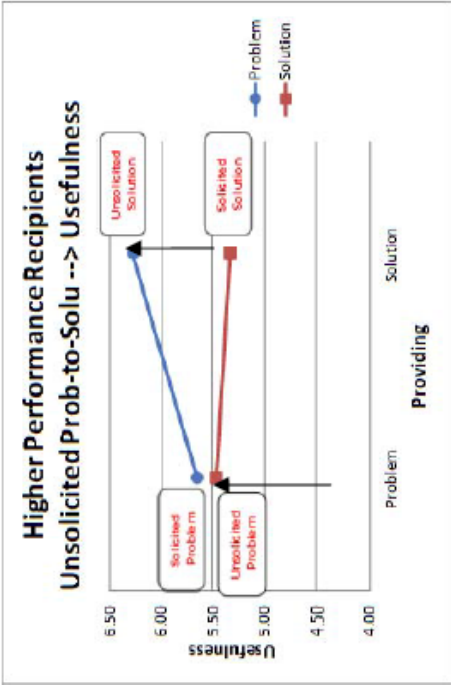


Figure 23: Internally to Externally Driven Motivation Continuum (Summary of SDT – Deci & Ryan, 2000)

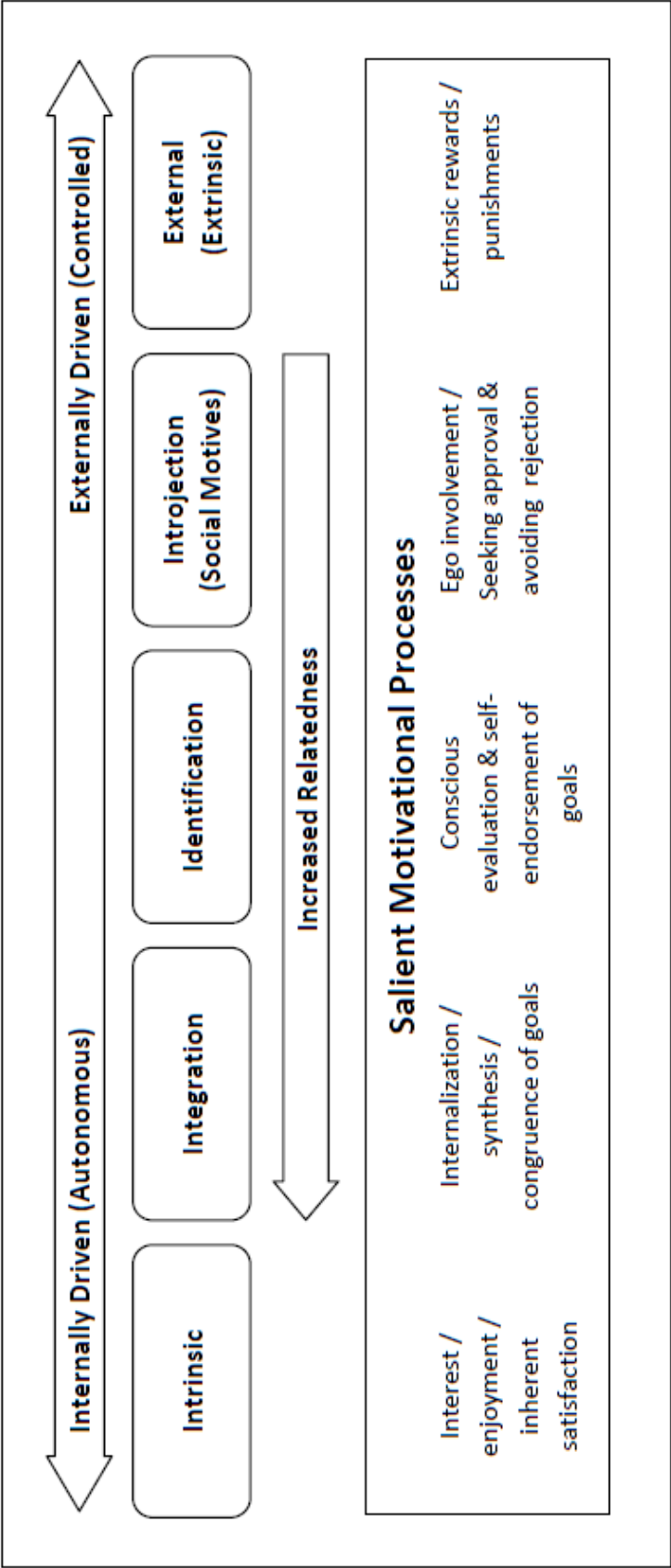


Figure 24: Motivational Trade-offs in Knowledge Exchanges

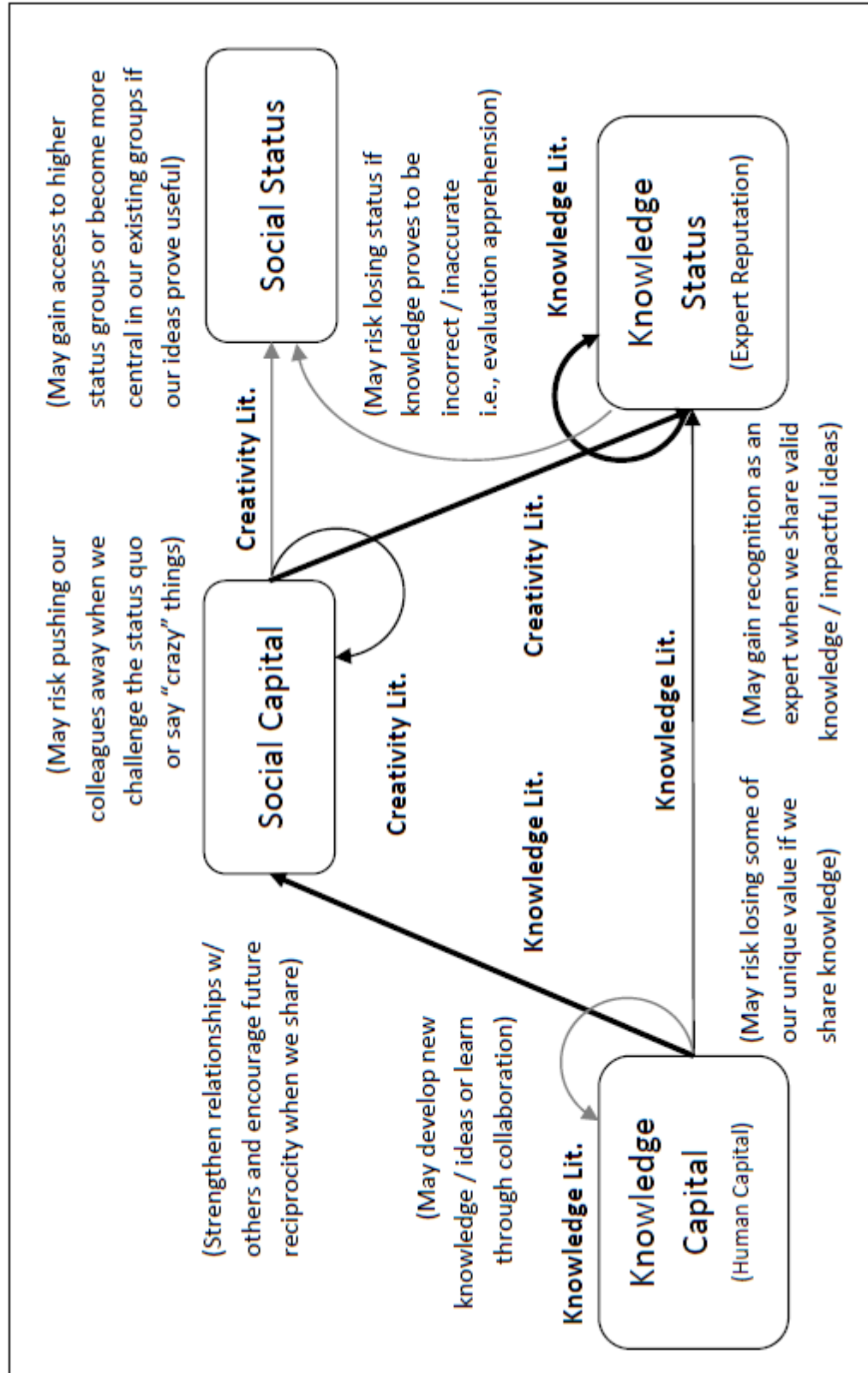


Figure 24 Notes:

- In the diagram, each arrow represents an apparent trade-off (risk of loss vs. potential gain) involved in a source's act of sharing knowledge as discussed in the literature (e.g., a source may decide to risk [trade] some knowledge capital for social capital and/or some knowledge status). Darker arrows represent stronger relationships or those more frequently argued and/or found in past studies (e.g., social status outcomes are less clearly emphasized than expert reputation).
- For simplicity sake in this picture I have used the terms:
 - "Knowledge Capital" represents the value one possesses / gains due to their knowledge; this is ordinarily referred to as "Human Capital" in the literature
 - "Knowledge Status" represents the recognition / reputation one obtains as a competent expert
 - "Social Capital" represents the value one obtains from their social relationships / networks
 - "Social Status" as the prestige a person may have in their social networks (especially their membership in more restricted / higher status groups and networks)
- Both knowledge [human] capital and social capital can be subsumed under the concept of intellectual capital. Knowledge Status can be thought of as expertise or competence related status or reputation but there is not an established term for this (thus my choice to use knowledge status as a contrast to knowledge capital for clarity).
- It is unclear whether Social Status can be fully differentiated theoretically or empirically from Social Capital (there are several papers written on this topic but this discussion goes beyond the scope of this paper. I usually think about Social Capital as any relationships that can bring value to an individual, while Social Status is related to relationships with higher status individuals or membership in higher status groups).
- In my data analysis Social Capital, Knowledge Status, and Social Status all load together into positive and negative introjected motivational factors. This is in line with Deci & Ryan's SDT perspective but not necessarily consistent with the discussions in the various Knowledge and Creativity literatures which seemingly differentiate these phenomena (although they rarely if ever measure them side-by-side). This is driven, at least in part, by the limited number of items used in this survey to measure these concepts and might be a ripe area for future research.

Figure 25: Internal vs. External Motivation Effect on Receptivity to Problem-to-Solution Knowledge

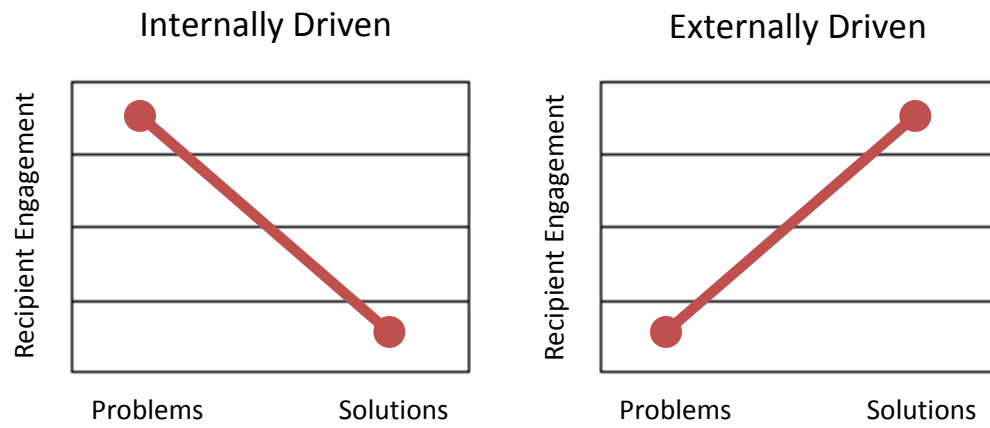


Figure 26: Relatedness Motivation Effect on Receptivity to Generation-to-Feedback Knowledge

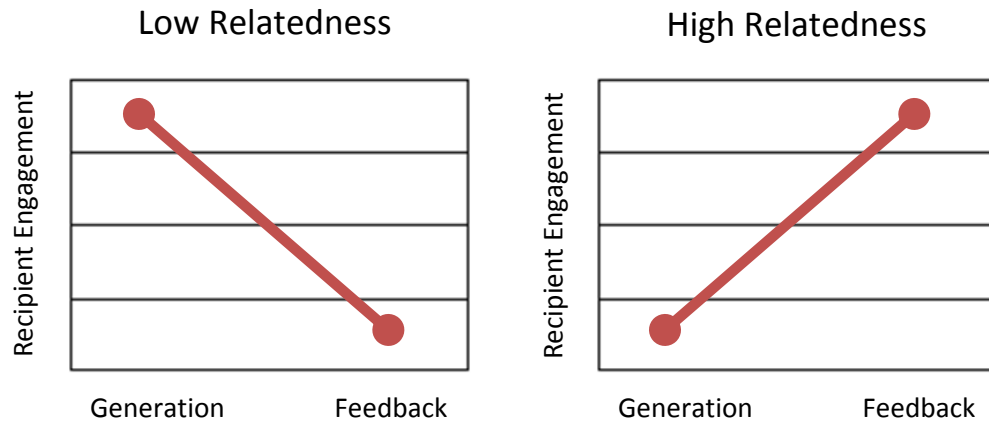


Figure 27: Structural Equation Path Model for Motives on Pull vs. Push Initiation Frequency

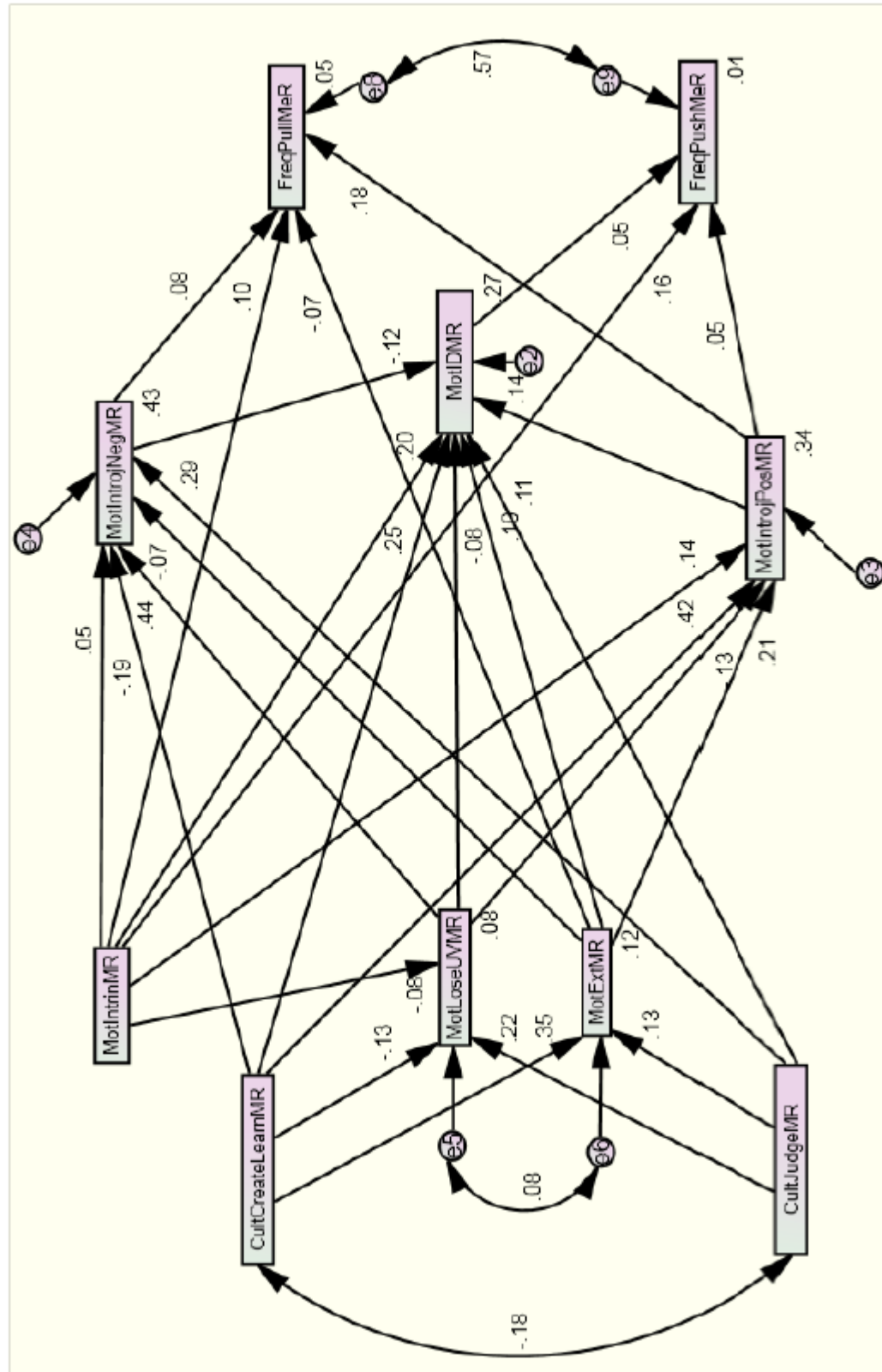


Figure 28: Extrinsic Motivation and Unsolicited Problem-Solving Knowledge on Recipient Engagement Interaction Effects

Figure 28a: Unsol PS by Low Extrinsic on Engagement



Figure 28b: Unsol PS by High Extrinsic on Engagement

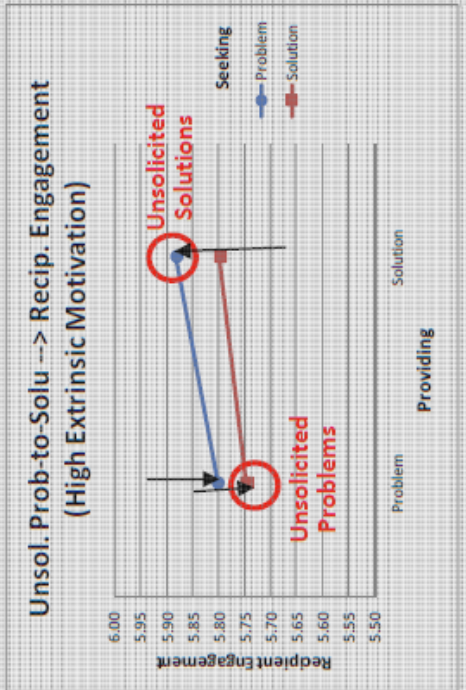


Figure 28c: Unsol GF by Low Extrinsic on Engagement

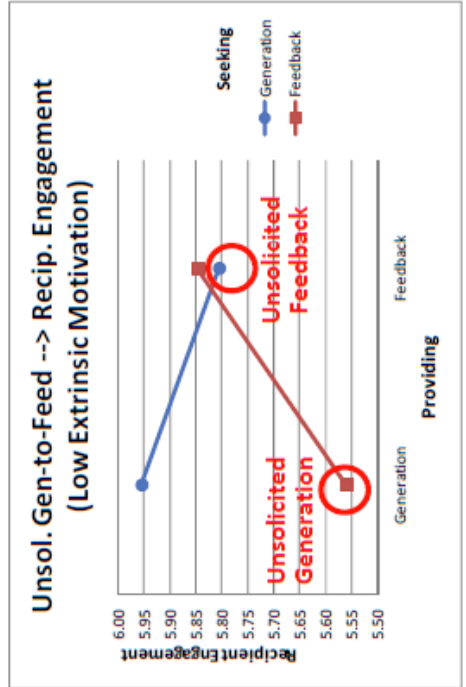


Figure 28d: Unsol GF by High Extrinsic on Engagement

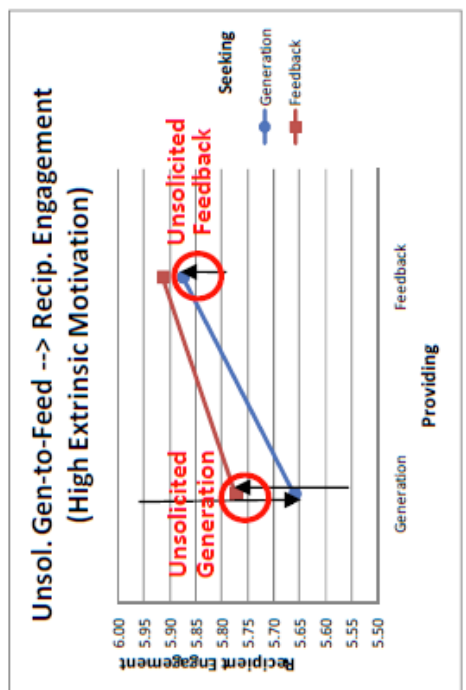


Figure 29: Introjection Motivation and Unsolicited Problem-Solving Knowledge on Recipient Engagement Interaction Effects

Figure 29a: Unsol PS by Low Introject on Engagement



Figure 29b: Unsol PS by High Introject on Engagement

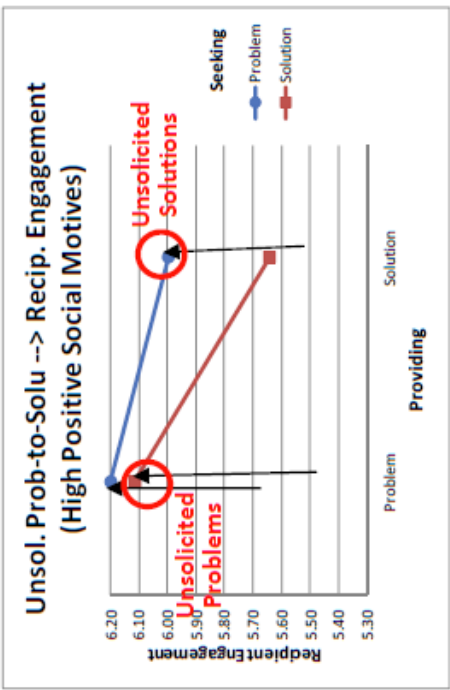


Figure 29c: Unsol GF by Low Introject on Engagement

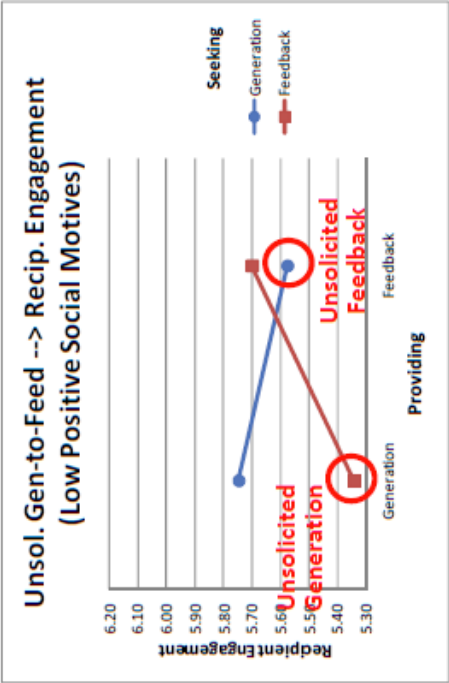


Figure 29d: Unsol GF by High Introject on Engagement

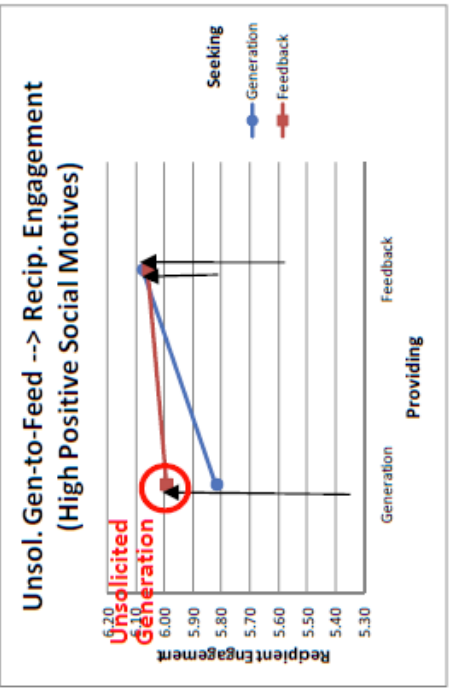


Figure 30: Identification Motivation and Unsolicited Problem-Solving Knowledge on Recipient Engagement Interaction Effects

Figure 30a: Unsol PS by Low Ident on Engagement

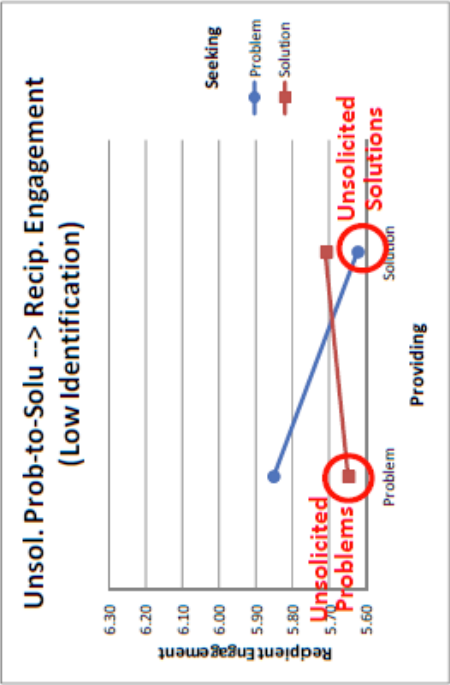


Figure 30b: Unsol PS by High Ident on Engagement

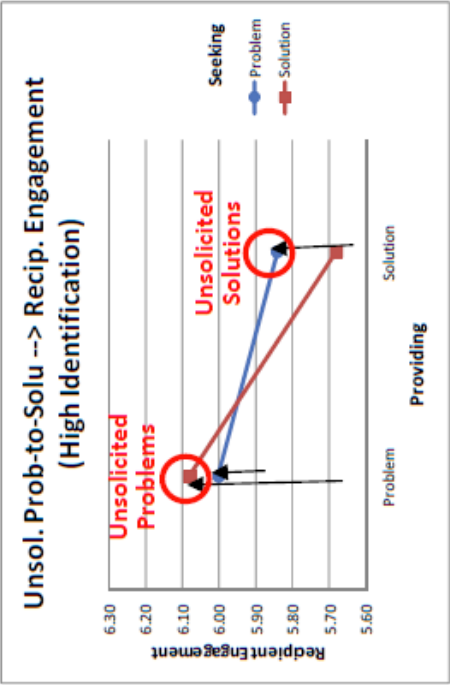


Figure 30c: Unsol GF by Low Ident on Engagement

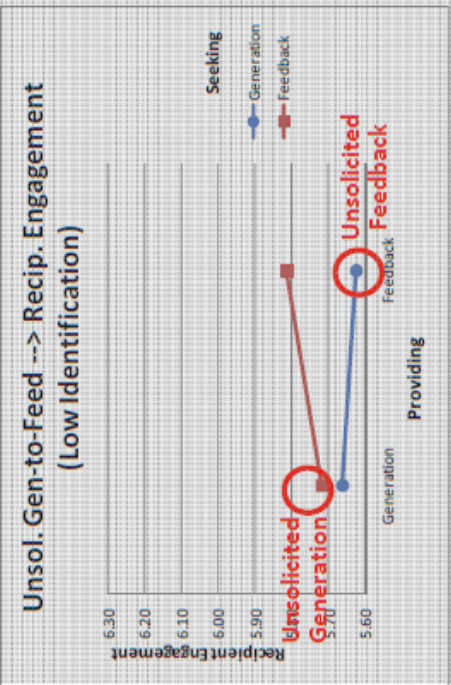


Figure 30d: Unsol GF by High Ident on Engagement

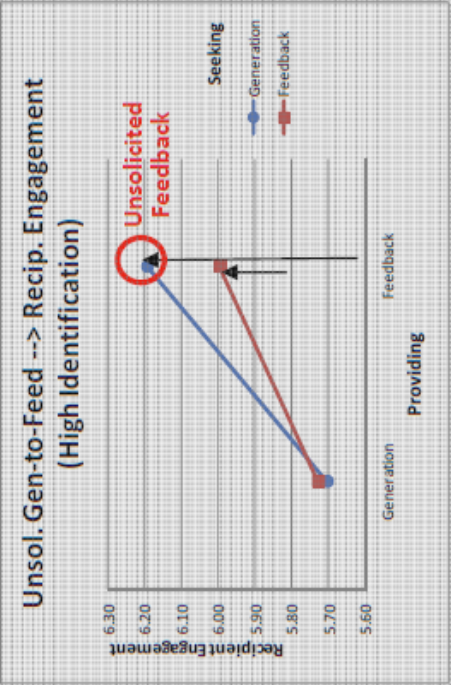


Figure 31: Intrinsic Motivation and Unsolicited Problem-Solving Knowledge on Recipient Engagement Interaction Effects

Figure 31a: Unsol PS by Low Intrinsic on Engagement

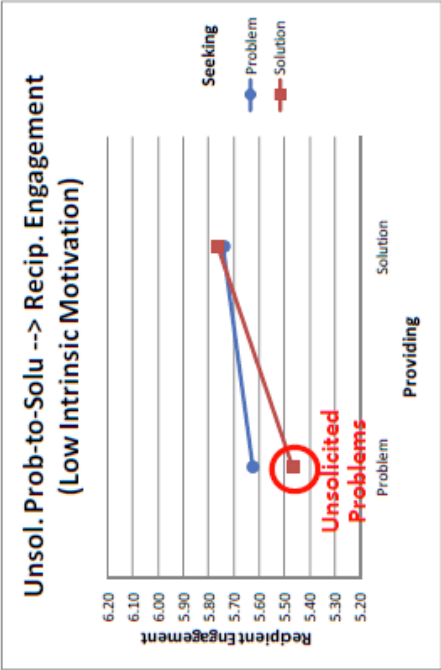


Figure 31b: Unsol PS by High Intrinsic on Engagement

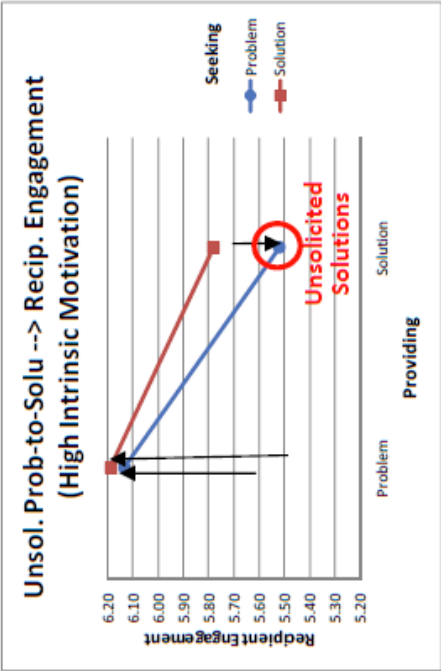


Figure 31c: Unsol GF by Low Intrinsic on Engagement

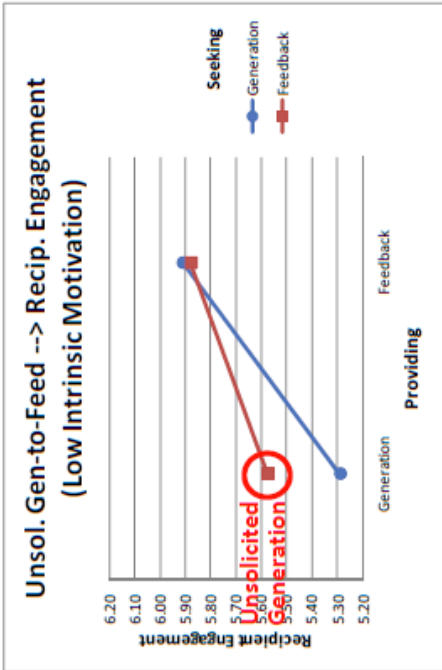


Figure 31d: Unsol GF by High Intrinsic on Engagement

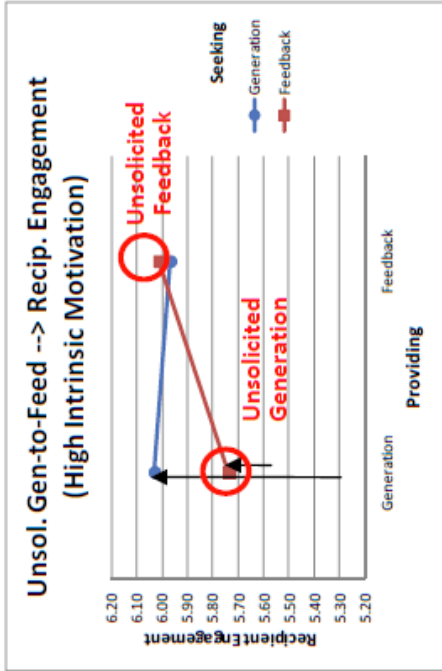


Figure 32: Summary of Results for Internally vs. Externally Driven by Divergent vs. Convergent Knowledge

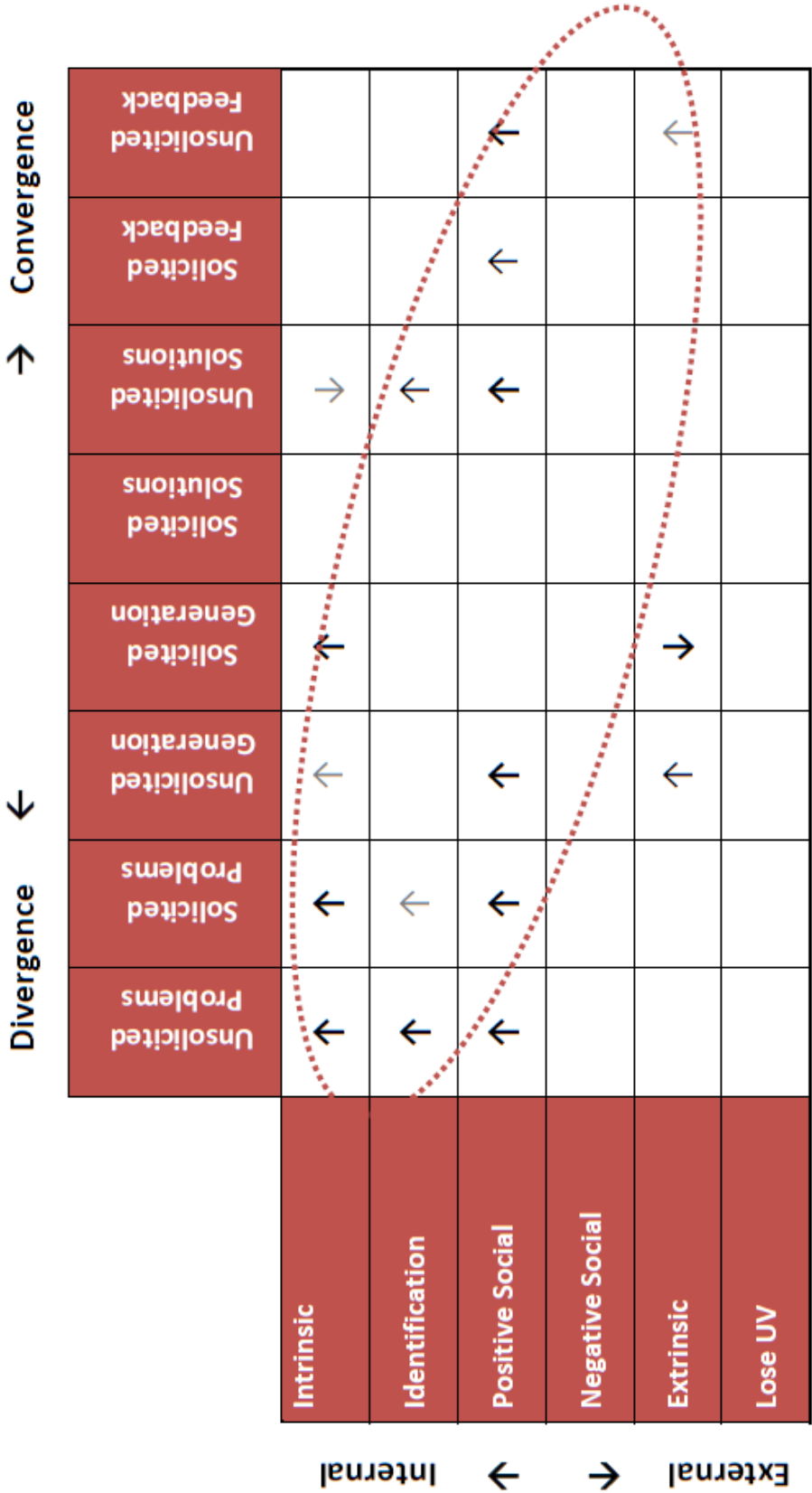


Figure 33: Summary of Results for Internally vs. Externally Driven by Divergent vs. Convergent Knowledge (Example Contrasts)

Figure 33a: High Intrinsic X Prob-to-Solu

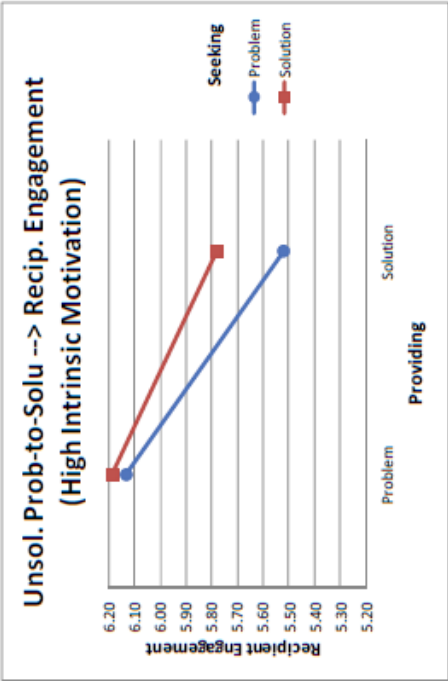


Figure 33b: High Extrinsic X Prob-to-Solu

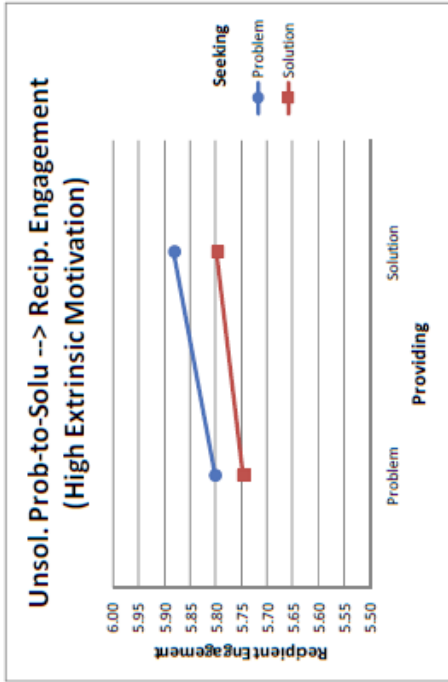


Figure 33c: Low Relatedness X Gen-to-Feed

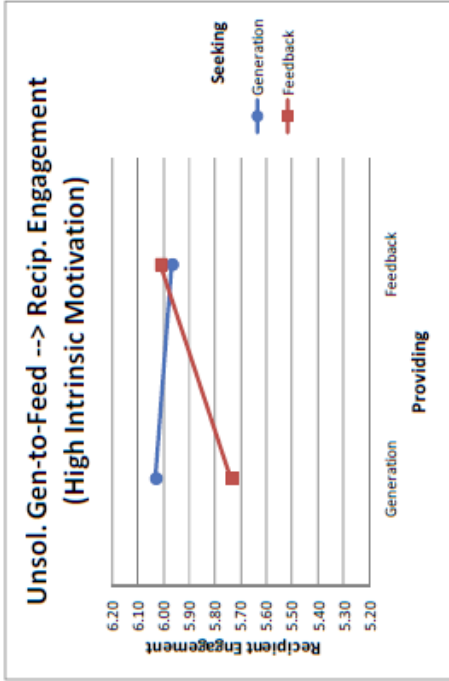


Figure 33d: High Relatedness X Gen-to-Feed

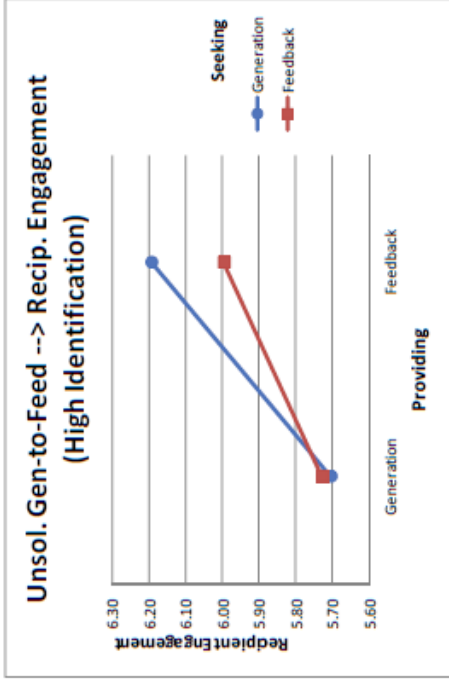


Figure 34: Push vs. Pull Exchange Usefulness for Higher vs. Lower Expertise Sources
Interaction Effects

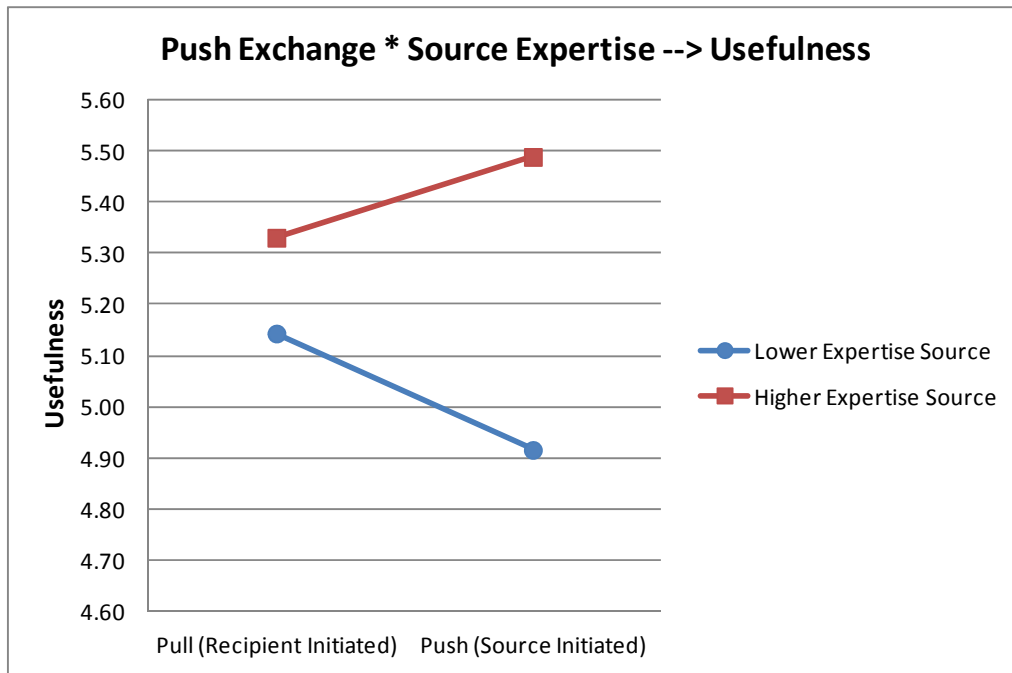


Figure 35: Unsolicited / Unsought Exchange Usefulness for Higher vs. Lower Expertise Sources Interaction Effects

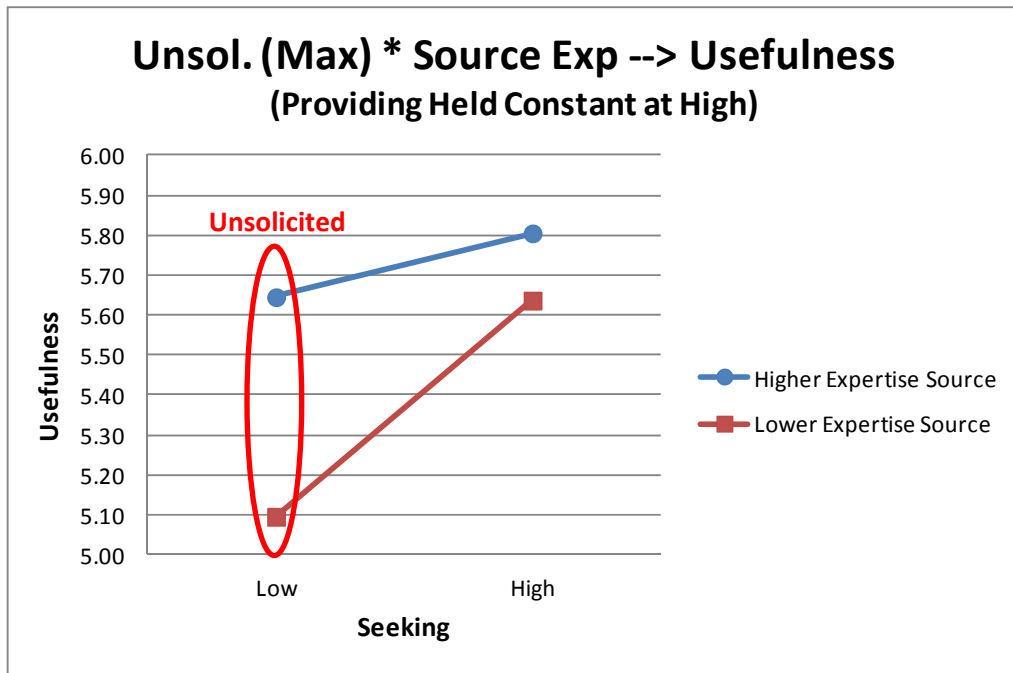


Figure 36: Recipient Engagement for Unsolicited Problem-to-Solution Knowledge by Source Expertise

Figure 36a: Unsol PS by Low Expertise on Engagement Figure 36b: Unsol PS by High Expertise on Engagement

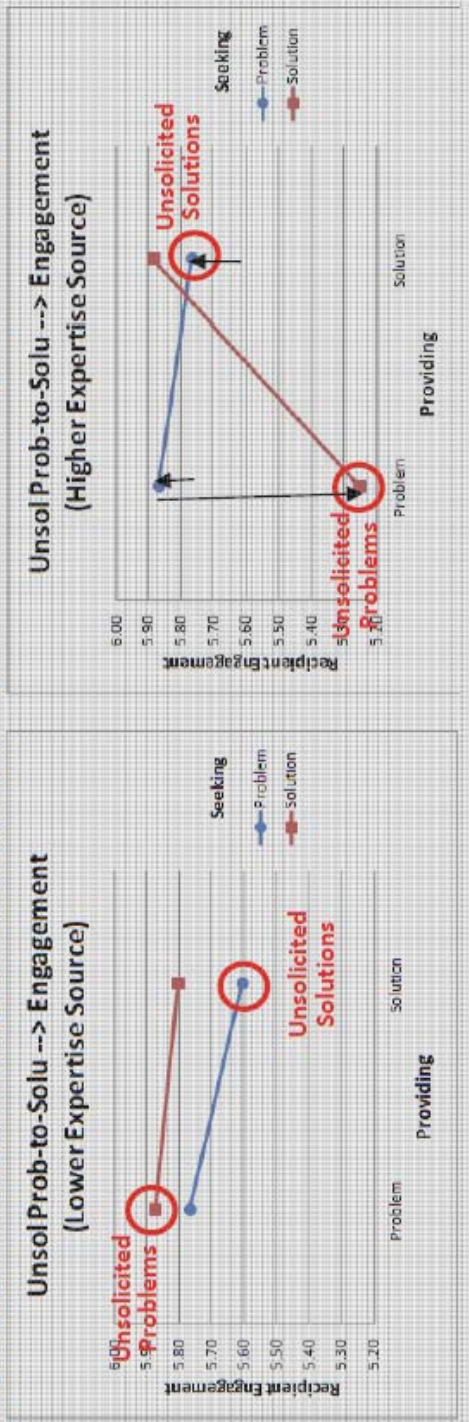


Figure 36c: Unsol GF by Low Expertise on Engagement Figure 36d: Unsol GF by High Expertise on Engagement

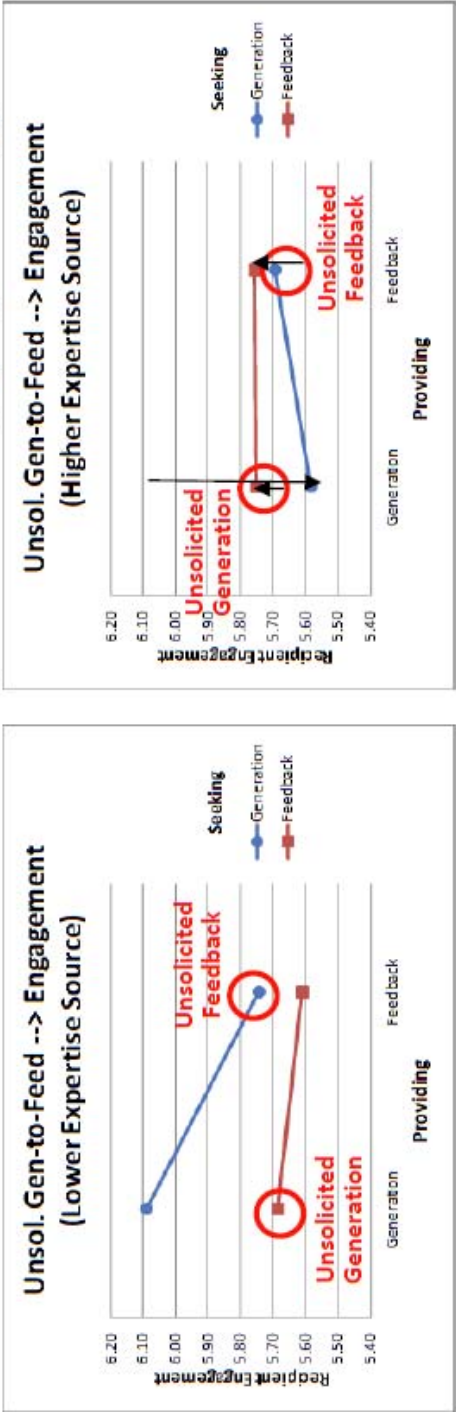


Figure 37: Exchange Usefulness for Unsolicited Problem-to-Solution Knowledge by Source Expertise

Figure 37a: Unsol PS by Low Expertise on Usefulness

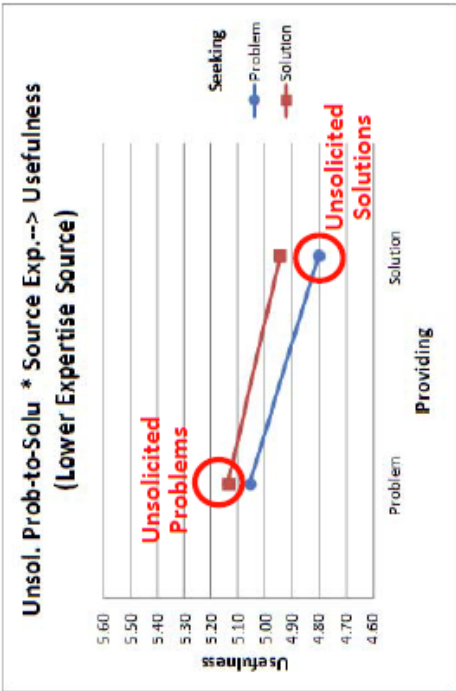


Figure 37b: Unsol PS by High Expertise on Usefulness

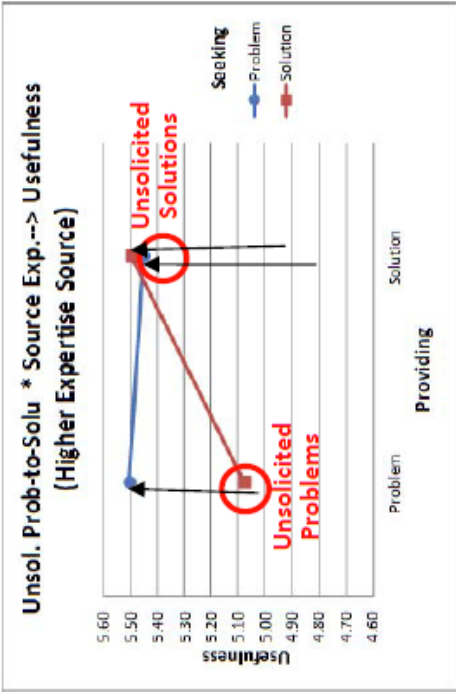


Figure 37c: Unsol GF by Low Expertise on Usefulness

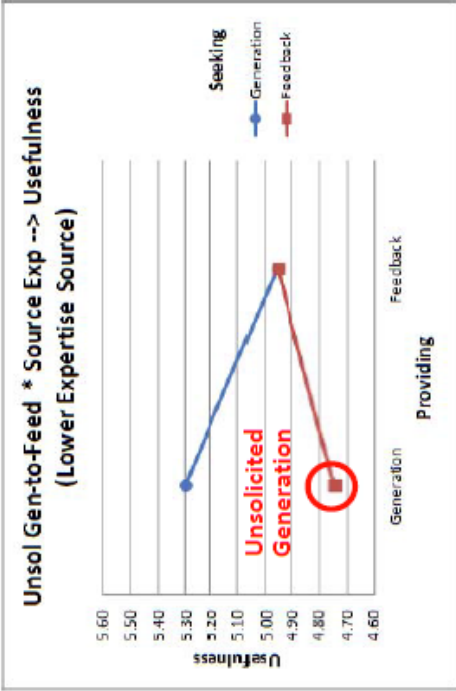


Figure 37d: Unsol GF by High Expertise on Usefulness

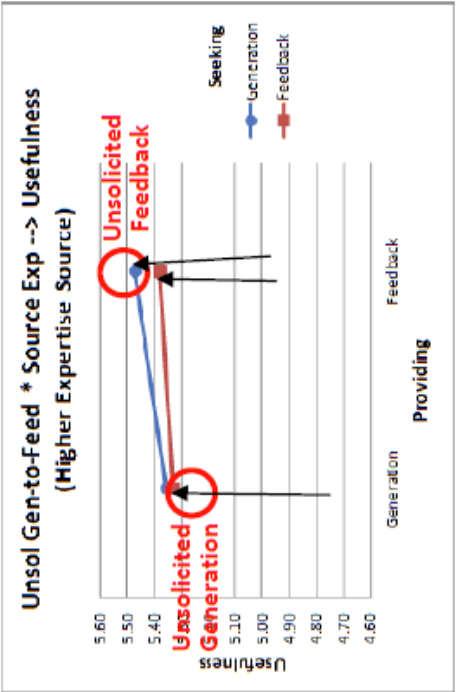


Figure 38: Tacitness of Unsolicited / Unsought Exchanges

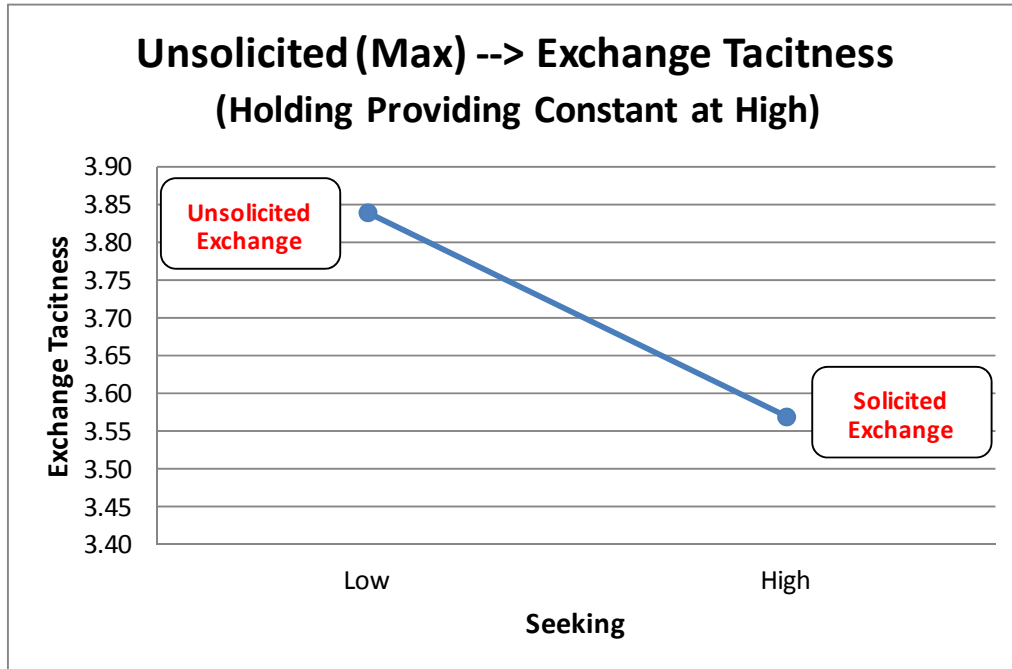


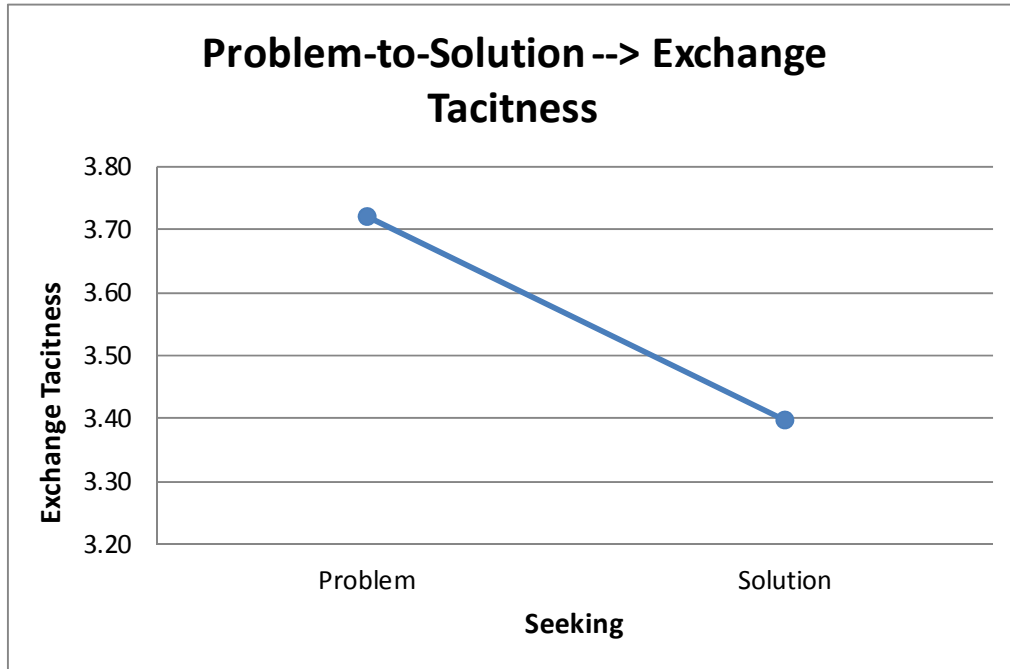
Figure 39: Tacitness of Problem-to-Solution Knowledge

Figure 40: Novelty of Unsolicited / Solicited Exchanges

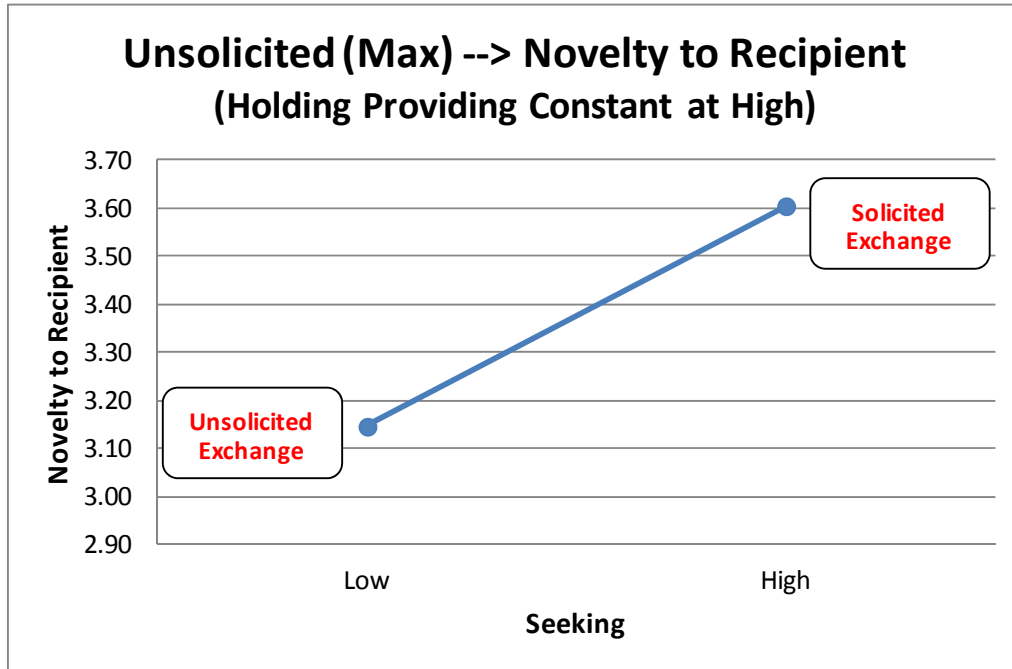


Figure 41: Novelty of Unsolicited / Unsought Generation-to-Feedback Knowledge

Figure 41a: Interaction Effect Based on Model 4 Regression Results

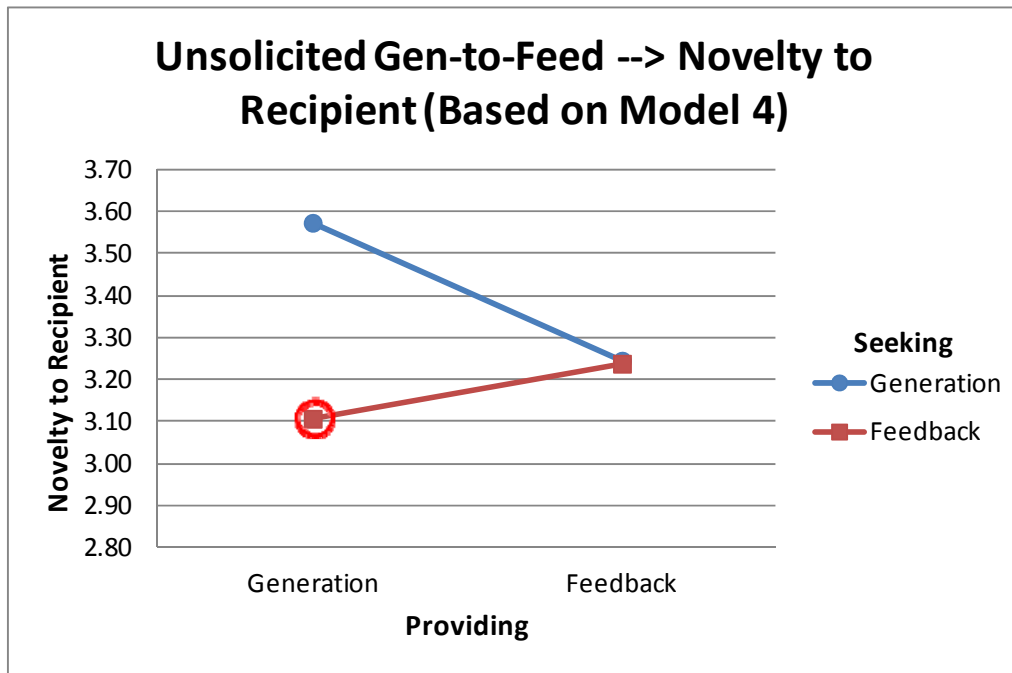


Figure 41b: Interaction Effect Based on Model 5 Regression Results

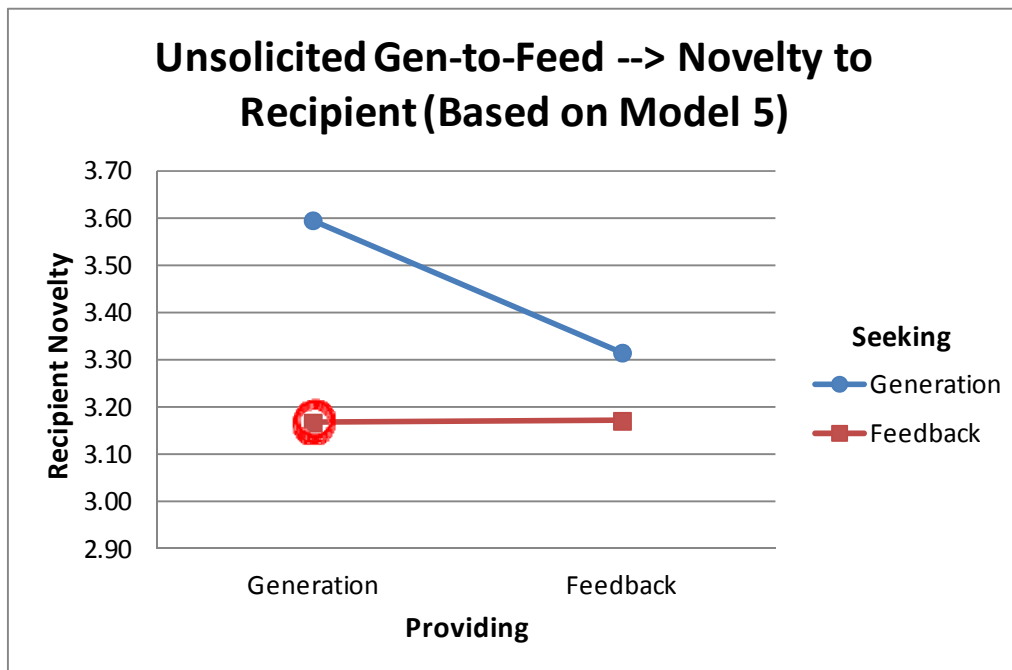


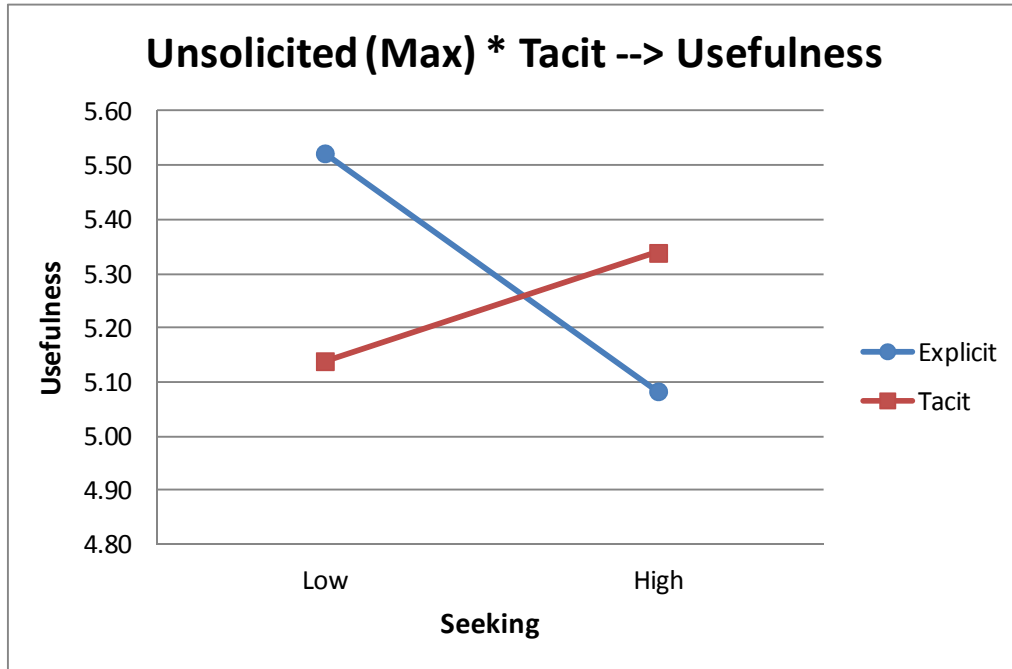
Figure 42: Exchange Usefulness for Unsolicited / Unsought Exchanges by Tacitness

Figure 43: Exchange Usefulness for Unsolicited / Unsought Gen-to-Feed Knowledge by Tacitness

Figure 43a: Unsolicited Generation-to-Feedback in Explicit Exchanges

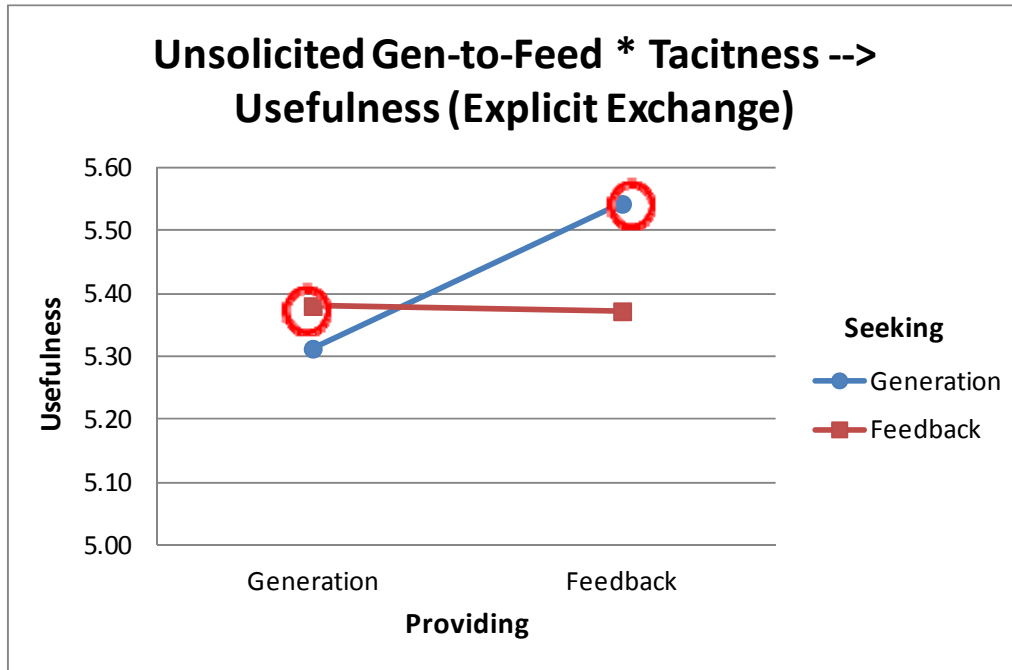


Figure 43b: Unsolicited Generation-to-Feedback in Tacit Exchanges

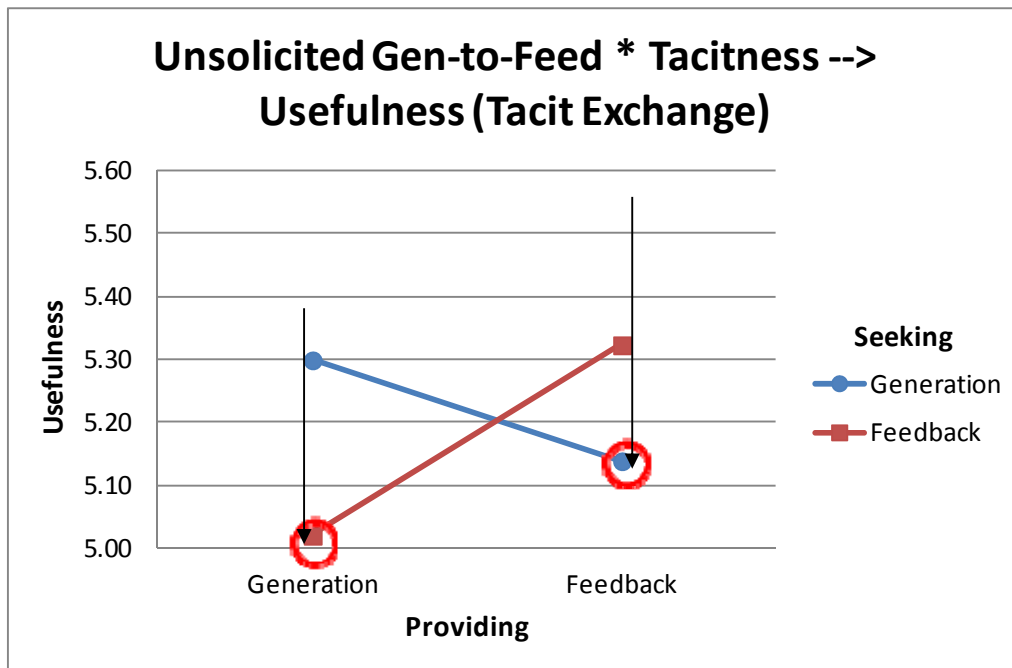


Figure 44: Exchange Usefulness for Unsolicited / Unsought Exchanges by Novelty

Figure 44a: Unsolicited / Unsought Exchanges Involving Familiar Knowledge

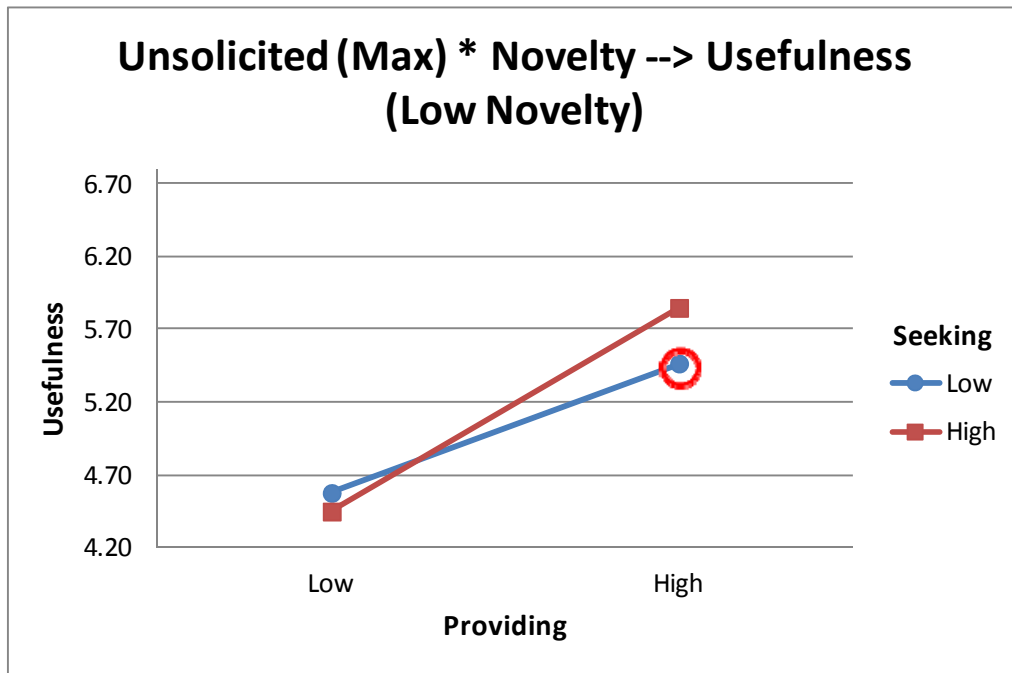


Figure 44b: Unsolicited / Unsought Exchanges Involving Novel Knowledge

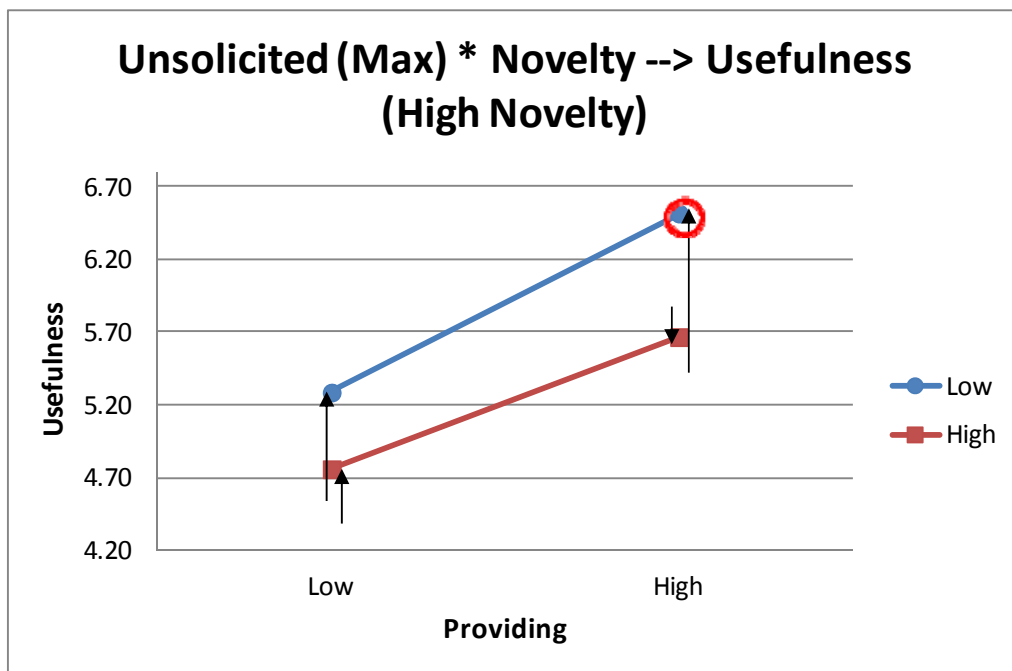


Figure 45: Exchange Usefulness for Unsolicited / Unsought Gen-to-Feed Knowledge by Novelty

Figure 45a: Unsolicited / Unsought Gen-to-Feed Familiar Knowledge

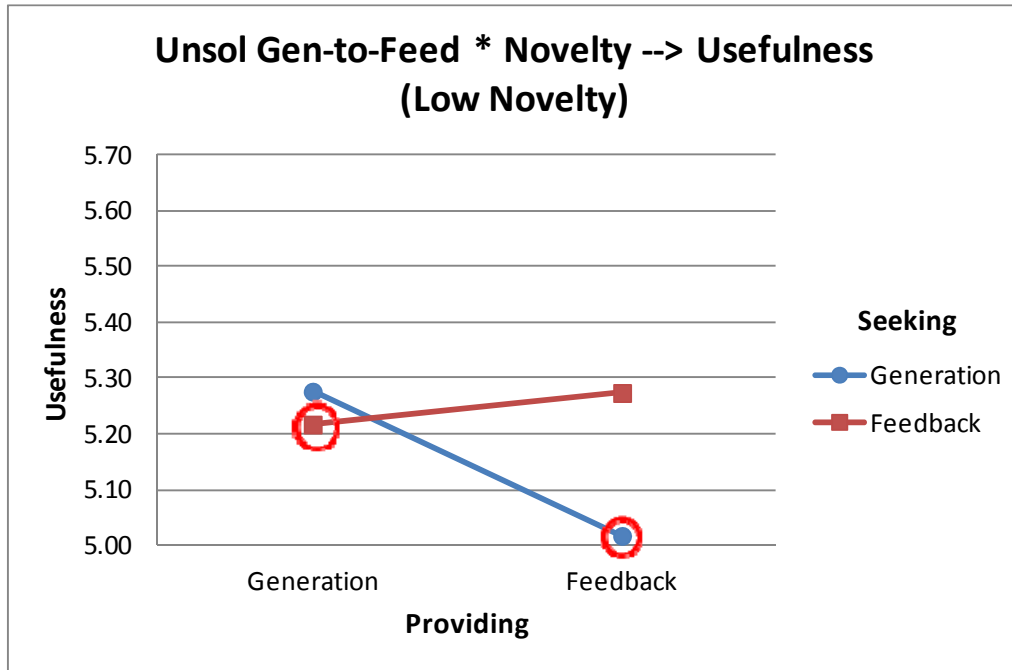
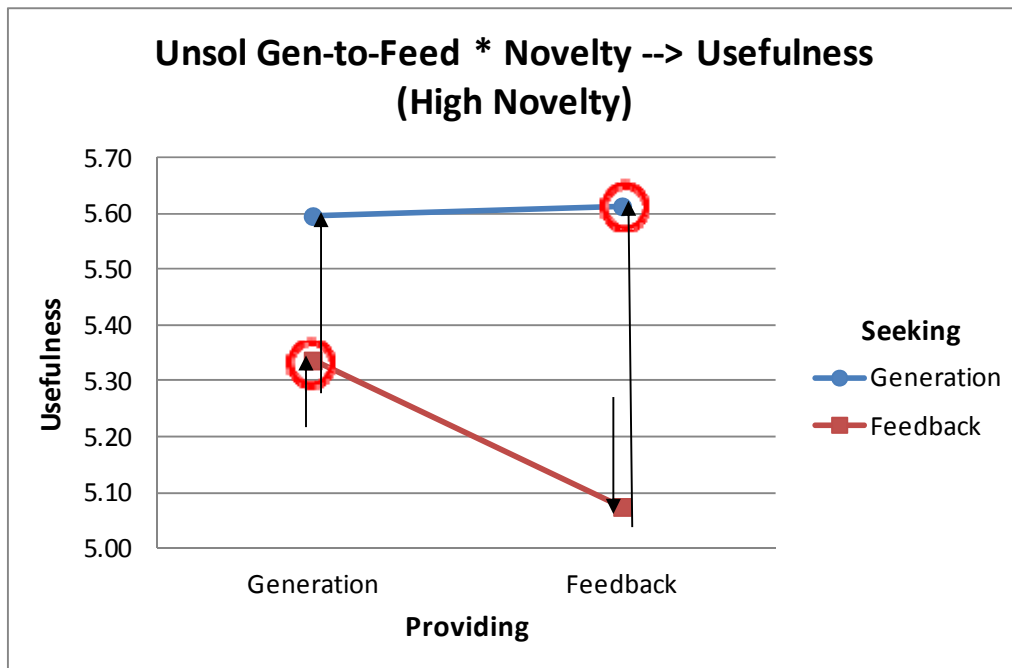


Figure 45b: Unsolicited / Unsought Gen-to-Feed Novel Knowledge



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CURRICULUM VITAE:

ACADEMIC WORK EXPERIENCE

2011 – Pres. Academic Director & Assistant Professor
Innovation & Entrepreneurship Institute / Dept. of Strategic Mgmt
Fox School of Business, Temple University

EDUCATION

2005 – 2012 **Rutgers University** Doctor of Philosophy (Mgmt & Intl. Bus.)
1991 – 1996 **Virginia Polytechnic University** Bachelor of Science (Psych & Sociology)

RESEARCH

Selected Publications in Refereed Journals & Best Papers Proceedings

- 2012 Chen, C.C., Belkin, L.Y., McNamee, R., & Kurtzberg, T.R. (Forthcoming) Charisma Attribution During Organizational Change: The Importance of Followers' Concern For Well-Being. **Journal of Applied Social Psychology**
- 2011 Fetterhoff, T., Nila, P., McNamee, R. (Nov. –Dec. 2011). Accessing Internal Knowledge: Organizational Practices that Facilitate the Transfer of Tacit Knowledge. **Research Technology Management**, 54(6), 50-54
- 2011 Schoch, N., Oelschlaeger, P., Huskey, L., McNamee, R. (Nov. –Dec. 2011). Collaboration Continuum: Benchmarking Knowledge Sharing Environments in Organizations. **Research Technology Management**, 54(6), 54-56
- 2011 Slone, R., Becker, S., Penton, P., Pu, X., McNamee, R., (Nov. –Dec. 2011). Managing Global R&D Networks. **Research Technology Management**, 54(6), 59-61
- 2010 McNamee, R., Schoch, N., Oelschlaeger, P., Huskey, L. (Nov. –Dec. 2010). Collaboration Continuum: Cultural & Technological Enablers of Knowledge Exchange. **Research Technology Management**, 53(6), 54-57
- 2008 Graffin, S., Wade, J., Porac, J., & McNamee, R. (May–Jun. 2008). The impact of CEO status leakage on the economic outcomes of other senior managers. **Organization Science**, 19(3), 1–18.
- 2007 Chen, C.C., Belkin, L.Y., McNamee, R., & Kurtzberg, T.R. (Aug. 2007). In the eyes of the follower: Construction of charisma in response to organizational change. **Academy of Management Best Papers Proceedings**.

Selected Publications Under Review or Revise & Resubmit

- 2010 McNamee, R. Can't see the forest for the leaves: Similarity and distance measures for hierarchical taxonomies with a patent classification example. **Research Policy (under R&R)**.